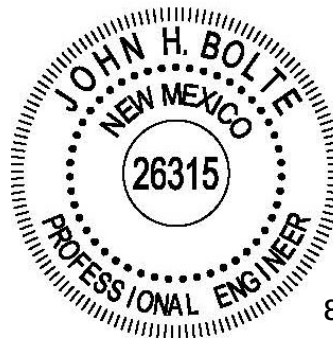


**Project Manual**  
For  
**Site and MEP Package for Moriarty Public Access  
CNG Fueling Station**

For the  
E.M.W. Gas Association  
An Intercommunity Natural Gas Association

Located in  
Torrance County  
Moriarty, New Mexico

**August 2020**



8/11/20

A handwritten signature in black ink, appearing to read "J.H. Bolte".

PREPARED BY:



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[www.smallarrow.com](http://www.smallarrow.com)

SAE Project No. 20104

Section 00005

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ADVERTISEMENT FOR BIDS

**Project Name: 2020 EMW GAS ASSOCIATION CNG STATION CONSTRUCTION PROJECT**  
**Project No. ITB 2020-1**

Competitive Sealed Bids are being solicited from bona fide general contractors with appropriate New Mexico licenses for the construction of one CNG Public Access Fueling Station along US Route 66 in Moriarty, NM. (Commodity Code 40513) for the installation of new electric service and systems, new stainless steel CNG piping, concrete pavement and equipment pads, CMU enclosure, composite fence gates, custom carports, ground mounted sign, fueling canopy and station equipment integration. This project is located in Torrance County, New Mexico. Bid documents can be accessed through EMW Gas website: <http://www.emwgas.com/procurements/>.

Sealed bids will be received at *EMW Gas Association, 416 5<sup>th</sup> St, Estancia, NM 87016* by no later than 11:00a.m. MDT on **Thursday, September 10, 2020** at which time the public opening and reading of bids received will begin in EMW Gas Association Conference Room.

Delivery of bids is the sole responsibility of the Bidder. The bids will be considered by the Gas Association following the opening of the bids, and an award of the Contract, if made, will be within thirty (30) days after the Bid Opening. Bid Security in the amount of 5% of the bid will be required to accompany bids. No Bidder may withdraw his/her bid within 60 days after the actual date of the opening thereof.

The Owner reserves the right to reject any or all bids and to waive irregularity in the bids and in the bidding. It is understood that Bid prices shall include all freight charges to the Owner's requested delivery location. All items shall be delivered to the EMW North Shop Warehouse at 409 Roosevelt Ave., Moriarty, NM 87035 or to the Public Access CNG Station site on US Route 66 in Moriarty, NM.

To receive a resident or resident veteran contractor preference pursuant to Section 13-4-2 NMSA 1978, a resident or resident veteran contractor shall submit *with its bid* a copy of a valid resident or resident veteran contractor certificate issued by the New Mexico Taxation and Revenue Department pursuant to Section 13-1-22 NMSA 1978.

A 2:00pm MDT Pre-Bid conference and Job Showing will be held on Thursday, August 27, 2020 at the EMW North Shop, 409 Roosevelt Ave, Moriarty, New Mexico 87035. Attendance at the Pre-Bid Conference for this project is **mandatory** to qualify to submit a Bid. **Please note that Face Covering, Social Distancing and Group Size Measures will be followed.**

Attention of bidders is called to the requirements as to conditions of employment to be observed and minimum wage rates to be paid under the contract, Section 3, Segregated Facility, Section 109 and E.O. 11246. Also, all bidders must furnish the properly executed "**Non-Collusion Affidavit**" contained with the bid documents and follow "**Buy American Act**" provisions under FAR 52.225-9 and FAR 52.225-21.

**E.M.W. Gas Association** hereby notifies all bidders that it will affirmatively insure that in any contract entered into pursuant to this advertisement, Disadvantaged Business Enterprises will be afforded full opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, sex, or national origin in consideration for an award.

Questions may be directed to John H. Bolte, PE, Small Arrow Engineering, Email: [jbolte@smallarrow.com](mailto:jbolte@smallarrow.com) or Jennifer Gauna, Chief Procurement Officer, Email: [jeng@emwgas.org](mailto:jeng@emwgas.org)  
Advertised in Albuquerque Journal, The Independent & emwgas.com on: Tuesday, August 11, 2020

Section 00100  
INSTRUCTIONS TO BIDDERS

1. Defined Terms.

Terms used in these Instructions to Bidders which are defined in the Standard General Conditions of the Construction Contract (No. 1910-8) (1990 Edition) have the meanings assigned to them in the General Conditions. Certain additional terms used in these Instructions to Bidders have the meanings indicated below which are applicable to both the singular and plural thereof.

1.1. Bidder - one who submits a Bid directly to Owner as distinct from a sub-bidder, who submits a bid to a Bidder.

1.2. Issuing Office - the office from which the Bidding Documents are to be issued and where the bidding procedures are to be administered.

1.3. Successful Bidder - the lowest, responsible and responsive Bidder to whom Owner (on the basis of Owner's evaluation as hereinafter provided) makes an award.

2. Copies of Bidding Documents.

2.1. Complete sets of the Bidding Documents in the number and for the deposit sum, if any, stated in the Invitation to Bid may be obtained from the Issuing Office. The deposit will be refunded to each document holder of record who returns a complete set of Bidding Documents in good condition within five days after opening of Bids.

2.2. Complete sets of Bidding Documents must be used in preparing Bids; neither Owner nor Engineer assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

2.3. 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 confer a license or grant for any other use.

3. Qualifications of Bidder.

To demonstrate qualifications to perform the Work, each Bidder must be prepared to submit within five days after Bid opening upon Owner's request detailed written evidence such as financial data, previous experience, present commitments, and other such data as may be called for below (or in the Supplementary Instructions). Each Bid must contain evidence of Bidder's qualification to do business in the State of New Mexico or covenant to obtain such qualification prior to award of the contract.

In addition, the Bidder shall conform to the requirements of US Department of Transportation Drug Testing Programs - CFR Part 199.

4. Examination of Contract Documents and Site.

4.1. It is the responsibility of each Bidder before submitting a Bid:

4.1.1. To examine thoroughly the Contract Documents and other related data identified in the Bidding Documents (including "technical data" referred to below);

4.1.2. To visit the site to become familiar with and satisfy Bidder as to the general, local and site conditions that may affect cost, progress, performance or furnishing of the Work;

4.1.3. To consider federal, state and local Laws and Regulations that may affect cost, progress, performance or furnishing of the Work;

4.1.4. To study and carefully correlate Bidder's knowledge and observations with the Contract Documents and such other related data; and

4.1.5. To promptly notify Engineer of all conflicts, errors, ambiguities or discrepancies which Bidder has discovered in or between the Contract Documents and such other related documents.

4.2. Reference is made to the Supplementary Conditions for identification of:

4.2.1. Those reports of explorations and tests of subsurface conditions at or contiguous to the site which have been utilized by Engineer in preparation of the Contract Documents. Bidder may rely upon the general accuracy of the "technical data" contained in such reports but not upon other data, interpretations, opinions or information contained such reports or otherwise relating to the subsurface conditions at the site, nor upon the completeness thereof for the purposes of bidding or construction.

4.2.2. Those drawings of physical conditions in or relating to existing surface and subsurface structures (except Underground Facilities) which are at or contiguous to the site that have been utilized in preparation of the Contract Documents. Bidder may rely upon the general accuracy of the "technical data" contained in such drawings but not upon other data, interpretations, opinions or information to such structures, nor upon the completeness thereof for the purposes of bidding or construction. Copies of such reports and drawings will be made available by Owner to any Bidder on request. Those reports and drawings are not part of the Contract Documents, but the "technical data" contained therein upon which Bidder is entitled to rely as provided in Paragraph 4.2 of the General Conditions has been identified and established in Paragraph SC-4.2 of the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion drawn from any "technical data" or any such data, interpretations, opinions or information.

4.3. Information and data shown or indicated in the Contract 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 or others, and Owner and Engineer do not assume responsibility for the accuracy or completeness thereof unless it is expressly provided otherwise in the Supplementary Conditions.

4.4 Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions and Underground Facilities, and possible changes in the Contract Documents due to differing or unanticipated conditions appear in Paragraphs 4.2 and 4.3 of the General Conditions.

4.5 Before submitting a Bid each Bidder will be responsible to obtain such additional or supplementary examinations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the site or otherwise, which may affect cost, progress, performance or furnishing of the Work or which relate to any aspect of the means, methods, techniques, sequences or procedures of construction to be employed by Bidder and safety precautions and programs incident thereto or which Bidder deems necessary to determine its Bid for performing and furnishing the Work in accordance with the time, price and other terms and conditions of the Contract Documents.

4.6. On request, Owner will provide each Bidder access to the site to conduct such examinations, investigations, explorations, tests and studies as each Bidder deems necessary for submission of a Bid.

Bidder must fill all holes and clean up and restore the site to its former conditions upon completion of such explorations, investigations, test and studies.

4.7. Reference is made to the Supplementary Conditions for the identification of the general nature of work that is to be performed at the site by Owner or others (such as utilities and other prime contractors) that relates to the work for which a Bid is to be submitted. On request, Owner will provide to each Bidder for examination access to or copies of Contract Documents (other than portions thereof related to price) for such work.

4.8. 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 Contract Documents and applying the specific means, methods, techniques, sequences or procedures of construction (if any) that may be shown or indicated or expressly required by the Contract Documents, that Bidder has given Engineer written notice of all conflicts, errors, ambiguities and discrepancies that Bidder has discovered in the Contract Documents and the written resolutions thereof by Engineer is acceptable to Bidder, and that the Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.

4.9. The provision of I-4.1 through 4.8, inclusive, do not apply to Asbestos, Poly chlorinated biphenyl (PCBs), Petroleum, Hazardous Waste or Radioactive Material covered by paragraph 4.5 of the General Conditions.

#### 5. Availability of Land for Work, etc.

The lands upon which the Work is to be performed, right-of-way and easements for access thereto and other lands designated for use by Contractor in performing the Work are identified in the Contract 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. Easements for permanent structures or permanent changes in existing facilities are to be obtained and paid for by Owner unless otherwise provided in the Contract Documents.

#### 6. Interpretations and Addenda.

6.1. All questions about the meaning or intent of the Bidding Documents are to be directed to the Engineer. Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda mailed or delivered to all parties recorded by the Engineer as having received the Bidding Documents. Questions received less than ten days prior to the date for opening of Bids may not be answered. Only questions answered by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

6.2. Addenda may also be issued to modify the Bidding Documents as deemed advisable by Owner or Engineer.

#### 7. Bid Security.

7.1. Each Bid must be accompanied by Bid security made payable to Owner in an amount of five percent of the Bidder's maximum Bid price and in the form of a certified or bank check or a Bid Bond issued by a surety meeting the requirements of paragraph 5.1 of the General Conditions.

7.2. The Bid security of the Successful Bidder will be retained until such Bidder has executed the

Agreement furnished the required contract security and met the other conditions of the Award, whereupon the bid security will be returned. If the Successful Bidder fails to execute and deliver the Agreement and furnish the required contract security within fifteen days after the Notice of Award, Owner may annul the Notice of Award and the Bid security of that Bidder will be forfeited. The Bid security of the Bidders whom Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of the seventh day after the Effective Date of the Agreement or the forty-sixth day after the bid opening, whereupon Bid security furnished by such Bidders will be returned. Bid security with Bids which are not competitive will be returned within seven days after the Bid opening.

#### 8. Contract Times.

The number of days within which, or the dates by which, the Work is to be substantially completed and also completed and ready for final payment (term "Contract Times" is defined in paragraph 1.12 of the General Conditions) are set forth in the Agreement (or incorporated therein by reference to the attached Bid Form).

#### 9. Liquidated Damages.

Provisions for liquidated damages, if any, are set forth in the Agreement.

#### 10. Substitute of "Or-Equal" Items.

The Contract, if awarded, will be on the basis of materials and equipment described in the Drawings or specified in the Specifications with consideration of possible substitute or "or-equal" items. Whenever it is indicated in the Drawings or specified in the Specifications that a substitute or "or-equal" item of material or equipment may be furnished or used by Contractor if acceptable to Engineer, application for such acceptance will not be considered by Engineer until after the Effective Date of the Agreement. The procedure for submission of any such application by Contractor and consideration by Engineer is set forth in Paragraphs 6.7.1, 6.7.2 and 6.7.3 of the General Conditions and may be supplemented in the General Requirements.

#### 11. Subcontractors, Suppliers and Others.

11.1. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers and other persons and organizations (including those who are to furnish the principal items of material and equipment) to be submitted to Owner in advance of the specified date prior to the Effective Date of the Agreement, apparent Successful Bidder, and any other Bidder so requested, shall within seven (7) days after the Bid opening submit to Owner a list of all such Subcontractors, Suppliers and other persons and organizations 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, person or organization if requested by Owner. An Owner or Engineer who after due investigation has reasonable objection to any proposed Subcontractor, Supplier, other person or organization, may before the Notice of Award is given request apparent Successful Bidder to submit an acceptable substitute without an increase in Bid price. 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 and other persons and organizations. The declining to make requested substitutions will not constitute grounds for sacrificing the Bid security of any Bidder. Any Subcontractor, Supplier, other person or organization listed and to whom Owner and Engineer does not make 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



## 6.8.2 of the General Conditions.

If the Contract Documents require the identity of certain Subcontractors and other persons and organizations to be submitted to EMW in advance of the Notice of Award, the apparent successful Bidder, and any other Bidder so requested, will within seven (7) days after the day of the Bid Opening, submit to EMW a list of all Subcontractors and other persons and organizations (including those who are to furnish the principal items of material and equipment) proposed for those portions of the Work for which such identification is required. If requested by EMW, such list shall be accompanied by an experience statement with pertinent information as to similar projects and other evidence of qualification for each such Subcontractor, person and organization. If EMW, after due investigation, has reasonable objection to any proposed Subcontractor, other person, or organization, EMW may, before giving the Notice of Award, request the apparent successful Bidder to submit an acceptable substitute without an increase in the bid amount. Any Subcontractor, other person or organization so listed and to whom EMW does not make written objection prior to the giving of the Notice of Award will be deemed acceptable to EMW. Public Works Projects may be subject to the provisions of the "Subcontractors Fair Practices Act", Sections 13-4-31, et seq., NMSA 1978. When this Act is applicable, each Bidder shall comply with the requirements set forth in the Special Provisions of these Bidding Documents.

11.2. In contracts where the Contract Price is on the basis of Cost-of-the-Work Plus a Fee, the apparent Successful Bidder, prior to the Notice of Award, shall identify in writing to Owner those portions of the Work that such Bidder proposes to subcontract and after the Notice of Award may only subcontract other portions of the Work with Owner's written consent.

11.3. No Contractor shall be required to employ any Subcontractor, Supplier, other person or organization against whom Contractor has reasonable objection.

## 12. Bid Form.

12.1. The Bid Form is included with the Bidding Documents; additional copies may be obtained from Engineer (or Issuing Office).

12.2. All blanks on the Bid Form must be completed by printing in black ink or by typewriter.

12.3. Bids by corporations must be executed in the corporate name by the president or vice-president (or other corporate officer accompanied by evidence of authority to sign) and the corporate seal must be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation must be shown below the signature.

12.4. Bids by partnerships must be executed in the partnership name and signed by a partner, whose title must appear under the signature and the official address of the partnership must be shown below the signature.

12.5. All names must be typed or printed in black ink below the signature.

12.6. The Bid shall contain an acknowledgment of receipt of all Addenda (the numbers of which must be filled in on the Bid Form).

12.7. The mailing address, telephone number and email address for communications regarding the Bid must be shown.

12.8. Evidence of authority to conduct business as an out-of-state corporation in the state where the

Work is to be performed shall be provided in accordance with Paragraph 3 above. State contractor license number, if any, must also be shown.

12.9. Bidders may submit a Bid for any of the separate sections described in the Contract Documents or any combination of sections as provided for in the Bid Form.

### 13. Submission of Bids.

Bids shall be submitted at the time and place indicated in the Invitation to Bid and shall be enclosed in an opaque sealed envelope, marked with the Project title (and if applicable, the designated portion of the Project for which the Bid is submitted) and name and address of the Bidder accompanied by the Bid security and other required documents. If the Bid is sent through the mail or other delivery system the sealed envelope shall be enclosed in a separate envelope with the notation "BID ENCLOSED" on the face of it. Each prospective Bidder is furnished one copy of the Bidding Documents with one separate unbound copy each of the Bid Form and the Bid Bond. The Bidding Documents may be retained by the Bidder. The unbound copy of the Bid Form is to be completed and submitted with the Bid security and any other data required to be submitted with the Bid.

### 14. Modification and Withdrawal of Bids.

14.1. Bids may be modified or withdrawn by an appropriate document duly executed (in the manner that a Bid must be executed) and delivered to the place where Bids are to be submitted at any time prior to the opening of Bids.

14.2. If, within twenty-four hours Bids are opened, any Bidder files a duly signed, written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, that Bidder may withdraw its Bid and the Bid security will be returned. Thereafter, that Bidder will be disqualified from further bidding on the Work to be provided under the Contract Documents.

### 15. Opening of Bids.

Bids will be opened and (unless obviously non-responsive) read aloud publicly at the place where Bids are to be submitted. 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.

### 16. Bids to Remain Subject to Acceptance.

All bids will remain subject to acceptance for sixty days after the day of the Bid opening, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to that date.

EMW reserves the right to accept bids, award bids and/or reject any and all bids ***“In Whole or In Part,”*** (any combination of Project A, Project B, and Project C) to waive any and all informalities and technical irregularities and the right to disregard all nonconforming or conditional bids or counter proposals. EMW reserves the right to accept the bid that appears from all consideration to be for the best interest of EMW and to cancel the opportunity for submission of bids when it is in the best interest of EMW. EMW further reserves the right to reject any or all bids submitted for EMW's convenience or for cause. Bidders whose bids are rejected shall not be entitled to recover damages of any nature against EMW for EMW's rejection of a bid, for cause or for convenience.

*The New Mexico Procurement Code (Sections 13-1-21 through 13-1-199, NMSA 1978) imposes civil and criminal penalties for code violations. In addition, the New Mexico Criminal Statutes impose*

***felony penalties for illegal bribes, gratuities and kick-backs.***

EMW may cancel the award of any contract or portion thereof at any time before the execution of said contract by all parties without liability against the Association. If any provisions of this Bid shall be held to be invalid, illegal or unenforceable, the validity, legality and enforceability of the remaining provisions shall not in any way be affected or impaired thereby. The Chief Procurement Officer shall be the sole judge in the determination of these matters. Notice of bid award, if bid is awarded, will be made within thirty (30) days of bid opening.

17. Award of Contract.

17.1. Owner reserves the right to reject any or all Bids, including without limitation the rights to reject any or all nonconforming, nonresponsive, unbalanced or conditional Bids and to 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, whether because the Bid is not responsive or the Bidder is unqualified or of doubtful financial ability or fails to meet any other pertinent standard or criteria established by Owner. 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. 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. Discrepancies between words and figures will be resolved in favor of the words.

17.2. In evaluating Bids, Owner will consider the qualifications of the Bidders, 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.

17.3. Owner may consider the qualifications and experience of Subcontractors, Suppliers, and other persons and organizations proposed for those portions of the Work as to which the identity of Subcontractors, Suppliers, and other persons and organizations must be submitted as provided in the Supplementary Conditions. Owner also may consider the operating costs, maintenance requirements, performance data and guarantees of major items of materials and equipment proposed for incorporation in the Work when such data is required to be submitted prior to the Notice of Award.

17.4. Owner may conduct such investigations as Owner deems necessary to assist in the evaluation of any Bid and to establish the responsibility, qualifications and financial ability of Bidders, proposed Subcontractors, Suppliers and other persons and organizations to perform and furnish the Work in accordance with the Contract Documents to Owner's satisfaction within the prescribed time.

17.5. If the contract is to be awarded, it will be awarded to the lowest Bidder whose evaluation by Owner indicates to Owner that the award will be in the best interests of the Project.

17.6. If the contract is to be awarded, Owner will give the Successful Bidder a Notice of Award within sixty days after the day of Bid opening.

18. Contract Security.

Paragraph 5.1 of the General Conditions and the Supplementary Conditions set for the Owner's requirements as to Performance and Payment Bonds. When the Successful Bidder delivers the executed Agreement to owner, it must be accompanied by the required Performance and Payment Bonds.

19. Signing of Agreement.

When owner gives a Notice of Award to the Successful Bidder, it will be accompanied by the required number of unsigned counterparts of the Agreement with all other written Contract Documents attached. Within fifteen days thereafter Contractor shall sign and deliver the required number of counterparts of the Agreement and attached documents to Owner with the required Bonds. Within ten days thereafter Owner shall deliver one fully signed counterpart to Contractor. Each counterpart is to be accompanied by a complete set of the Drawings with appropriate identification.

## 20. Public Works Contracts

All bidders shall comply with the provisions of Sections 13-4-1, et seq. NMSA 1978.

**A. Resident Contractor Preference:** A Resident Contractor is a contractor that has a valid resident contractor certificate issued by the New Mexico Taxation and Revenue Department pursuant to Section 13-1-22 NMSA 1978.

A resident contractor preference is provided for in Section 13-4-2 NMSA 1978, which provides that for the purposes of awarding a public works contract using a formal bid process, a bid submitted by a resident contractor shall be deemed to be five percent (5%) lower than the bid actually submitted by the resident contractor.

To receive a resident contractor preference pursuant to Section 13-4-2 NMSA 1978, a resident contractor shall submit with its bid a copy of a valid resident contractor certificate issued by the New Mexico Taxation and Revenue Department. The resident contractor preference will not be given if a valid resident contractor certificate issued by the New Mexico Taxation and Revenue Department is not submitted with the resident contractor's bid.

**B. Resident Veteran Contractor Preference:** A Resident Veteran Contractor is a contractor that has a valid resident veteran contractor certificate issued by the New Mexico Taxation and Revenue Department pursuant to Section 13-1-22 NMSA 1978.

A resident veteran contractor preference is provided for in Section 13-4-2 NMSA 1978, which provides that for the purposes of awarding a public works contract using a formal bid process, a bid submitted by a resident veteran contractor shall be deemed to be ten percent (10%) less than the bid actually submitted.

A contractor shall not be awarded both a resident contractor preference and a resident veteran contractor preference.

To receive a resident veteran contractor preference pursuant to Section 13-4-2 NMSA 1978, a resident veteran contractor shall submit with its bid a copy of a valid resident veteran contractor certificate issued by the New Mexico Taxation and Revenue Department. The resident veteran contractor preference will not be given if a valid resident veteran certificate issued by the New Mexico Taxation and Revenue Department is not submitted with the resident veteran contractor's bid.

## 21. Registration of Contractors

All bidders shall comply with the provisions of Section 13-4-13.1 (NMSA 1978), with regard to Registration of Contractors. The Contractor will be required to obtain a New Mexico Contractor's license and GF-09 Certificate prior to bidding any work on this job.

Any contractor, serving as a prime or not, that submits a bid greater than \$60,000.00 for a public works project that is subject to the Public Works Minimum Wage Act shall be registered with the Labor and Industrial Division of the Department of Workforce Solutions (DWS).

Bidders shall indicate their DWS registration number in the space provided in the **Bid** form.

All subcontractors must be registered with the DWS before beginning work. The Contractor awarded  
Small Arrow Engineering                      Section 00100                      Page 8

the contract shall list the DWS number, if applicable, for each subcontractor listed on the form entitled **Contractor's List of Subcontractors** at page AF-5.

Pursuant to the Subcontractors Fair Practices Act, Section 13-4-31, et seq. NMSA 1978, EMW will not approve any subcontractor which has not complied with DWS registration requirements.

Any required substitution pursuant to this provision will be made at no cost to EMW.

## 22. Workers Compensation Insurance – Non-Resident Contractors

Notice is given that in addition to the requirements of the General Conditions of the Contract, non-Resident Contractors shall comply with the provisions of Section 52-1-66 of the Workers' Compensation Act and Sections 59A-17-10.1, 59A-18-1, and 59A-18-12 of the Insurance Code, NMSA 1978, pertaining to the worker's compensation insurance policy and rate for employers not domiciled in New Mexico.

## 23. Wage Rates

The Bidder's attention is directed to the fact that wages to be paid on this Project shall not be less than the prevailing wage rates as listed by the Director of the Labor and Industrial Division of the New Mexico Department of Workforce Solutions and (where applicable). The NM Department of Workforce Solutions Public Works Wage Decision is:

### **Type "A" – Street, Highway, Utility & Light Engineering – Jan 1, 2020**

**PRIOR TO BIDDING**, all General Contractors submitting bids exceeding \$60,000 **MUST** have an active registration with the *New Mexico Department of Workforce Solutions Labor Relations Division's Public Works and Apprenticeship Website* at:

<https://www.dws.state.nm.us/pwaa/LRDEmployer/Registration/EmployerRegistration.ASPX>

## 24. Gross Receipts Tax Surety Bond

Section 7-1-55 NMSA 1978 provides that any person engaged in the construction business **who does not have its principal place of business in New Mexico** and enters into a prime construction contract to be performed in this state, the gross receipts taxes to be paid on which would be in excess of \$50,000, shall at the time such contract is entered into, furnish the New Mexico Taxation and Revenue Department with a surety bond, or other acceptable security, in a sum equivalent to the gross receipts to be paid under the Contract multiplied by the applicable rate of the gross receipts tax imposed by Section 7-9-4 NMSA 1978, plus the applicable rate of local gross receipts taxes, to secure payment of the tax imposed on the gross receipts from the Contract, and shall obtain a certificate from the New Mexico Taxation & Revenue Department that the requirements of this section have been met.

SECTION 00300A – BID FORM

PROJECT IDENTIFICATION:

**One (1) CNG Public Access Fueling Station at 614 US Route 66 (W) in Moriarty, New Mexico.**

THIS BID IS SUBMITTED TO:

**E.M.W. Gas Association  
Attn: Eddie O’Brien  
416 5<sup>th</sup> Street  
Estancia, New Mexico 87016**

1.01 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 the Bid and in accordance with the other terms and conditions of the Bidding Documents.

2.01 Bidder accepts all of the terms and conditions of the Advertisement or Invitation to Bid and Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. The Bid will remain subject to acceptance for 60 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of OWNER.

3.01 In submitting this Bid, Bidder represents, as set forth in the Agreement, that:

A. Bidder has examined and carefully studied the Bidding Documents, the other related data identified in the Bidding Documents, and the following Addenda, receipt of all which is hereby acknowledged.

<u>Addendum No.</u>	<u>Addendum Date</u>
_____	_____
_____	_____
_____	_____

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. **A Mandatory pre-bid meeting will be held on Thursday, August 27<sup>th</sup>, 2020 at 2:00 PM, MDT, at the shop of E.M.W. Gas Association at 409 Roosevelt Ave., Moriarty, NM.** This mandatory meeting is open to all prospective bidders and will include a review of the plans and specifications, along with a walk through of the Public Access CNG Station site at Moriarty, NM.

C. Bidder 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. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in paragraph 4.02 of the General Conditions, and (2) reports and drawings of a Hazardous Environmental Condition, if any, which has been identified in the Supplementary Conditions as provided in paragraph 4.06 of the General Conditions.

E. Bidder has obtained and carefully studied (or assumes responsibility for having done so) all additional or supplementary examinations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of 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 to be employed by Bidder, and safety precautions and programs incident thereto.

F. Bidder does not consider that any 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 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 correlated the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, exploration, tests, studies, and data with the Bidding Documents.

I. 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.

J. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which the Bid is submitted.

K. It is understood that the Bid prices shall include all freight charges to Owner's requested delivery location in Moriarty, NM. Quotations for equipment and material used for the CNG Public Access Fueling Station shall be exempt from Sales Tax (NM Gross Receipts Tax). EMW Gas Association will provide the Contractor a Sales Tax Exemption Letter to use for the purchase of all materials and supplies used for installation and integration of the new CNG station.

L. The Bid Schedule is broken down into pay items for equipment/materials and labor to install the various equipment and materials. This is necessary to allow for tracking of labor costs to properly assess values that are subject to the New Mexico Gross Receipts Tax. The Contractor will be responsible for submitting the appropriate Gross Receipts Tax payment to the State office in Santa Fe once all contract labor is determined. EMW Gas Association will have a pay item to reimburse the Contractor this amount as part of this project cost. The project will be awarded based upon the grand total costs for labor and materials.

4.01 Bidder further represents that 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 agreement or rules of any group, association, organization or corporation; Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; Bidder has not solicited or induced any individual or entity to refrain from bidding; and Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over OWNER.

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

6.01 Refer to "Instruction to Bidders" and Standard Purchase Terms and Conditions before completing bid.

06.02 Quote your best price, F.O.B. EMW Gas Association, 409 Roosevelt Ave., Moriarty, New Mexico.

BID SCHEDULE: (Please reference Totals from Section 00300B – Unit Bid Price Schedule)

**Total Base Bid Items:** \$ \_\_\_\_\_

In Words: \_\_\_\_\_

**Total Alternate Bid Items:** \$ \_\_\_\_\_

In Words: \_\_\_\_\_

**Total Base Bid Items + Alternate Bid Items:** \$ \_\_\_\_\_

In Words: \_\_\_\_\_

Unit Prices have been computed in accordance with paragraph 11.03.B of the General Conditions. BIDDER acknowledges that quantities are not guaranteed and final payment will be based on actual quantities determined as provided in the Contract Documents.

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 provided, determined as provided in the Contract Documents. Bidder should be aware that the major equipment will be supplied by the Owner. The Bidder will be required to coordinate with the Owner's equipment Vendors to work together on the integration of the Public Access Fueling Station.

7.01 Bidder agrees that the Work will be substantially complete within 80 working 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.B of the General Conditions within 90 working days after the date when the Contract Times commence to run.

7.02 Bidder accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the Work within the times specified above, which shall be stated in the Agreement.

8.01 The following documents are attached to and made a condition of this Bid:

A. Required Bid Security in the form of a certified or bank check or a Bid Bond issued by a surety meeting the requirement of Paragraph 5.1 of the General Conditions.

9.01 The terms used in this Bid with initial capital letters have the meanings indicated in the Instruction to Bidders, the General Conditions, and the Supplementary Conditions.



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

State Contractor License No. \_\_\_\_\_ (If applicable)

If Bidder is:

An Individual

Name (typed or printed):

By: \_\_\_\_\_ (SEAL)

*(Individual's signature)*

Doing business as:

Business address:

Phone No.: \_\_\_\_\_ FAX No.:

A Partnership

Partnership Name: \_\_\_\_\_ (SEAL)

By:

*(Signature of general partner — attach evidence of authority to sign)*

Name (typed or printed):

Business address:

Phone No.: \_\_\_\_\_ FAX No.:

A Corporation

Corporation Name: \_\_\_\_\_ (SEAL)

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

*(Signature of Corporate Secretary)*

Business address:

Phone No.: \_\_\_\_\_ FAX NO.:

Date of Qualification to do business is \_\_\_\_\_.

A Joint Venture

Joint Venture Name: \_\_\_\_\_(SEAL)

By:

*(Signature of joint venture partner — attach evidence of authority to sign)*

Name (typed or printed):

Title:

Business address:

Phone No.: \_\_\_\_\_FAX No.:

Joint Venture Name: \_\_\_\_\_(SEAL)

By:

*(Signature — attach evidence of authority to sign)*

Name (typed or printed):

Title:

Business address:

Phone No.: \_\_\_\_\_FAX No.:

Phone and FAX Number, and Address for receipt of official communications:

(Each joint venture 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.)

**E.M.W. Gas Association  
614 US Route 66 (W)  
Moriarty, New Mexico  
Public Access CNG Fueling Station**

<b>Base Bid Items</b>								
<b>Item #</b>	<b>Description</b>	<b>Qty</b>	<b>Units</b>	<b>Unit Cost Materials</b>	<b>Total Cost Materials</b>	<b>Unit Cost Labor</b>	<b>Total Cost Labor</b>	<b>Total Cost Materials &amp; Labor</b>
1	JW Power EA-100-3 CNG Compressor Skid (Transport, Set, & Anchor)	1	LS		\$ -		\$ -	\$ -
2	Install CNG Storage Sphere Skids (3 spheres/skid) (Transport, Set, & Anchor)	2	EA		\$ -		\$ -	\$ -
3	Recondition CNG 24' Storage Cylinders (3 pack) (Paint, Relief Valves, Other Items as Req'd)	1	EA		\$ -		\$ -	\$ -
4	Install CNG Storage Cylinders (Reconditioned 3 pack) (Transport, Set, & Anchor)	1	EA		\$ -		\$ -	\$ -
5	Install Greenfield CNG Dispenser (Transport, Set, & Anchor)	1	EA		\$ -		\$ -	\$ -
6	Install Xebec STR18NGX Gas Dryer (Transport, Set, & Anchor)	1	EA		\$ -		\$ -	\$ -
7	ANGI 50 CNG Compressor (Set, & Anchor)	1	EA		\$ -		\$ -	\$ -
8	TGT CNG Dispenser 7203-8 NGC50 (Transport, Set, & Anchor)	1	EA		\$ -		\$ -	\$ -
9	Fuel Master FMU 2550 Card Reader (Transport, Set, & Anchor)	1	EA		\$ -		\$ -	\$ -
10	Rebuild/Reconfigure Skid Priority Panel System (Includes Parts/Labor)	1	EA		\$ -		\$ -	\$ -
11	24' x 44' 4 Column CNG Fueling Canopy w/Roof Drains w/ LED Lights, and Facia w/ Signage/Artwork (Arning Industries Inc or Equal)	1	LS		\$ -		\$ -	\$ -
12	Site Grading/Earthwork (Includes Stripping, Cutting, Filling & Compacting, Subgrade Prep, and Fine Grading)	1350	CY		\$ -		\$ -	\$ -
13	8" Reinforced Concrete Pavement over 4" NMDOT Type 2 Base	1850.6	SY		\$ -		\$ -	\$ -
14	12" Thick Chip and Seal Granular Paving	1662.8	SY		\$ -		\$ -	\$ -
15	4" Concrete Sidewalk over 4" NMDOT Type 2 Base	35.5	SY		\$ -		\$ -	\$ -
16	12" Thick Driveway NMDOT Type 2 Base (Shoulder)	156.1	SY		\$ -		\$ -	\$ -
17	6" Reinforced Concrete Equipment Pad (Dryer & Transformer)	10.7	SY		\$ -		\$ -	\$ -

Item #	Description	Qty	Units	Unit Cost Materials	Total Cost Materials	Unit Cost Labor	Total Cost Labor	Total Cost Materials & Labor
18	10" Double Mat Reinforced Concrete Equipment Pad (Compressor & Sphere Pads and Sphere Skid Runner Pads)	53.7	SY		\$ -		\$ -	\$ -
19	Masonry Wall Foundation	29.3	CY		\$ -		\$ -	\$ -
20	8' High Masonry Equipment Enclosure Wall (Including Sunflower Blocks for Air Flow)	1491.25	SF		\$ -		\$ -	\$ -
21	3'-0" x 80" Steel Door w/Frame and ALL Hardware	2	EA		\$ -		\$ -	\$ -
22	12' Wide Double Swing Composite Fence Gates w/All Hardware	2	EA		\$ -		\$ -	\$ -
23	26' Wide x 30' Long x 10' High Legs Vertical Roof Carport	1	LS		\$ -		\$ -	\$ -
24	10' Wide x 24' Long x 10' High Legs Vertical Roof Carport	1	LS		\$ -		\$ -	\$ -
25	3" Thick Native Stone w/ Landscape Fabric	173.8	SY		\$ -		\$ -	\$ -
26	5" Thick Native Stone Landscape Rock	421.2	SY		\$ -		\$ -	\$ -
27	Seeding / Landscaping	0.49	AC		\$ -		\$ -	\$ -
28	Striping/Pavement Marking	1	LS		\$ -		\$ -	\$ -
29	6" Dia Concrete Filled Pipe Bollards w/ Covers	12	EA		\$ -		\$ -	\$ -
30	15" Driveway Culvert Pipe	80	LF		\$ -		\$ -	\$ -
31	Traffic Control (NM DOT Requirements)	1	LS		\$ -		\$ -	\$ -
32	Erosion Control	1	LS		\$ -		\$ -	\$ -
33	Electric Primary Service Conduits & Coordination w/CNMEC to pull Primary Conductors and set Transformer, CT Meter & Disconnect	1	LS		\$ -		\$ -	\$ -
34	Electrical Switchgear, Equipment, Conduits, Cable, etc (per drawings)	1	LS		\$ -		\$ -	\$ -
35	Control, Communication, and ESD Equipment, Conduits, Cable, etc. (per drawings)	1	LS		\$ -		\$ -	\$ -
36	Video Surveillance System Includes: (8) 4K Resolution, Live 30fps, Motorized Zoom Lens, 120ft Color Night Vision, POE, Cat 6, Cameras; (1) 8 Channel 4K, 8mp, 6mp, & 5mp recording, 2 SATA 4 Terabyte Hard Drives, 8 POE Ports, Smart Phone, Internet, and PC-MAC Remote Viewing, HD Live Viewing, NVR; CAT 6 Cable; Conduits; Wall Mount Climate Control 24" x 24" x 24" Cabinet w/ 800 BTU AC	1	LS		\$ -		\$ -	\$ -
37	Light Pole Base, Pole, Navion LED Light Fixture	4	EA		\$ -		\$ -	\$ -
38	Wall Mount Hazardous Area Champ LED Fixture	3	EA		\$ -		\$ -	\$ -
39	4" Welded Steel Pipe & Ftgs, w/Flanges	30	LF		\$ -		\$ -	\$ -
40	2" Welded Steel Pipe & Ftgs, w/Flanges	15	LF		\$ -		\$ -	\$ -
41	1 1/2" and 1" Welded Steel Pipe & Ftgs, w/Flanges	5	LF		\$ -		\$ -	\$ -
42	1" House Regulator (to ANGI 50 Compressor) (125 psi in/10 psi out)	1	LS		\$ -		\$ -	\$ -

Item #	Description	Qty	Units	Unit Cost Materials	Total Cost Materials	Unit Cost Labor	Total Cost Labor	Total Cost Materials & Labor
43	1/2" SS Tubing 0.065" Wall (Comp to Storg, Storg to Disp)	700	LF		\$ -		\$ -	\$ -
44	1/2" SS Tubing 0.065" Wall (Storage Manifold & Connections)	60	LF		\$ -		\$ -	\$ -
45	1/2" SS Tubing 0.020" Wall (Air) (Comp to Storage & Disp's)	150	LF		\$ -		\$ -	\$ -
46	1/2" SS Tubing 0.020" Wall (Air) (Storage Manifold & Connect)	40	LF		\$ -		\$ -	\$ -
47	25' HD Air Hose, Air Chuck w/Pressure Gauge, & Aluminum Wall Hanger	1	LS		\$ -		\$ -	\$ -
48	1 1/4" MDPE Conduit (Sleeve for SS lines to Compressors)	120	LF		\$ -		\$ -	\$ -
49	2" MDPE Conduit (Sleeve for SS lines to Dispensers)	240	LF		\$ -		\$ -	\$ -
50	1/2" SS AFV CNG Valves w/ Lockable Handles	13	EA		\$ -		\$ -	\$ -
51	Misc CNG SS Valves & SS Fittings (ALLOWANCE)	1	LS	\$ 15,000.00	\$ 15,000.00			\$ 15,000.00
52	Coalescing Filter Rack Assemblies	2	EA		\$ -		\$ -	\$ -
53	Greenfield Dispenser Tub	1	EA		\$ -		\$ -	\$ -
54	Protective Hat over exposed Tubing/Conduits	1	LS		\$ -		\$ -	\$ -
55	4" Dia, 10' Tall Vent Stack Assy	2	EA		\$ -		\$ -	\$ -
56	2" Sch. 80 Black Iron Pipe, (Vent Pipe) (Painted White)	55	LF		\$ -		\$ -	\$ -
57	Ground Mounted Sign w/ 2 Sided Digital Price Display (per drawing)	1	LS		\$ -		\$ -	\$ -
58	20# BC Fire Extinguishers & Cabinets	8	EA		\$ -		\$ -	\$ -
59	CNG & Misc. Safety Signage (per drawings)	1	LS		\$ -		\$ -	\$ -
60	1 1/4" PEX Water Line and Fittings	490	LF		\$ -		\$ -	\$ -
61	Frost Free Hydrant w/Lockable Handle	2	EA		\$ -		\$ -	\$ -
62	Overall CNG Equipment/Station Integration/Start Up/Training	1	LS				\$ -	\$ -
63	JW Power - Programming / Startup Support (ALLOWANCE)	1	LS			\$ 7,500.00	\$ 7,500.00	\$ 7,500.00
<b>Subtotal Base Bid Items</b>								
64	Gross Receipts Tax (On Labor Only)	7.6875%	LS				\$ -	\$ -
<b>Total Base Bid Items</b>								<b>\$ -</b>
Total Bid (in Words) _____								

Item #	Description	Qty	Units	Unit Cost Materials	Total Cost Materials	Unit Cost Labor	Total Cost Labor	Total Cost Materials & Labor
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<b>Alternate Bid Items</b>								
1	Recondition CNG Storage Spheres (Paint, Relief Valves, Other Items as Req'd)	3	EA		\$ -		\$ -	\$ -
2	4' Dia CNG Storage Spheres (Set, & Anchor)	3	EA		\$ -		\$ -	\$ -
3	10" Double Matt Reinforced Concrete Equipment Pad (Compressor & Sphere Pads and Sphere Skid Runner Pads)	14.2	SY		\$ -		\$ -	\$ -
4	3" Thick Native Stone w/ Landscape Fabric (Deduct)	-14.2	SY		\$ -		\$ -	\$ -
5	1/2" SS Tubing 0.065" Wall (Storage Manifold & Connections)	35	LF		\$ -		\$ -	\$ -
6	1/2" SS AFV CNG Valves w/ Lockable Handles	3	EA		\$ -		\$ -	\$ -
7	4" Dia, 10' Tall Vent Stack Assy	1	EA		\$ -		\$ -	\$ -
8	2" Sch. 80 Black Iron Pipe, (Vent Pipe) (Painted White)	30	LF		\$ -		\$ -	\$ -
<b>Subtotal Alternate Bid Items</b>								

9	Gross Receipts Tax (On Labor Only)	7.6875%	LS				\$ -	\$ -
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<b>Total Alternate Bid Items</b>							\$	-
Total Bid (in Words) _____								

<b>Total Base Bid Items + Alternate Bid Items</b>							\$	-
Total Bid (in Words) _____								

**SECTION 00410  
BID BOND**

BID REQUEST NO. \_\_\_\_\_

BOND NO. \_\_\_\_\_

KNOW ALL MEN BY THESE PRESENTS, That we, \_\_\_\_\_ ,  
hereinafter referred to as the Principal, \_\_\_\_\_ ,  
with general offices in the city of \_\_\_\_\_ ,

a Corporation duly organized and existing under the laws of the State of \_\_\_\_\_ and  
authorized to do business in the State of New Mexico, hereinafter called the Surety, as Surety, are  
held and firmly bound unto the E.M.W. Gas Association, 416 5<sup>th</sup> Street, Estancia, New Mexico  
87016, hereinafter called the Oblige, in the sum of

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Dollars (\$ \_\_\_\_\_), good and lawful money of the United States of America, to be paid  
upon demand of the Oblige, for payment of which sum well and truly to be made, we bind  
ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly  
by these presents.

THE CONDITION OF THE FOREGOING OBLIGATION IS SUCH THAT, Whereas, the Principal has  
submitted to the Oblige a Bid for furnishing all labor, materials, equipment and incidentals thereto necessary  
for work generally described as

**Providing Equipment, Materials, and Labor for Construction of a  
Public Access CNG Fueling Station in Moriarty, Torrance County, New Mexico**

---

NOW, THEREFORE, If the Oblige shall accept the Bid of the Principal and the Principal shall enter into a  
written agreement with the Oblige in accordance with the terms, conditions and price(s) set forth therein, and  
furnish such insurance and give such bond or bonds as may be specified in the Bidding or Contract Documents  
with good and sufficient surety for the faithful performance of such Agreement and for the prompt payment  
of labor and materials furnished in the prosecution thereof, then this obligation shall become null and void;  
otherwise, it shall remain in full force and effect; and the Surety shall, upon failure of the Principal to comply  
with any or all of the foregoing requirements immediately pay to the Oblige, upon demand, the amount hereof  
in good and lawful money of the United States of America, not as a penalty, but as liquidated damages.

IN TESTIMONY WHEREOF, the Principal and Surety have caused these presents to be duly signed and  
sealed this \_\_\_\_ day of \_\_\_\_\_, 20 \_\_\_\_.

\_\_\_\_\_  
Principal

By \_\_\_\_\_  
(Seal)

\_\_\_\_\_  
Official Title

\_\_\_\_\_  
Surety

By \_\_\_\_\_  
Attorney-in-Fact

By \_\_\_\_\_  
New Mexico Agent

(Accompany this bond with Attorney-in-Fact's authority from Surety Company certified to include the date of the bond.)



**SECTION 00500**  
**STANDARD FORM OF AGREEMENT**  
**BETWEEN OWNER AND CONTRACTOR**  
**ON THE BASIS OF A STIPULATED PRICE**

**THIS AGREEMENT** is by and between E.M.W. Gas Association (hereinafter called OWNER) and \_\_\_\_\_  
(hereinafter called CONTRACTOR).

OWNER and CONTRACTOR, in consideration of the mutual covenants hereinafter set forth, 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:

**Providing Equipment, Materials and Labor for Construction of a  
Public Access CNG Fueling Station in Moriarty, Torrance County, New Mexico**

**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:

**Providing Equipment, Materials and Labor for Construction of a  
Public Access CNG Fueling Station in Moriarty, Torrance County, New Mexico**

**ARTICLE 3 - ENGINEER**

3.01 The Project has been designed by: **SMALL ARROW ENGINEERING, LLC**

who is hereinafter called ENGINEER and who 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 80 working days after the date when the Contract Times commence to run as provided in Article 2.3 of the General Conditions, and completed and ready for final payment in accordance with Article 14 of the General Conditions within 90 working days after the date when the Contract Times commence to run.

4.03 *Liquidated Damages*

A. CONTRACTOR and OWNER recognize that time is of the essence of this Agreement 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 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.

**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:

\_\_\_\_\_ (\$ \_\_\_\_\_)  
(use words) (figure)

All specific cash allowances are included in the above price and have been computed in accordance with Article 11.2 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 estimated quantity of that item as indicated in this paragraph 5.01.B:

**TOTAL OF ALL UNIT PRICES**

\_\_\_\_\_ (\$ \_\_\_\_\_)  
(use words) (figure)

As provided in Article 11 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 Article 9 of the General Conditions. Unit prices have been computed as provided in Article 11 of the General Conditions.

C. For all Work, at the prices stated in CONTRACTOR's Bid, attached hereto as an exhibit.

**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 1st day of each month during performance of the Work as provided in paragraphs 6.02.A. 1 and 6.02.A.2 below. All such payments will be measured by the schedule of values established in Article 2 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, in accordance with Article 14 of the General Conditions:

- a. 90 % of Work completed (with the balance being retainage). If the Work has been 50% completed as determined by ENGINEER, and if the character and progress of the Work have been satisfactory to OWNER and ENGINEER, OWNER, on recommendation of ENGINEER, may determine that as long as the character and progress of the Work remain satisfactory to them, there will be no retainage on account of Work subsequently completed, in which case the remaining progress payments prior to Substantial Completion will be in an amount equal to 100% of the Work completed less the aggregate of payments previously made; and
- b. 100 % of cost of materials and equipment not incorporated in the Work (with the balance being retainage).

2. Upon Substantial Completion, OWNER shall pay an amount sufficient to increase total payments to CONTRACTOR to 99 % of the Work completed, less such amounts as ENGINEER shall determine in accordance with Article 14 of the General Conditions and less 110 % 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 Article 14 of the General Conditions, OWNER shall pay the remainder of the Contract Price as recommended by ENGINEER as provided in said Article 14.

## **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 6 % 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. CONTRACTOR has obtained and carefully studied (or assumes responsibility for having done so) all examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by CONTRACTOR, including applying the specific means, methods, techniques, sequences, and procedures of construction, if any, expressly required by the Contract Documents to be employed by CONTRACTOR, and safety precautions and programs incident thereto

E. CONTRACTOR does not consider that any 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.

F. 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.

G. CONTRACTOR has correlated the information known to CONTRACTOR, information and observations obtained from visits to the Site, reports and drawings identified in the Contract Documents, and all additional examinations, investigations, explorations, tests, studies, and data with 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 (pages 1 to 6, inclusive);
2. Construction Performance Bond (pages 1 to 4, inclusive);
3. Construction Payment Bond (pages 1 to 3, inclusive);
4. Other Bonds:
  - a. Maintenance Bond (pages 1 to 2, inclusive);
  - b. \_\_\_\_\_ (pages \_\_\_\_\_ to \_\_\_\_\_, inclusive);
  - c. \_\_\_\_\_ (pages \_\_\_\_\_ to \_\_\_\_\_, inclusive);
5. General Conditions (pages 1 to 47, inclusive);
6. Supplementary Conditions (pages 1 to 17, inclusive);
7. Specifications as listed in the table of contents of the Project Manual;
8. Drawings consisting of Twenty-seven (27) sheets, with each sheet bearing the following general title:

Public Access CNG Station, Moriarty, New Mexico.

9. Addenda (numbers \_\_\_\_\_ to \_\_\_\_\_, inclusive);
  10. Exhibits to this Agreement (enumerated as follows):
    - a. Notice to Proceed (pages   1   to   1  , inclusive);
    - b. CONTRACTOR's Bid (pages   1   to   4  , inclusive);
    - c. Documentation submitted by CONTRACTOR prior to Notice of Award (pages \_\_\_\_\_ to \_\_\_\_\_, inclusive);
    - d. \_\_\_\_\_;
  11. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:
    - a. Written Amendments;
    - b. Work Change Directives;
    - c. Change Order
- 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 Article 3 of the General Conditions.

**ARTICLE 10- MISCELLANEOUS**

10.01 *Terms*

- A. Terms used in this Agreement will have the meanings indicated in the General 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 Other Provisions - N/A

IN WITNESS WHEREOF, OWNER and CONTRACTOR have signed this Agreement in duplicate. One counterpart each has been delivered to OWNER and CONTRACTOR. All portions of the Contract Documents have been signed or identified by OWNER and CONTRACTOR or on their behalf.

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

OWNER:

CONTRACTOR:

E.M.W. Gas Association

\_\_\_\_\_

By: \_\_\_\_\_  
Eddie O'Brien, General Manager

By: \_\_\_\_\_  
[CORPORATE SEAL]

Attest \_\_\_\_\_

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

Address for giving notices:

Address for giving notices:

416 5<sup>th</sup> Street  
Estancia, New Mexico 87016  
(505) 384-2369

(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 OWNER-CONTRACTOR Agreement.)

License No. \_\_\_\_\_  
(Where applicable)

Agent for service of process:

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

Designated Representative:

Designated Representative:

Name: Small Arrow Engineering, LLC

Name:

Title: John H. Bolte, P.E., Principal

Title:

Address: 216 S. Main Street

Address:

Joplin, MO 64801

Phone: 417.624.2333

Phone:

Facsimile: 417.624.2441

Facsimile:

SECTION 00610  
CONSTRUCTION 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 Principal Place of Business):

OWNER (Name and Address):

**E.M.W. Gas Association  
416 5<sup>th</sup> Street  
Estancia, New Mexico 87016**

CONSTRUCTION CONTRACT

Date:

Amount:

Description (Name and Location):

**Providing Equipment, Materials, and Labor for  
Construction of a Public Access CNG Fueling Station at  
614 US ROUTE 66 (W) MORIARTY, TORRANCE COUNTY, NM**

BOND

Date (Not earlier than Construction Contract Date):

Amount:

Modifications to this Bond Form:

CONTRACTOR AS PRINCIPAL

Company: (Corp.Seal)

SURETY

Company: (Corp. Seal)

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

Name and Title: \_\_\_\_\_

Signature:

Name and Title:

CONTRACTOR AS PRINCIPAL

Company: (Corp. Seal)

SURETY

Company: (Corp. Seal)

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

Name and Title: \_\_\_\_\_

Signature:

Name and Title:

Prepared through the joint efforts of the Surety Association of America, Engineers' Joint Contract Documents Committee, the Associated General Contractors of America, American Institute of Architects, American Subcontractors Association, and the Associated Specialty Contractors.

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

2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except to participate in conferences as provided in Subparagraph 3.1.

3. If there is no Owner Default, the Surety's obligation under this Bond shall arise after:

3.1. The Owner has notified the Contractor and the Surety at its address described in Paragraph 10 below, that the Owner is considering declaring a Contractor Default and has requested and attempted to arrange a conference with the Contractor and the Surety to be held not later than fifteen days after receipt of such notice to discuss methods of performing the Construction Contract. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default; and

3.2. The Owner has declared a Contractor Default and formally terminated the Contractor's right to complete the contract. Such Contractor Default shall not be declared earlier than twenty days after the Contractor and the Surety have received notice as provided in Subparagraph 3.1; and

3.3. The Owner has agreed to pay the Balance of the Contract Price to the Surety in accordance with the terms of the Construction Contract or to a contractor selected to perform the Construction Contract in accordance with the terms of the contract with the Owner.

4. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

4.1. Arrange for the Contractor, with consent of the Owner, to perform and complete the Construction Contract; or

4.2. Undertake to perform and complete the Construction Contract itself, through its agents or through independent contractors: or

4.3. Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and the contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and to pay to the Owner the amount of damages as described in Paragraph 6 in excess of the balance of the Contract Price incurred by the Owner resulting from the Contractor's default; or

4.4. Waive its right to perform and complete, arrange for completion or obtain, a new contractor and with reasonable promptness under the circumstances:

4.4.1. After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, tender payment therefor to the Owner: or

4.4.2. Deny liability in whole or in part and notify the Owner citing reasons therefor.

5. If the Surety does not proceed as provided in Paragraph 4 with reasonable promptness, the Surety shall be deemed to be in default on this Bond fifteen days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Subparagraph 4.4, and the Owner refuses the payment tendered or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

6. After the Owner has terminated the Contractor's right complete the Construction Contract, and if the Surety elects to act under Subparagraph 4.1. 4.2. or 4.3 above, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. To the limit of the amount of this Bond, but subject to commitment by the Owner of the Balance of the Contract Price to mitigation of costs and damages on the Construction Contract, the Surety is obligated without duplication for:

6.1. The responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

6.2. Additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 4; and

6.3. Liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

7. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction 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 the Owner or its heirs, executors, administrators, or successors.

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

9. 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 the Contractor ceased working or within two years after the 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.

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

11. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted here from and provisions conforming to such statutory or other legal 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.

## 12. Definitions

12.1. Balance of the Contract Price: The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

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

12.3. Contractor Default: Failure of the Contractor, which has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Construction Contract.

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

**SECTION 00613  
MAINTENANCE BOND**

KNOW ALL PERSONS BY THESE PRESENTS:

That \_\_\_\_\_  
(Name of Contractor)

\_\_\_\_\_  
(Address of Contractor)

a \_\_\_\_\_ hereinafter called Principal, and  
(Corporation, Partnership, or Individual)

\_\_\_\_\_  
(Name of Surety)

hereinafter called Surety, are held and firmly bound unto \_\_\_\_\_

**E.M.W. Gas Association**  
(Name of Owner)

**416 5<sup>th</sup> Street**  
**Estancia, New Mexico 87016**  
(Address of Owner)

hereinafter called OWNER, and unto all persons, firms, and corporations who or which may furnish labor, or who furnish materials to perform as described under the contract and to their successors and assigns in the total aggregate penal sum of \_\_\_\_\_ Dollars

(\$\_\_\_\_\_) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH THAT, Whereas, on the \_\_\_\_ day of \_\_\_\_\_, 20\_\_, the Principal entered into a written agreement with OWNER, for the construction, reconstruction, or repair of certain public improvements as designated and described in the said agreement; and

Whereas, it was a condition of the contract award by the Owner that these presents be executed by the Principal and Surety aforesaid, and

Whereas, the Principal agrees to guarantee the work herein above described, including all materials and workmanship, for the period of one (1) year beginning on the date the Owner so accepts said Work, said date being the formal acceptance date.

NOW, THEREFORE, if the Principal shall and will, in all particulars well, duly, and faithfully observe, perform and abide by each and every covenant, condition and part of said written agreement and other Contract Documents and shall protect the Owner against all damages, losses and expenses which may occur to Owner, by reason of defective materials used, or by reason of defective workmanship done, and for the construction, reconstruction or repair of said public improvements, and settlement of backfill excavated areas.

IN WITNESS WHEREOF, this instrument is executed in   4   counterparts, each one of which shall be (Number)

deemed an original, this the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

ATTEST:

\_\_\_\_\_  
*Principal*

\_\_\_\_\_  
(Witness as to Principal)

By \_\_\_\_\_

\_\_\_\_\_  
(SEAL)

\_\_\_\_\_  
(Address)

\_\_\_\_\_  
(Address)

ATTEST:

\_\_\_\_\_  
Surety

\_\_\_\_\_  
(Witness as to Surety)

By \_\_\_\_\_

\_\_\_\_\_  
(SEAL)

\_\_\_\_\_  
(Address)

\_\_\_\_\_  
(Address)

NOTE:

1. Date of BOND must not be prior to date of contract.
2. If CONTRACTOR is partnership, all partners should execute BOND.
3. Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the Project is located.
4. Accompany this bond with Attorney-in-Fact's Authority from the Surety Company certified to include the date of the bond.

**SECTION 00614  
NOTICE OF AWARD**

**TO:**

**AT:**

**RE: Providing Equipment, Materials, and Labor for Construction of a Public Access CNG Fueling Station in Moriarty, Torrance County, New Mexico.**

*You are notified that your Bid dated \_\_\_\_\_, 20\_\_ for the referenced Contract has been evaluated. Your organization has been determined to be the lowest responsible Bidder and has been awarded the Contract for the Work as itemized on your Bid Form.*

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

*Your organization shall comply with the following conditions precedent within the number of days after receipt of the Notice of Award specified in the Instructions to Bidders, that is by \_\_\_\_\_, you shall:*

*1. Sign and return to the **ENGINEER** the executed Notice of Award and all of the following required documents:*

*Four (4) copies of Contract Documents and Specifications with: Agreement, Performance Bond with Power of Attorney, Payment Bond with Power of Attorney, Maintenance Bond with Power of Attorney, and Insurance Binders and Certificates of Insurance.*

*Failure to comply with these conditions within the time specified may entitle the **Owner** to consider your Bid abandoned, annul this Notice of Award and declare your Bid Security forfeited.*

**Issued by The Owner: EMW Gas Association Received On \_\_\_\_\_, 20\_\_**

By: Eddie O'Brien By: \_\_\_\_\_

\_\_\_\_\_  
(Authorized Signature)

\_\_\_\_\_  
(The Contractor)

General Manager  
(Title)

\_\_\_\_\_  
(Authorized Signature)

Return to the Engineer: Small Arrow Engineering, LLC  
216 South Main Street  
Joplin, Missouri 64801

**SECTION 00615  
NOTICE TO PROCEED**

\_\_\_\_\_, 20\_\_\_\_

**TO:**

**AT:**

**RE: Providing Equipment, Materials, and Labor for Construction of a Public Access CNG Fueling Station in Moriarty, Torrance County, New Mexico.**

*You are notified that the Contract Time for work under the above Contract will commence to run on \_\_\_\_\_ . On that date, your organization shall start performance and furnishing of the Work.*

*In accordance with the Agreement, the date of Substantial Completion for the entire Work is \_\_\_\_\_ .*

Issued by the Owner:

Received

On \_\_\_\_\_, 20\_\_\_\_

BY: Eddie O'Brien, General Manager, EMW Gas Association

\_\_\_\_\_  
(Authorized Signature)

\_\_\_\_\_  
(The Contractor)

\_\_\_\_\_  
(Title) \ (Authorized Signature)

**SECTION 00616M  
CERTIFICATE OF OWNER'S ATTORNEY**

I, the undersigned, \_\_\_\_\_, the  
duly authorized and acting representative of **E.M.W. Gas Association**, do hereby certify as follows:

I have examined the attached contract(s) of \_\_\_\_\_  
(Contractor)

and surety bonds, and the manner of execution thereof, and I am of the opinion that each of the aforesaid agreements has been duly executed by the proper parties thereto acting through their duly authorized representatives; that said representatives have full power and authority to execute said agreements on behalf of the respective parties named thereon; and that the foregoing agreements constitute valid and legally binding obligations upon the parties executing the same in accordance with terms, conditions, and provisions thereof. In addition, I have examined the Certificate of Insurance for amounts and coverage per the requirements of the General Conditions/Supplemental General Conditions of the Contract Document and find that adequate insurance is in full force and effect.

\_\_\_\_\_  
Project Attorney

\_\_\_\_\_  
Date

Address:  
\_\_\_\_\_  
\_\_\_\_\_

**SECTION 00620  
CONSTRUCTION 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 Principal Place of Business):

OWNER (Name and Address):                      **E.M.W. Gas Association  
416 5<sup>th</sup> Street  
Estancia, New Mexico 87016**

**CONSTRUCTION CONTRACT**

Date:  
Amount:  
Description (Name and Location):                      **Providing Equipment, Materials, and Labor for  
Construction of a Public Access CNG Fueling  
Station in Moriarty, Torrance County, New Mexico**

**BOND**

Date (Not earlier than Construction Contract Date):  
Amount:  
Modifications to this Bond Form:

<b>CONTRACTOR AS PRINCIPAL</b>		<b>SURETY</b>	
Company: _____	(Corp. Seal)	Company: _____	(Corp. Seal)
Signature: _____		Signature: _____	
Name and Title: _____		Name and Title: _____	

<b>CONTRACTOR AS PRINCIPAL</b>		<b>SURETY</b>	
Company: _____	(Corp. Seal)	Company: _____	(Corp. Seal)
Signature: _____		Signature: _____	
Name and Title: _____		Name and Title: _____	

Prepared through the joint efforts of the Surety Association of America, Engineers' Joint Contract Documents Committee, Associated General Contractors of America, American Institute of Architects, American Subcontractors Association, and the Associated Specialty Contractors.

1. The Contractor and the Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference.
2. With respect to the Owner, this obligation shall be null and void if the Contractor:
  - 2.1. Promptly makes payment, directly or indirectly, for all sums due Claimants, and
  - 2.2. Defends, indemnifies and holds harmless the Owner from all claims, demands, liens or suits by any person or entity who furnished labor, materials or equipment for use in the performance of the

Construction Contract, provided the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 12) of any claims, demands, liens or suits and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety, and provided there is no Owner Default.

3. With respect to Claimants, this obligation shall be null and void if the Contractor promptly makes payment, directly or indirectly, for all sums due.

4. The Surety shall have no obligation to Claimants under this Bond until:

4.1. Claimants who are employed by or have a direct contract with the Contractor have given notice to the Surety (at the address described in Paragraph 12) and sent a copy, or notice thereof, to the 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 the Contractor:

4.2.1. Have furnished written notice to the Contractor and sent a copy, or notice thereof, to the 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 were furnished or supplied or for whom the labor was done or performed; and

4.2.2. Have either received a rejection in whole or in part from the Contractor, or not received within 30 days of furnishing the above notice any communication from the Contractor by which the Contractor has indicated the claim will be paid directly or indirectly; and

4.2.3. Not having been paid within the above 30 days, have sent written notice to the Surety (at the address described in Paragraph 12) and sent a copy, or notice thereof, to the Owner, stating that a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to the Contractor.

5. If a notice required by Paragraph 4 is given by the Owner to the Contractor or to the Surety that is sufficient compliance.

6. When the Claimant has satisfied the conditions of Paragraph 4, the Surety shall promptly and at the Surety's expense take the following actions:

6.1. Send an answer to the Claimant, with a copy to the Owner, within 45 days after receipt of the claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed.

6.2. Pay or arrange for payment of any undisputed amounts.

7. The 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 the Surety.

8. Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any Construction Performance Bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and the Surety under this Bond, subject to the Owner's priority to use the



funds for the completion of the work.

9. The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The 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. The Surety hereby waives notice of any change, including changes of time, to the Construction 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 Subparagraph 4.1 or Clause 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 Construction 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 the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the signature page. Actual receipt of notice by Surety, the Owner or the 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 or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal 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 by any person or entity appearing to be a potential beneficiary of this Bond, the 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 the Contractor or with a subcontractor of the 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 Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the 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. Construction Contract: The agreement between the Owner and the Contractor identified on the signature page, including all Contract Documents and changes thereto.

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

SECTION 00621  
CHANGE ORDER

CHANGE ORDER NO. \_\_\_\_\_

PAGE 1 OF 2

DATE ISSUED: \_\_\_\_\_

CONTRACT: Construction of Public Access CNG Station in Moriarty, Torrance County, NM per Engineer's Plan

CONTRACTOR: \_\_\_\_\_

OWNER: E.M.W. GAS ASSOCIATION

ENGINEER: SMALL ARROW ENGINEERING, LLC

ENGINEER'S CONTRACT NO. 20104

THE FOLLOWING CHANGES ARE MADE TO THE CONTRACT DOCUMENTS

**A. ADJUSTMENTS IN CONTRACT PRICE**

The Contract Price from the Agreement	\$ _____
Net adjustment in said Contract Price in prior Change Orders	\$ _____
The amended Contract Price before this Change Order	\$ _____
Net increase (decrease) from this Change Order	\$ _____
The Contract Price including this Change Order will be	\$ _____

**B. ADJUSTMENTS IN CONTRACT TIME**

The Contract Time from the Agreement	_____ days
Net adjustment in said Contract Time in prior Change Orders	_____ days
The amended Contract Time before this Change Order	_____ days
Net extension (shortening) by this Change Order	_____ days
The Contract Time including this Change Order will be	_____ days
The Work will be substantially completed on or before	_____, 20____
The Work will be completed and ready for final payment on or before	_____, 20____

**C. THIS CHANGE ORDER incorporates these Change Authorizations:**

**D. OTHER ADJUSTMENTS IN CONTRACT PRICE OR CONTRACT TIME:** Adjustments for separable parts of the Work referenced in the Agreement are detailed in the following documents:

**E. WORK SEQUENCING CONDITIONS:** The Contractor shall complete the Work changed and affected by this Change order on or before \_\_\_\_\_, 20\_\_\_\_, in accordance with the Progress Schedule, dated \_\_\_\_\_.

**F. OTHER PROVISIONS OF THIS CHANGE ORDER:**

It is expressly agreed and understood that the approval of this Change Order will have no effect on the Contract Documents other than with respect to this Change Order and the matters expressly provided in this Change Order.

**G. ATTACHMENTS:** The following additional documents are attached to and made a part of this Change Order by this reference:

**H. RECOMMENDED BY** \_\_\_\_\_, 20\_\_\_\_  
Engineer Date

**APPROVED BY** \_\_\_\_\_, 20\_\_\_\_  
Owner Date

**I. CERTIFICATION, ACCEPTANCE & WAIVER OF FUTURE CLAIMS BY CONTRACTOR:** This is to certify to the best of my knowledge and belief that the cost and pricing data so summarized herein are complete, current, and accurate as of \_\_\_\_\_, 20\_\_\_\_ and that a financial management capability exists to account fully and accurately for the financial transactions under this Contract. I further certify that I understand that the Contract Price may be subject to downward renegotiation and/or recoupment where the above costs and pricing data have been determined, a result of audit, not to have been complete, current and accurate as of the above date. The undersigned Contractor also acknowledges and agrees that the adjustment in Contract Price and Contract Time stipulated in this Change Order constitute an all inclusive settlement for all changes and any delay and all costs, and the undersigned Contractor's signature represents a waiver of any and all rights to file a claim on account of this Change Order, the Work, or the Work involved in this and all prior Change Orders.

APPROVED BY \_\_\_\_\_, 20\_\_\_\_

You are hereby directed to make the following changes:

**I. Description, location, and reason for change of each item and effect on completion time.**

**II. Cost of work affected by this change order.**

(A) BID FORM ITEM NO.	(B) ITEM DESCRIPTION	(C) BID FORM UNITS	(D) UNITS ADD OR DEDUCT	(E) CONTRACT OR UNIT PRICE	(F) AMOUNT ADDED	(G) AMOUNT DEDUCTED
<b>TOTAL</b>					<b>\$</b>	<b>\$</b>

- |  |          |          |
|--|----------|----------|
| <b>1. Original Contract Amount</b>                         |          | \$ _____ |
| <b>2. Add or Deduct This Order<br/>(Totals of F&amp;G)</b> | \$ _____ |          |
| <b>3. Add or Deduct Previous<br/>(Change Orders)</b>       | \$ _____ |          |
| <b>4. Total Add or Deduct to<br/>Date (2+3)</b>            |          | \$ _____ |
| <b>5. Revised Contract Amount (1+4)</b>                    |          | \$ _____ |

**SECTION 00622**  
**APPLICATION FOR PAYMENT NO. \_\_\_\_\_**

To: **E.M.W. Gas Association**  
From:  
Contract:  
Project: **Providing Equipment, Materials, and Labor for Construction of a Public Access CNG Fueling Station in Moriarty, Torrance County, New Mexico.**

Owner's No. \_\_\_\_\_ ENGINEER's Project No. 20104  
For Work accomplished through the date of:

- |    |  |                 |
|----|--|-----------------|
| 1. | Original Contract Price:                           | \$ _____        |
| 2. | Net Change Orders and Written Amendments (+ or -): | \$ _____        |
| 3. | Current Contract Price (1 plus 2):                 | \$ _____        |
| 4. | Total work completed to date:                      | \$ _____        |
| 5. | Retainage (per Agreement):                         | \$ _____        |
|    | 10.0% of completed Work: \$ _____                  |                 |
| 6. | Total completed to date less retainage (4 minus 5) | \$ _____        |
| 7. | Less previous Application for payments:            | \$ _____        |
| 8. | <b>DUE THIS APPLICATION (6 MINUS 7):</b>           | <b>\$ _____</b> |
- Accompanying Documentation:

CONTRACTOR'S Certification:

The undersigned CONTRACTOR certifies that (1) all previous progress payments received from OWNER on account of Work done under the Contract referred to above have been applied on account to discharge CONTRACTOR's legitimate obligations incurred in connection with Work covered by prior Applications for Payment numbered 1 through \_\_\_ inclusive; (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 Lien, security interest or encumbrance); and (3) all Work covered by this Application for Payment is in accordance with the Contract Documents and not defective.

Dated: \_\_\_\_\_ By: \_\_\_\_\_  
CONTRACTOR

Payment of the above AMOUNT DUE THIS APPLICATION is recommended.

Dated: \_\_\_\_\_ By: \_\_\_\_\_  
ENGINEER

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

**SECTION 00626  
CERTIFICATE OF SUBSTANTIAL COMPLETION**

Date Issued: \_\_\_\_\_, 20\_\_\_\_\_

Contract: Public Access CNG Fueling Station in Moriarty, Torrance County, New Mexico

Contractor:

Owner: E.M.W. GAS ASSOCIATION

Engineer: Small Arrow Engineering, LLC

Engineer's Contract No. 20104

**A. SCOPE:** This certificate of Substantial Completion is for the entire Work listed in the Agreement dated \_\_\_\_\_, for the Public Access CNG Fueling Station.

**B. DATE OF SUBSTANTIAL COMPLETION:** The Work to which this certificate applies has been reviewed by authorized representatives of the Owner, the Contractor and the Engineer, and that Work is hereby declared to be substantially complete in accordance with the Contract Documents on the following date of Substantial Completion: \_\_\_\_\_, 20\_\_\_\_\_.

**C. LIST OF ITEMS TO BE COMPLETED OR CORRECTED:** A Punch list (or minor incomplete or unsatisfactory items not impairing the usefulness of the Work) to be completed or corrected is attached to this certificate. This list may not be all-inclusive, and the failure to include an item in it does not alter the responsibility of Contractor to complete all the Work in accordance with the Contract Documents. The items in the attached Punch List shall be completed or corrected by the Contractor within \_\_\_\_\_ days after the date of Substantial Completion fixed by this certificate, that is on or before \_\_\_\_\_, 20\_\_\_\_\_. The Owner reserves the right to correct any items not corrected or completed by the specified date, as provided in the General Conditions.

**D. DIVISION OF RESPONSIBILITIES:** The responsibilities between the Owner and Contractor for security, operation, safety, maintenance, heat & utilities, insurance and warranties and guarantees, pending final payment (or Substantial Completion of the entire Work), shall be as follows:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**E. DOCUMENTS ATTACHED:** The following documents are attached to and made a part of this Certificate:

\_\_\_\_\_

**F. LIMITATION:** This certificate does not constitute an acceptance of Work not in accordance with the Contract Documents, it is not a release of Contractor's obligation to complete the Work in accordance with the Contract Documents, nor is it a release of the Surety.

By \_\_\_\_\_  
The Engineer

\_\_\_\_\_  
Date

By \_\_\_\_\_  
The Owner

\_\_\_\_\_  
Date

The Contractor acknowledges receipt of this Certificate of Substantial Completion on:

By \_\_\_\_\_  
The Contractor

\_\_\_\_\_  
Date

Small Arrow Engineering, LLC

**SECTION 660  
NON-COLLUSION AFFIDAVIT**

STATE OF \_\_\_\_\_ )

COUNTY OF \_\_\_\_\_ )

\_\_\_\_\_ Of lawful age, being first duly sworn on oath says that (s)he is the agent authorized by the bidder to submit the attached bid. Affiant further states that the bidder has not been a party to any collusion among Bidders in restraint of freedom of competition by agreement to bid at a fixed price or to refrain from bidding or with any EMW Gas Association or State Official or employee as to quantity, quality, or price in the prospective contract or any other terms of said prospective contract of in any discussions between bidders and any EMW Gas Association or State Official concerning exchange of money or other thing of value for special consideration in the letting of a contract.

\_\_\_\_\_  
Affiant

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_

\_\_\_\_\_

My Commission Expires: \_\_\_\_\_

NOTE: This form is to be submitted with the BID.

## SECTION 00700

### STANDARD GENERAL CONDITIONS OF THE CONTRACT EJCDC No. 1910-8 (1990 ed.)

#### ARTICLE 1 - DEFINITIONS

Wherever used in these General Conditions or in the other Contract Documents the following terms have the meanings indicated which are applicable to both the singular and plural thereof:

1.1. Addenda: Written or graphic instruments issued prior to the opening of Bids which clarify, correct or change the Bidding Requirements or the Contract Documents.

1.2. Agreement: The written contract between OWNER and CONTRACTOR covering the Work to be performed; other Contract Documents are attached to the Agreement and made a part thereof as provided therein.

1.3. Application for Payment: The form accepted by ENGINEER which is to be used by CONTRACTOR in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

1.4. 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.

1.5. Bid: The offer or proposal of the bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

1.6. Bidding Documents: The advertisement or invitation to Bid, instructions to bidders, the Bid form, and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids).

1.7. Bidding Requirements: The advertisement or invitation to Bid, instructions to bidders, and the Bid form.

1.8. Bonds: Performance and Payment bonds and other instruments of security.

1.9. 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.

1.10. Contract Documents: The Agreement, Addenda (which pertain to the Contract Documents), CONTRACTOR'S Bid (including documentation accompanying the Bid and any post Bid documentation submitted prior to the Notice of Award) when attached as an exhibit to the Agreement, the Notice to Proceed, the Bonds, these General Conditions, the Supplementary Conditions, the Specifications and the Drawings as the same are more specifically identified in the Agreement, together with all Written Amendments, Change Orders, Work Change Directives, Field Orders and ENGINEER'S written interpretations and clarifications issued pursuant to paragraphs 3.5, 3.6.1, and 3.6.3 on or after the Effective Date of the Agreement. Shop Drawing submittals approved pursuant to paragraphs 6.26 and 6.27 and the reports and drawings referred to in paragraphs 4.2.1.1 and 4.2.2.2 are not Contract Documents.

1.11. 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 11.9.1 in the case of Unit Price Work).

1.12. Contract Times: The numbers of days or the dates stated in the Agreement:

1.12.1 To achieve Substantial Completion, and

1.12.2 To complete the Work so that it is ready for final payment as evidenced by ENGINEER'S written recommendation of final payment in accordance with paragraph 14.13.

1.13. CONTRACTOR: The person, firm or corporation with whom OWNER has entered into the Agreement.

1.14. Defective: An adjective which when modifying the word Work refers to Work that is unsatisfactory, faulty or deficient, in that it does not conform to the Contract Documents, or does not meet the requirements of any inspection, reference standard, test or approval referred to in the Contract Documents, or 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 14.8 or 14.10).

1.15. Drawings: The drawings which show the scope, extent and character of the Work to be furnished and performed by CONTRACTOR and which have been prepared or approved by ENGINEER and are referred to in the Contract Documents. Shop drawings are not Drawings as so defined.

1.16. 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.

1.17. ENGINEER: The person, firm or corporation named as such in the Agreement.

1.18. ENGINEER'S Consultant: A person, firm or corporation having a contract with ENGINEER to furnish services as ENGINEER'S independent professional associate or consultant with respect to the Project and who is identified as such in the Supplementary Conditions.

1.19. Field Order: A written order issued by ENGINEER which orders minor changes in the Work in accordance with paragraph 9.5 but which does not involve a change in the Contract Price or the Contract Times.

1.20. General Requirements: Sections of Division 1 of the Specifications.

1.21. 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.

1.22. Laws and Regulations: Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities and courts having jurisdiction.

1.23. Liens: Liens, charges, security interests or encumbrances upon real property or personal property.



1.24. 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.

1.25. Notice of Award: A written notice by OWNER to the apparent successful bidder stating that upon compliance by the apparent successful bidder with the conditions precedent enumerated therein, within the time specified, OWNER will sign and deliver the Agreement.

1.26. Notice to Proceed: A written notice given by OWNER to CONTRACTOR (with a copy to ENGINEER) fixing the date on which the Contract Times will commence to run and on which CONTRACTOR shall start to perform CONTRACTOR'S obligations under the Contract Documents.

1.27. OWNER: The public body or authority, corporation, association, firm or person with whom CONTRACTOR has entered into the Agreement and for whom the Work is to be provided.

1.28. Partial Utilization: Use by OWNER of a substantially completed part of the Work for the purpose for which it is intended (or a related purpose) prior to Substantial Completion of all the Work.

1.29. PCBs: Poly chlorinated biphenyls.

1.30. 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 Wastes and crude oils.

1.31. Project: The total construction of which the Work to be provided under the Contract Documents may be the whole, or a part as indicated elsewhere in the Contract Documents.

1.32. 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.

1.33. Resident Project Representative: The authorized representative of ENGINEER who may be assigned to the site or any part thereof.

1.34. 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.

1.35. 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.

1.36. Specifications: Those portions of the Contract Documents consisting of written technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the Work and certain administrative details applicable thereto.

1.37. Subcontractor: An individual, firm or corporation having a direct contract with CONTRACTOR or with any other Subcontractor for the performance of a part of the Work at the site.

1.38. Substantial Completion: The Work (or a specified part thereof) has progressed to the point where, in the opinion of ENGINEER as evidenced by ENGINEER'S definitive certificate of Substantial

Completion, it is sufficiently complete, in accordance with the Contract Documents, so that the Work (or specified part) can be utilized for the purposes for which it is intended; or if no such certificate is issued, when the Work is complete and ready for final payment as evidenced by ENGINEER'S written recommendation of final payment in accordance with paragraph 14.13. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

1.39. Supplementary Conditions: The part of the Contract Documents which amends or supplements these General Conditions.

1.40. Supplier: A manufacturer, fabricator, supplier, distributor, material man 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 any Subcontractor.

1.41. Underground Facilities: All pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels or other such facilities or attachments, and any encasements containing such facilities which have been installed underground to furnish any of the following services or materials: electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, sewage and drainage removal, traffic or other control systems or water.

1.42. Unit Price Work: Work to be paid for on the basis of unit prices.

1.43. Work: The entire completed construction or the various separately identifiable parts thereof required to be furnished under the Contract Documents. Work includes and is the result of performing or furnishing labor and furnishing and incorporating materials and equipment into the construction, and performing or furnishing services and furnishing documents, all as required by the Contract Documents.

1.44. Work Change Directive: A written directive 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 physical conditions under which the Work is to be performed as provided in paragraph 4.2 or 4.3 or to emergencies under paragraph 6.23. A Work Change Directive will not change the Contract Price or the Contract Times, but is evidence that the parties expect that the change directed 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 as provided in paragraph 10.2.

1.45. Written Agreement: A written amendment of the Contract Documents, signed by OWNER and CONTRACTOR on or after the Effective Date of the Agreement and normally dealing with the non-engineering or non-technical rather than strictly construction-related aspects of the Contract Documents.

## **ARTICLE 2 - PRELIMINARY MATTERS**

2.1. Delivery of Bonds: When CONTRACTOR delivers the executed Agreements to OWNER, CONTRACTOR shall also deliver to OWNER such Bonds as CONTRACTOR may be required to furnish in accordance with paragraph 5.1.

2.2. Copies of Documents: OWNER shall furnish to CONTRACTOR up to ten copies (unless otherwise specified in the Supplementary Conditions) of the Contract Documents as are reasonably necessary for the execution of the Work. Additional copies will be furnished, upon request, at the cost of reproduction.

2.3. Commencement of Contract Times; Notice to Proceed: 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 thirty 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.

2.4. Starting the Work: CONTRACTOR shall start to perform the Work on the date when the Contract Times commence to run, but no Work shall be done at the site prior to the date on which the Contract Times commence to run.

2.5. Before Starting Construction: Before undertaking each part of the Work, CONTRACTOR shall carefully study and compare the Contract Documents and check and verify pertinent figures shown thereon and all applicable field measurements. CONTRACTOR shall promptly report in writing to ENGINEER any conflict, error, ambiguity or discrepancy which CONTRACTOR may discover and shall obtain a written interpretation or clarification from ENGINEER before proceeding with any Work affected thereby; however, 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 knew or reasonably should have known thereof.

2.6. Within ten days after the Effective Date of the agreement (unless otherwise specified in the General Requirements), CONTRACTOR shall submit to ENGINEER for review:

2.6.1. 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;

2.6.2. A preliminary schedule of Shop Drawing and Sample submittals which will list each required submittal and the times for submitting, reviewing and processing such submittal;

2.6.3. A preliminary schedule of values for all of the Work which will include quantities and prices of items aggregating the Contract Price and will subdivide the Work into component parts in sufficient detail to serve as the basis for progress payments during construction. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.7. 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 paragraphs 5.4, 5.6, and 5.7.

2.8. Preconstruction Conference: Within twenty days after the Contract Times start to run, but before any Work at the site is started, a conference attended by 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 2.6, procedures for handling Shop Drawings and other submittals, processing Applications for Payment and maintaining required records.

2.9. Initially Acceptable Schedules: Unless otherwise provided in the Contract Documents, at least ten 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 2.6. CONTRACTOR shall have an additional ten days to make corrections and adjustments and to complete and resubmit the schedules. No

progress payment shall be made to CONTRACTOR until the schedules are submitted to and acceptable to ENGINEER as provided below. The progress schedule will be acceptable to ENGINEER as providing an orderly progression of the Work to completion within any specified Milestones and the Contract Times, but such acceptance will neither impose on ENGINEER responsibility for the sequencing, scheduling or progress of the Work nor interfere with or relieve CONTRACTOR from CONTRACTOR'S full responsibility thereof. CONTRACTOR'S schedule of Shop Drawing and Sample submissions will be acceptable to ENGINEER as providing a workable arrangement for reviewing and processing the required submittals. CONTRACTOR'S schedule of values will be acceptable to ENGINEER as to form and substance.

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

3.1. Intent: The Contract Documents comprise the entire agreement between OWNER and CONTRACTOR concerning the Work. The Contract Documents are complementary; what is called for by one is as binding as if called for by all. The Contract Documents will be construed in accordance with the law of the place of the Project.

3.2. 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 Work, materials or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be furnished and performed whether or not specifically called for. When words or phrases which have a well- known technical or construction industry or trade meaning are used to describe Work, materials or equipment; such words or phrases shall be interpreted in accordance with that meaning. Clarification and interpretations of the Contract Documents shall be issued by ENGINEER as provided in paragraph 9.4.

3.3. Reference to Standards and Specifications of Technical Societies; Reporting and Resolving Discrepancies:

3.3.1. Reference to standards, specifications, manuals or codes of any technical society, organization or association, or to the Laws or Regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest 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.

3.3.2. 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 any provision of any such Law or Regulation applicable to the performance of the Work or of any such standard, specification, manual or code or of any instruction of any Supplier referred to in paragraph 6.5, CONTRACTOR shall report it to ENGINEER in writing at once, and, CONTRACTOR shall not proceed with the Work affected thereby (except in an emergency as authorized by paragraph 6.23) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in paragraph 3.5 or 3.6; provided, however, that CONTRACTOR shall not be liable to OWNER or ENGINEER for failure to report any such conflict, error, ambiguity or discrepancy unless CONTRACTOR knew or reasonably should have known thereof.

3.3.3. Except as otherwise specifically stated in the Contract Documents or as may be provided by amendment or supplement thereto issued by one of the methods indicated in paragraph 3.5 or 3.6, 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:

3.3.3.1. the provisions of any such standard, specification, manual, code or instruction (whether or not specifically incorporated by reference in the Contract Documents); or

3.3.3.2. the provisions of any such 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).

No provision of any such standard, specification, manual, code or instruction shall be effective to change the duties and responsibilities of OWNER, CONTRACTOR or ENGINEER, or any of their subcontractors, consultants, agents, or employees from those set forth in the Contract Documents, nor shall it be effective to assign to OWNER, ENGINEER or any of ENGINEER'S Consultants, agents or employees any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of paragraph 9.13 or any other provision of the Contract Documents.

3.4. Whenever in the Contract Documents the terms "as ordered," "as directed," "as required," "as allowed," "as approved," or terms of like effect or import are used, or the adjectives "reasonable," "suitable," "acceptable," "proper" or "satisfactory" or adjectives of like effect or import are used to describe a requirement, direction, review or judgment of ENGINEER as to the Work, it is intended that such requirement, direction, review or judgment will be solely to evaluate, in general, the completed Work for compliance with the requirements of and information in the Contract Documents and conformance with the design concept of the completed 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 shall not be effective to assign to ENGINEER any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of paragraph 9.13 or any other provision of the Contract Documents.

3.5. Amending Contract Documents: The Contract Documents may be amended to provide for additions, deletions and revisions in the Work or to modify the terms and conditions thereof in one or more of the following ways:

3.5.1. A formal Written Amendment.

3.5.2. A Change Order (pursuant to paragraph 10.4), or

3.5.3. A Work Change Directive (pursuant paragraph 10.1).

3.6. Supplementing Contract Documents: In addition, the requirements of the Contract Document may be supplemented and minor variations and deviations in the Work may be authorized, in one or more of the following ways:

3.6.1. A Field Order (pursuant to paragraph 9.5),

3.6.2. ENGINEER'S approval of a Shop Drawing or Sample (pursuant to paragraphs 6.26 and 6.27), or

3.6.3. ENGINEER'S written interpretation or clarification (pursuant to paragraph 9.4).

3.7. Reuse Of Documents: CONTRACTOR, and any Subcontractor or Supplier or other person or organization performing or furnishing any of the Work under a direct or indirect contract with OWNER:

3.7.1 Shall not 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 ENGINEER'S Consultant, and

3.7.2 Shall not reuse any of such Drawings, Specifications, other documents or copies on extensions of the Project or any other project without written consent of OWNER and ENGINEER and specific written verification or adaption by ENGINEER.

#### **ARTICLE 4 - AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; REFERENCE POINTS**

4.1. Availability of Lands: OWNER shall furnish, as indicated in the Contract Documents, the lands upon which the Work is to be performed, rights-of-way and easements for access thereto, and such other lands which are designated for the use of CONTRACTOR. Upon reasonable written request, OWNER shall furnish CONTRACTOR with a correct 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 lien against such lands in accordance with applicable Laws and Regulations. OWNER shall identify any encumbrances or restrictions not of general application but specifically related to use of lands so furnished with which CONTRACTOR will have to comply in performing the Work. Easements for permanent structures or permanent changes in existing facilities will be obtained and paid for by OWNER, unless otherwise provided in the Contract Documents. If CONTRACTOR and OWNER are unable to agree on entitlement to or the amount or extent of any adjustments in the Contract Price or the Contract Times as a result of any delay in OWNER's furnishing these lands, rights-of-way or easements, CONTRACTOR may make a claim therefore as provided in Articles 11 and 12. CONTRACTOR shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

##### 4.2 Subsurface and Physical Conditions:

4.2.1. Reports and Drawings: Reference is made to the Supplementary Conditions for identification of;

4.2.1.1. Subsurface Conditions: Those reports of explorations and tests of subsurface conditions at or contiguous to the site that have been utilized by ENGINEER in preparing the Contract Documents; and

4.2.1.2. Physical Conditions: Those drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the site (except Underground Facilities) that have been utilized by ENGINEER in preparing the Contract Documents.

4.2.2. Limited Reliance By Contractor Authorized; Technical Data: CONTRACTOR may rely upon the general 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, ENGINEER or any of ENGINEER'S Consultants with respect to:

4.2.2.1. 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

4.2.2.2. other data, interpretations, opinions and information contained in such reports or shown or

indicated in such drawings, or

4.2.2.3. any CONTRACTOR interpretation of or conclusion drawn from any "technical data" or any such data, interpretations, opinions or information.

4.2.3. Notice of Differing Subsurface or Physical Conditions: If CONTRACTOR believes that any subsurface or physical condition at or contiguous to the site that is uncovered or revealed either:

4.2.3.1. is of such a nature as to establish that any "technical data" on which CONTRACTOR is entitled to rely as provided in paragraphs 4.2.1 and 4.2.2 is materially inaccurate, or

4.2.3.2. is of such a nature as to require a change in the Contract Documents, or

4.2.3.3. differs materially from that shown or indicated the Contract Documents, or

4.2.3.4. 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 conditions affected thereby or performing any Work in connection therewith (except in an emergency as permitted by paragraph 6.23), notify OWNER and ENGINEER in writing about such condition. CONTRACTOR shall not further disturb such conditions or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

4.2.4. ENGINEER'S Review: ENGINEER will promptly review the pertinent conditions, determine the necessity of OWNER obtaining additional exploration or tests with respect thereto and advise OWNER in writing (with a copy to CONTRACTOR) of ENGINEER'S findings and conclusions.

4.2.5. Possible Contract Documents Change: If ENGINEER concludes that a change in the Contract Documents is required as a result of a condition that meets one or more of the categories in paragraph 4.2.3., a Work Change Directive or a Change Order will be issued as provided in Article 10 to reflect and document the consequences of such change.

4.2.6. Possible Price and Times Adjustments: An equitable adjustment in the Contract Price or in the Contract Times, or both, will be allowed to the extent that the existence of such uncovered or revealed condition causes an increase or decrease in CONTRACTOR'S cost of, or time required for performance of, the Work; subject, however, to the following:

4.2.6.1. such condition must meet any one or more of the categories described in paragraphs 4.2.3.1 through 4.2.3.4, inclusive;

4.2.6.2. a change in the Contract Documents pursuant to paragraph 4.2.5 will not be an automatic authorization of nor a condition precedent to entitlement to any such adjustment;

4.2.6.3. 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 9.10 and 11.9; and

4.2.6.4. CONTRACTOR shall not be entitled to any adjustment in the Contract Price or Times if:

4.2.6.4.1. CONTRACTOR knew of the existence of such conditions at the time CONTRACTOR

made a final commitment to OWNER in respect of Contract Price and Contract Times by the submission of a bid or becoming bound under a negotiated contract: or

4.2.6.4.2. 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

4.2.6.4.3. CONTRACTOR failed to give the written notice within the time and as required by paragraph 4.2.3.

If OWNER and CONTRACTOR are unable to agree on entitlement to or as to the amount or length of any such equitable adjustment in the Contract Price or Contract Times, a claim may be made therefore as provided in Articles 11 and 12. However, OWNER, ENGINEER and ENGINEER'S Consultants shall not be liable to CONTRACTOR for any claims, costs, losses or damages sustained by CONTRACTOR on or in connection with any other project or anticipated project.

#### 4.3. Physical Conditions - Underground Facilities:

4.3.1. 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 or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

4.3.1.1. OWNER and ENGINEER shall not be responsible for the accuracy or completeness of any such information or data; and

4.3.1.2. The cost of all of the following will be included in the Contract Price and CONTRACTOR shall have full responsibility for:

4.3.1.2.1 Reviewing and checking all such information and data,

4.3.1.2.2 locating all Underground Facilities shown or indicated in the Contract Documents,

4.3.1.2.3 coordination of the Work with the owners of such Underground Facilities during construction, and

4.3.1.2.4 The safety and protection of all such Underground Facilities as provided in paragraph 6.20 and repairing any damage thereto resulting from the Work.

4.3.2. Not Shown or Indicated: If an Underground Facility is uncovered or revealed at or contiguous to the site which was not shown or indicated 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 6.23), 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 of the Underground Facility. If ENGINEER concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued as provided in Article 10 to reflect and document such consequences. During such time, CONTRACTOR shall be responsible for the safety and protection of such Underground Facility as provided in paragraph 6.20. CONTRACTOR shall be



allowed an increase in the Contract Price or an extension of the Contract Times, or both, to the extent that they are attributable to the existence of any Underground Facility that was not shown or indicated 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 the amount or length of any such adjustment in Contract Price or Contract Times, CONTRACTOR may make a claim therefore as provided in Articles 11 and 12. However, OWNER, ENGINEER and ENGINEER'S Consultants shall not be liable to CONTRACTOR for any claims, costs, losses or damages incurred or sustained by CONTRACTOR on or in connection with any other project or anticipated project.

4.4. Reference Points: 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 shall make no changes or relocations without the prior written approval of OWNER. CONTRACTOR shall report to ENGINEER whenever any reference point is lost or destroyed or requires relocation because or necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points by professionally qualified personnel.

#### 4.5 Asbestos, PCBs, Petroleum, Hazardous Waste or Radioactive Material:

4.5.1. OWNER shall be responsible for any Asbestos, PCBs, Petroleum, Hazardous Waste or Radioactive Material 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 and which may present a substantial danger to persons or property exposed thereto in connection with the Work at the site. OWNER shall not be responsible for any such materials brought to the site by CONTRACTOR, Subcontractor, Suppliers or anyone else for whom CONTRACTOR is responsible.

#### 4.5.2. CONTRACTOR shall immediately:

4.5.2.1 Stop all Work in connection with such hazardous condition and in any area affected thereby (except in an emergency as required by paragraph 6.23), and

4.5.2.2 Notify OWNER and ENGINEER (and 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 hazardous condition or take corrective action, if any. CONTRACTOR shall not be required to resume Work in connection with such hazardous condition or in any such affected area until after OWNER has obtained any required permits related thereto and delivered to CONTRACTOR special written notice: (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 the amount or extent of an adjustment, if any, in Contract Price or Contract Times as a result of such Work stoppage or such special conditions under which Work is agreed by CONTRACTOR to be resumed, either party may make a claim therefore as provided in Articles 11 and 12.

4.5.3. If after receipt of such special 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 such portion of the Work that is in connection with such hazardous condition or in such affected area to be deleted from the Work. If OWNER and CONTRACTOR cannot agree as to entitlement to or the amount or extent of an adjustment, if any, in Contract Price or Contract

Times as a result of deleting such portion of the Work, then either party may make a claim therefore as provided in Articles 11 and 12. OWNER may have such deleted portion of the Work performed by OWNER's own forces or others in accordance with Article 7.

4.5.4. To the fullest extent permitted by Laws and Regulations, OWNER shall indemnify and hold harmless CONTRACTOR, Subcontractors, ENGINEER, ENGINEER'S Consultants and the officers, directors, employees, agents, other consultants and subcontractors of each and any of them from and against all claims, costs, losses and damage arising out of or resulting from such hazardous condition, provided that:

4.5.4.1 Any such claim, cost, loss or damaged 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 there from, and

4.5.4.2 Nothing in this subparagraph 4.5.4 shall obligate OWNER to indemnify any person or entity from and against the consequences of that person's or entities own negligence.

4.5.5. The provisions of paragraphs 4.2 and 4.3 are not intended to apply to Asbestos, PCBs, Petroleum, Hazardous Waste or Radioactive Material uncovered or revealed at the site.

## **ARTICLE 5 - BONDS AND INSURANCE**

5.1. Performance, Payment and Other Bonds: 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 CONTRACTOR'S obligations under the Contract Documents. These Bonds shall remain in effect at least until one year after the date when final payment becomes due, 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 Supplementary Conditions. 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 current 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 Audit Staff, Bureau of Government Financial Operations, U.S. Treasury Department. All Bonds signed by an agent must be accompanied by a certified copy of such agent's authority to act.

5.2. If the surety on any Bond furnished by CONTRACTOR is declared a 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 5.1, CONTRACTOR shall within ten days thereafter substitute another Bond and surety, both of which must be acceptable to OWNER.

5.3. Licensed Sureties and Insurers; Certificates of Insurance:

5.3.1. 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.

5.3.2. CONTRACTOR shall deliver to OWNER, with copies to each additional insured 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 in accordance with paragraph 5.4. OWNER shall deliver to CONTRACTOR, with copies to each additional insured 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 in accordance with paragraphs 5.6 and 5.7 hereof.

5.4. CONTRACTOR'S Liability Insurance: CONTRACTOR shall purchase and maintain such liability and other insurance as is appropriate for the Work being performed and furnished and as will provide protection from claims set forth below which may arise out of or result from CONTRACTOR'S performance and furnishing of the Work and CONTRACTOR'S other obligations under the Contract Documents, whether it is to be performed or furnished by CONTRACTOR, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform or furnish any of the Work, or by anyone for whose acts any of them may be liable:

5.4.1. claims under workers' compensation, disability benefits and other similar employee benefit acts;

5.4.2. claims for damages because of bodily injury, occupational sickness or disease, or death of CONTRACTOR'S employees;

5.4.3. claims for damages because of bodily injury, sickness or disease, or death of any person other than CONTRACTOR'S employees;

5.4.4. claims for damages insured by customary personal injury liability coverage which are sustained;

5.4.4.1 by any person as a result of an offense directly or indirectly related to the employment of such person by CONTRACTOR, or

5.4.4.2 by any other person for any other reason:

5.4.5. 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 there from; and

5.4.6. 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.

The policies of insurance so required by this paragraph 5.4 to be purchased and maintained shall:

5.4.7. with respect to insurance required by paragraphs 5.4.3 through 5.4.6 inclusive, include as additional insured (subject to any customary exclusion in respect of professional liability) OWNER, ENGINEER, ENGINEER'S Consultants and any other persons or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insured, and include coverage for the respective officers and employees of all such additional insured;

5.4.8. include 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;

5.4.9. include completed operations insurance;

5.4.10. include contractual liability insurance covering CONTRACTOR'S indemnity obligations under paragraphs 6.12, 6.16, and 6.31 through 6.33;

5.4.11. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least thirty 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 5.3.2 will so provide);

5.4.12. 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 13.12; and

5.4.13. with respect to completed operations insurance, and any insurance coverage written on a claims-made basis, remain in effect for at least two years after final payment (and 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). :

5.5. OWNER'S Liability Insurance: In addition to the insurance required to be provided by CONTRACTOR under paragraph 5.4, 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.

5.6. Property Insurance: 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:

5.6.1. Include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER'S Consultants and any other persons or entities identified in the Supplementary Conditions, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured:

5.6.2. Be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy from that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework and Work in transit and shall insure against at least the following perils: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage, and such other perils as may be specifically required by the Supplementary Conditions;

5.6.3. Include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);

5.6.4. 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; and

5.6.5. Be maintained in effect until final payment is made unless otherwise agreed to in writing by OWNER, CONTRACTOR and ENGINEER with thirty days written notice to each other additional insured to whom a certificate of insurance has been issued.

5.7. OWNER shall purchase and maintain such boiler and machinery insurance or additional property insurance as may be required by Supplementary Conditions or Laws and Regulations which will include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER'S Consultants and any other persons or entities identified in the Supplementary Conditions, each of whom is deemed to have

an insurable interest and shall be listed as an insured or additional insured.

5.8. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained by OWNER in accordance with paragraphs 5.6 and 5.7 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least thirty days' prior written notice has been given to OWNER and CONTRACTOR and to each other additional insured to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with paragraph 5.11.

5.9. OWNER shall not be responsible for purchasing and maintaining any property insurance 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, Subcontractor or others suffering any such loss and if any them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

5.10 If CONTRACTOR requests in writing that other special insurance be included in the property insurance policies provided under paragraphs 5.6 or 5.7, OWNER shall, if possible, include such insurance, and the cost thereof will be charged to CONTRACTOR by appropriate Change Order or Written Amendment. 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.

#### 5.11. Waiver of Rights:

5.11.1. OWNER and CONTRACTOR intend that all policies purchased in accordance with paragraphs 5.6 and 5.7 will protect OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER'S Consultants and all other persons or entities identified in the Supplementary Conditions to be listed as insured or additional insured in such policies and will provide primary coverage for all losses and damages caused by the perils 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 insured or additional insured there under. OWNER and CONTRACTOR waive all rights against each other and their respective officers, directors, employees and agents for all losses and damages caused by, arising out of or resulting from any of the perils covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors, ENGINEER, ENGINEER'S Consultants and all other persons or entities identified in the Supplementary Conditions to be listed as insured or additional insured 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.

5.11.2. In addition, OWNER waives all rights against CONTRACTOR, Subcontractors, ENGINEER, ENGINEER'S Consultants and the officers, directors, employees and agents of any of them, for:

5.11.2.1. 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 peril, whether or not insured by OWNER; and

5.11.2.2. loss or damage to the completed Project or part thereof caused by, arising out of or resulting from fire or other insured peril covered by any property insurance maintained on the completed Project or part thereof by OWNER during partial utilization pursuant to paragraph 14.10, after substantial completion pursuant to paragraph 14.8 or after final payment pursuant to paragraph 14.13.

Any insurance policy maintained by OWNER covering any loss, damage or consequential loss referred to in this paragraph 5.11.2 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 any of CONTRACTOR, Subcontractors, ENGINEER, ENGINEER'S Consultants and the officers, directors, employees and agents of any of the

5.12. Receipt and Application of Insurance Proceeds: Any insured loss under the policies of insurance required by paragraphs 5.6 and 5.7 will be adjusted with OWNER and made payable to OWNER as fiduciary for the insured, as their interests may appear, subject to the requirements of any applicable mortgage clause and of paragraph 5.13. 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 or Written Amendment.

5.13. 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 fifteen 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.

5.14. Acceptance of Bonds and Insurance; Option to Replace: If either party (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 ten days after receipt of the certificates (or other evidence requested) required by paragraph 2.7. 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.

5.15. Partial Utilization - Property Insurance: If OWNER finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, such use or occupancy may be accomplished in accordance with paragraph 14.10; provided that no such use or occupancy shall commence before the insurers providing the property insurance 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**

6.1. Supervision and Superintendence: 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, but CONTRACTOR shall not be responsible for the negligence of others 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. CONTRACTOR shall be responsible to see that the completed Work complies accurately with the Contract Documents.

6.2. CONTRACTOR shall keep on the Work at all times during its progress a competent resident superintendent, who shall not be replaced without written notice to OWNER and ENGINEER except under extraordinary circumstances. The superintendent will be CONTRACTOR'S representative at the site and shall have authority to act on behalf of CONTRACTOR. All communications to the superintendent shall be as binding as if given to CONTRACTOR.

6.3. Labor, Materials and Equipment: CONTRACTOR shall provide competent, suitably qualified personnel to survey, lay out and construct the Work as required by the Contract Documents. CONTRACTOR shall at all times maintain good discipline and order at the site. 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 indicated in the Contract Documents, all Work at the site shall be performed during regular working hours and CONTRACTOR will not permit overtime work or the performance of Work on Saturday, Sunday or any Legal holiday without OWNER's written consent given after prior written notice to ENGINEER.

6.4. Unless otherwise specified in the General Requirements, CONTRACTOR shall furnish and assume full responsibility for all 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 furnishing, performance, testing, start-up and completion of the Work.

6.5. All materials and equipment shall be good quality and new, except as otherwise provided in the Contract Documents. All warranties and guarantees specifically called for 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 kind and quality of materials and equipment. All materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with instructions of the applicable Supplier, except as otherwise provided in the Contract Documents.

6.6. Progress Schedule: CONTRACTOR shall adhere to the progress schedule established in accordance with paragraph 2.9 as it may be adjusted from time to time as provided below:

6.6.1. CONTRACTOR shall submit to ENGINEER for acceptance (to the extent indicated in paragraph 2.9) proposed adjustments in the progress schedule that will not change the Contract Times (or Milestones). Such adjustments will conform generally to the progress schedule then in effect and additionally will comply with any provisions of the General Requirements applicable thereto.

6.6.2. Proposed adjustments in the progress schedule that will change the Contract Times (or Milestones) shall be submitted in accordance with the requirements of paragraph 12.1. Such adjustments may only be made by a Change Order or Written Amendment in accordance with Article 12.

6.7. Substitutes and "Or-Equal" Items:

6.7.1. 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 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 of other Suppliers may be accepted by ENGINEER under the following circumstances:

6.7.1.1. "Or-Equal": 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 acceptance of proposed substitute items.

6.7.1.2. Substitute Items: If in ENGINEER'S sole discretion an item of material or equipment proposed by CONTRACTOR does not qualify as an "or equal" item under subparagraph 6.7.1.1, it will be considered a proposed substitute item. CONTRACTOR shall submit sufficient information as provided below to allow ENGINEER to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefore. The procedure for review by the ENGINEER will include the following as supplemented in the General Requirements and as ENGINEER may decide is appropriate under the circumstances. Requests for review of proposed substitute items of material or equipment will not be accepted by ENGINEER from anyone other than CONTRACTOR. If CONTRACTOR wishes to furnish or use a substitute item of material or equipment, CONTRACTOR shall first make written application to ENGINEER for acceptance thereof, certifying that the proposed substitute will perform adequately the functions and achieve the results called for by the general design, be similar in substance to that specified and be suited to the same use as that specified. The application will state the extent, if any, to which the evaluation and acceptance of the proposed substitute will prejudice CONTRACTOR'S achievement of Substantial Completion on time, whether or not acceptance of the substitute for use 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 work on the Project) to adapt the design to the proposed substitute and whether or not incorporation or use of the substitute in connection with the Work is subject to payment of any license fee or royalty. All variations of the proposed substitute from that specified will be identified in the application and available maintenance, repair and replacement service will be indicated. The application will also contain an itemized estimate of all costs or credits that will result directly or indirectly from acceptance of such substitute, including costs of redesign and claims of other contractors affected by the resulting change, all of which will be considered by ENGINEER in evaluating the proposed substitute. ENGINEER may require CONTRACTOR to furnish additional data about the proposed substitute.

6.7.1.3. CONTRACTOR'S Expense: All data to be provided by CONTRACTOR in support of any proposed "or-equal" or substitute item will be at CONTRACTOR'S expense.

6.7.2. Substitute Construction Methods or Procedures: If a specific means, method, technique, sequence or procedure of construction is shown or indicated in and expressly required by the Contract Documents, CONTRACTOR may furnish or utilize a substitute means, method, technique, sequence or procedure of construction acceptable to 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 procedure for review by ENGINEER will be similar to that provided in subparagraph 6.7.1.2.

6.7.3. ENGINEER'S Evaluation: ENGINEER will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to paragraphs 6.7.1.2 and 6.7.2. ENGINEER will be the sole judge of acceptability. No "or-equal" or substitute will be ordered, installed or utilized without ENGINEER'S prior written acceptance which will be evidenced by either a Change Order or an approved



Shop Drawing. OWNER may require CONTRACTOR to furnish at CONTRACTOR'S expense a special performance guarantee or other surety with respect to any "or-equal" or substitute. ENGINEER will record time required by ENGINEER and ENGINEER'S Consultants in evaluating substitutes proposed or submitted by CONTRACTOR pursuant to paragraphs 6.7.1.2 and 6.7.2 and in making changes in the Contract Documents (or in the provisions of any other direct contract with OWNER for work on the Project) occasioned thereby. Whether or not ENGINEER accepts a substitute item so proposed or submitted by CONTRACTOR, CONTRACTOR shall reimburse OWNER for the charges of ENGINEER and ENGINEER'S Consultants for evaluating each such proposed substitute item.

6.8.1. Concerning Subcontractors, Suppliers and Others: CONTRACTOR shall not employ any Subcontractor, Supplier or other person or organization (including those acceptable to OWNER and ENGINEER as indicated in paragraph 6.8.2), whether initially or as a substitute, against whom OWNER or ENGINEER may have reasonable objection. CONTRACTOR shall not be required to employ any Subcontractor, Supplier or other person or organization to furnish or perform any of the Work against whom CONTRACTOR has reasonable objection.

6.8.2. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers or other persons or organizations (including those who are to furnish the principal items of materials or equipment) to be submitted to OWNER in advance of the specified date prior to the Effective Date of the Agreement for acceptance by OWNER, and ENGINEER, and if CONTRACTOR has submitted a list thereof in accordance with the Supplementary Conditions, OWNER'S or ENGINEER'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 person or organization so identified may be revoked on the basis of reasonable objection after due investigation, in which case CONTRACTOR shall submit an acceptable substitute, the Contract Price will be adjusted by the difference in the cost occasioned by such substitution and an appropriate Change Order will be issued or Written Amendment signed. No acceptance by OWNER or ENGINEER of any such Subcontractor, Supplier or other person or organization shall constitute a waiver of any right of OWNER or ENGINEER to reject defective Work.

6.9.1. CONTRACTOR shall be fully responsible to OWNER and ENGINEER for all acts and omissions of the Subcontractors, Suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect contract with CONTRACTOR just as CONTRACTOR is responsible for CONTRACTOR'S own acts and omissions. Nothing in the Contract Documents shall create for the benefit of any such Subcontractor, Supplier or other person or organization any contractual relationship between OWNER or ENGINEER and any such Subcontractor, Supplier or other person or organization, nor shall it 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 person or organization except as may otherwise be required by Laws and Regulations.

6.9.2. CONTRACTOR shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect contract with CONTRACTOR. CONTRACTOR shall require all Subcontractors, Suppliers and such other persons and organizations performing or furnishing any of the Work to communicate with the ENGINEER through CONTRACTOR.

6.10. The divisions and sections of 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.

6.11. 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 an additional insured on the property insurance provided in paragraph 5.6 or 5.7, 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, ENGINEER'S Consultants and all other additional insured for all losses and damages caused by, arising out of or resulting from any of the perils 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.

6.12. Patent Fees and Royalties: 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. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER'S Consultants and the officers, directors, employees, agents and other consultants of each and any of them from and against all claims, costs, losses and damages arising out of or resulting from 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.

6.13. Permits: 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. CONTRACTOR shall pay all charges of utility owners for connections to the Work, and OWNER shall pay all charges of such utility owners for capital costs related thereto such as plant investment fees.

#### 6.14. Laws and Regulations:

6.14.1. CONTRACTOR shall give all notices and comply with all Laws and Regulations applicable to furnishing and 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.

6.14.2. 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 caused by, arising out of or resulting there from; however, it shall not be CONTRACTOR'S primary 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 3.3.2.

6.15. Taxes: 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.

6.16. Use of Premises: CONTRACTOR shall confine construction equipment, the storage of materials

and equipment and the operations of workers to the site and land and areas identified in and permitted by the Contract Documents and other land and areas permitted by Laws and Regulations, rights-of-way, permits and easements, and shall not unreasonably encumber the premises 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. 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. CONTRACTOR shall, to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless OWNER, ENGINEER, ENGINEER'S Consultant and anyone directly or indirectly employed by any of them from and against all claims, costs, losses and damages arising out of or resulting from 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.

6.17. During the progress of the Work, CONTRACTOR shall keep the premises free from accumulations of waste materials, rubbish and other debris resulting from the Work. At the completion of the Work CONTRACTOR shall remove all waste materials, rubbish and debris from and about the premises as well as all tools, appliances, construction equipment and machinery and surplus materials. CONTRACTOR shall leave the site clean and ready for occupancy by OWNER at Substantial Completion of the Work. CONTRACTOR shall restore to original condition all property not designated for alteration by the Contract Documents.

6.18. 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.

6.19. Record Documents: CONTRACTOR shall maintain in a safe place at the site one record copy of all Drawings, Specifications, Addenda, Written Amendments, Change Orders, Work Change Directives, Field Orders and written interpretations and clarifications (issued pursuant to paragraph 9.4) in good order and annotated to show all 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.

6.20. Safety and Protection: CONTRACTOR shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. CONTRACTOR shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

6.20.1. all persons on the Work site or who may be affected by the Work;

6.20.2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the site; and

6.20.3. 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.

CONTRACTOR shall comply with all applicable Laws and Regulations of any public body having jurisdiction for safety of persons or property or to protect them 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 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. All damage, injury or loss to any property referred to in paragraph 6.20.2 or 6.20.3 caused, directly or indirectly, in whole or in part, by CONTRACTOR, any Subcontractor, Supplier or any other person or organization directly or indirectly employed by any of them to perform or furnish 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 ENGINEER'S Consultant 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 person or organization directly or indirectly employed by any of them). 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 14.13 that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion)

6.21. Safety Representative: 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.

6.22. Hazard Communication Programs: CONTRACTOR shall be responsible for coordinating any exchange of material safety data sheets or hazard communication information required to be made available to or exchanged between or among employers at the site in accordance with Laws or Regulations.

6.23. Emergencies: In emergencies affecting the safety or protection of persons or the Work or property at the site or adjacent thereto, CONTRACTOR, without special instruction or authorization from OWNER or ENGINEER, 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. 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 to document the consequences of such action.

#### 6.24 Shop Drawings and Samples:

6.24.1. CONTRACTOR shall submit Shop Drawings to ENGINEER for review and approval in accordance with the accepted schedule of Shop Drawings and Sample submittals (see paragraph 2.9). All submittals will be identified as ENGINEER may require and in the number of copies specified in the General Requirements. The 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 materials and equipment CONTRACTOR proposes to provide and to enable ENGINEER to review the information for the limited purposes required by paragraph 6.26.

6.24.2. CONTRACTOR shall also submit Samples to ENGINEER for review and approval in accordance with said accepted schedule of Shop Drawings and Sample submittals. Each Sample will be identified clearly as to material, Supplier, pertinent data such as catalog numbers and the use for which intended and otherwise as ENGINEER may require to enable ENGINEER to review the submittal for the

limited purposes required by paragraph 6.26. The numbers of each Sample to be submitted will be as specified in the Specifications.

#### 6.25. Submittal Procedures:

6.25.1. Before submitting each Shop Drawing or Sample, CONTRACTOR shall have determined and verified:

6.25.1.1. all field measurements, quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers and similar information with respect thereto.

6.25.1.2. all materials with respect to intended use, fabrication, shipping, handling, storage, assembly and installation pertaining to the performance of the Work, and

6.25.1.3. all information relative to CONTRACTOR'S sole responsibilities in respect of means, methods, techniques, sequences and procedures of construction and safety precautions and programs incident thereto.

CONTRACTOR shall also have reviewed and coordinated each Shop Drawing or Samples with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.

6.25.2. Each submittal will bear a stamp or specific written indication that CONTRACTOR has satisfied CONTRACTOR'S obligations under the Contract Documents with respect to CONTRACTOR'S review and approval of that submittal.

6.25.3. At the time of each submission, CONTRACTOR shall give ENGINEER specific written notice of such variations, if any, that the Shop Drawing or Sample submitted may have from the requirements of the Contract Documents, such notice to be in a written communication separate from the submittal; and, in addition, shall cause a specific notation to be made on each Shop Drawing and Sample submitted to ENGINEER for review and approval of each such variation.

6.26. ENGINEER will review and approve Shop Drawings and Samples in accordance with the schedule of Shop Drawings and Sample submittals accepted by ENGINEER as required by paragraph 2.9. 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. 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. 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.

6.27. ENGINEER'S review and approval of Shop Drawings or Samples shall not relieve CONTRACTOR from responsibility for any variation from the requirements of the Contract Documents unless CONTRACTOR has in writing called ENGINEER'S attention to each such variation at the time of submission as required by paragraph 6.25.3 and ENGINEER has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or

Sample approval; nor will any approval by ENGINEER relieve CONTRACTOR from responsibility for complying with the requirements of paragraph 6.25.1.

6.28. Where a Shop Drawing or Sample is required by the Contract Documents or the schedule of Shop Drawings and Sample submissions accepted by ENGINEER as required by paragraph 2.9, 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.

6.29. Continuing the Work: 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 15.5 or as OWNER and CONTRACTOR may otherwise agree in writing.

6.30. CONTRACTOR'S General Warranty and Guarantee:

6.30.1. CONTRACTOR warrants and guarantees to OWNER, ENGINEER and ENGINEER'S Consultants that all Work will be in accordance with the Contract Documents and will not be defective. CONTRACTOR'S warranty and guarantee hereunder excludes defects or damage caused by:

6.30.1.1. abuse, modification or improper maintenance or operation by persons other than CONTRACTOR, Subcontractors or Suppliers; or

6.30.1.2. normal wear and tear under normal usage.

6.30.2. 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:

6.30.2.1. observations by ENGINEER;

6.30.2.2. recommendation of any progress or final payment by ENGINEER;

6.30.2.3. the issuance of a certificate of Substantial Completion or any payment by OWNER to CONTRACTOR under the Contract Documents;

6.30.2.4. use or occupancy of the Work or any part thereof by OWNER;

6.30.2.5. any acceptance by OWNER or any failure to do so;

6.30.2.6. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by ENGINEER pursuant to paragraph 14.13;

6.30.2.7. any inspection, test or approval by others: or

6.30.2.8. any correction or defective Work by OWNER.

6.31. Indemnification: To the fullest extent permitted by Laws and Regulations. CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER'S Consultants and the officers, directors, employees, agents and other consultants 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) caused by, arising out of or resulting from the performance of the Work, provided that any such claim, cost, loss or damage:

6.31.1 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 there from, and

6.31.2 is caused in whole or in part by any negligent act or omission of CONTRACTOR, any Subcontractor, any Supplier, any person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be liable, regardless of whether or not caused in part by any negligence or omission of a person or entity indemnified hereunder or whether liability is imposed upon such indemnified party by Laws and Regulations regardless of the negligence of any such person or entity.

6.32. In any and all claims against OWNER or ENGINEER or any of their respective consultants, agents, officers, directors or employees by any employee (or the survivor or personal representative of such employee) of CONTRACTOR, any Subcontractor, any Supplier, any person or organization directly or indirectly employed by any of them to perform or furnish any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under paragraph 6.31 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 person or organization under workers' compensation acts, disability benefit acts or other employee benefit acts.

6.33. The indemnification obligations of CONTRACTOR under paragraph 6.31 shall not extend to the liability of ENGINEER and ENGINEER'S Consultants, officers, directors, employees or agents caused by the professional negligence, errors or omissions of any of them.

6.34. Survival of Obligations: 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 and termination or completion of the Agreement.

## **ARTICLE 7 - OTHER WORK**

7.1. Related Work at Site: OWNER may perform other work related to the Project at the site by OWNER'S own forces, or let other direct contracts therefore which shall contain General Conditions similar to these, or have other work performed by utility owners. If the fact that such other work is to be performed was not noted in the Contract Documents, then:

7.1.1. Written notice thereof will be given to CONTRACTOR prior to starting any such other work, and

7.1.2. CONTRACTOR may make a claim therefore as provided in Articles 11 and 12 if CONTRACTOR believes that such performance will involve additional expense to CONTRACTOR or requires additional time and the parties are unable to agree as to the amount or extent thereof.

7.2. CONTRACTOR shall afford each other contractor who is a party to such a direct contract and each utility owner (and OWNER, if OWNER is performing the additional work with OWNER'S employees) proper and safe access to the site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work and shall properly connect and coordinate

the Work with theirs. Unless otherwise provided in the Contract Documents, CONTRACTOR shall do all cutting, fitting and patching of the Work that may be required to make its several parts come together properly and integrate with such other work. CONTRACTOR shall not endanger any work of others by cutting, excavating or otherwise altering their work and will only cut or alter their 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.

7.3. 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 so to report will constitute an acceptance of such other work as fit and proper for integration with CONTRACTOR'S Work except for latent or non-apparent defects and deficiencies in such other work.

7.4. Coordination: If OWNER contracts with others for the performance of other work on the Project at the site, the following will be set forth in Supplementary Conditions:

7.4.1. the person, firm or corporation who will have authority and responsibility for coordination of the activities among the various prime contractors will be identified;

7.4.2. the specific matters to be covered by such authority and responsibility will be itemized; and

7.4.3. the extent of such authority and responsibilities will be provided.

Unless otherwise provided in the Supplementary Conditions, OWNER shall have sole authority and responsibility in respect of such coordination.

## **ARTICLE 8 - OWNER'S RESPONSIBILITIES**

8.1. Except as otherwise provided in these General Conditions, OWNER shall issue all communications to CONTRACTOR through ENGINEER.

8.2. In case of termination of the employment of ENGINEER, OWNER shall appoint an engineer against whom CONTRACTOR makes no reasonable objection, whose status under the Contract Documents shall be that of the former ENGINEER.

8.3. OWNER shall furnish the data required of OWNER under the Contract Documents promptly and shall make payments to CONTRACTOR promptly when they are due as provided in paragraphs 14.4 and 14.13.

8.4. OWNER'S duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in paragraphs 4.1 and 4.4. Paragraph 4.2 refers to OWNER'S identifying and making available to CONTRACTOR copies of reports of explorations and tests of subsurface conditions at the site and drawings of physical conditions in existing structures at or contiguous to the site that have been utilized by ENGINEER in preparing the Contract Documents.

8.5. OWNER'S responsibilities in respect of purchasing and maintaining liability and property insurance



are set forth in paragraphs 5.5 through 5.10.

8.6. OWNER is obligated to execute Change Orders as indicated in paragraph 10.4.

8.7. OWNER'S responsibility in respect of certain inspections, tests and approvals is set forth in paragraph 13.4.

8.8. In connection with OWNER'S right to stop Work or suspend Work, see paragraphs 13.10 and 15.1. Paragraph 15.2 deals with OWNER'S right to terminate services of CONTRACTOR under certain circumstances.

8.9. 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 furnishing or performance of the Work. OWNER will not be responsible for CONTRACTOR'S failure to perform or furnish the Work in accordance with the Contract Documents.

8.10. OWNER'S responsibility in respect of undisclosed Asbestos, PCBs, Petroleum, Hazardous Waste or Radioactive Materials uncovered or revealed at the site is set forth in paragraph 4.5.

8.11. If and to the extent OWNER has agreed to furnish CONTRACTOR reasonable evidence that financial arrangements have been made to satisfy OWNER'S obligations under the Contract Documents, OWNER'S responsibility in respect thereof will be as set forth in the Supplementary Conditions.

## **ARTICLE 9 - ENGINEER'S STATUS DURING CONSTRUCTION**

9.1. OWNER'S Representative: 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 and shall not be extended without written consent of OWNER and ENGINEER.

9.2: Visits to Site: 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 will endeavor for the benefit of OWNER to determine, in general, if the Work is proceeding in accordance with the Contract Documents. ENGINEER will not be required to make exhaustive or continuous on-site inspections 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 on-site observations, ENGINEER will keep OWNER informed of the progress of the Work and will endeavor to guard OWNER against defective Work. ENGINEER's visits and on-site observations are subject to all the limitations on ENGINEER's authority and responsibility set forth in paragraph 9.13, and particularly, but without limitation, during or as a result of ENGINEER's on-site 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 furnishing or performance of the Work.

9.3. Project Representative: If OWNER and ENGINEER agree, ENGINEER will furnish a Resident Project Representative to assist ENGINEER in providing more continuous observation of the Work. The responsibilities and authority and limitations thereon of any such Resident Project Representative and assistants will be as provided in paragraph 9.13 and in the Supplementary Conditions. 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 person will be as provided in the Supplementary Conditions.

9.4. Clarifications and Interpretations: ENGINEER will issue with reasonable promptness such written clarifications or interpretations of the requirements of the Contract Documents (in the form of Drawings or otherwise) as ENGINEER may determine necessary, which shall be consistent with the intent of and reasonably inferable from Contract Documents. Such written clarifications and interpretations will be binding on OWNER and CONTRACTOR. If OWNER or CONTRACTOR believes that a written clarification or interpretation justifies an adjustment in the Contract price or the Contract Times and the parties are unable to agree to the amount or extent thereof, if any, OWNER or CONTRACTOR may make a written claim therefore as provided in Article 11 or Article 12.

9.5. Authorized Variations in Work: 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 the Contract Times and the parties are unable to agree as to the amount or extent thereof, OWNER or CONTRACTOR may make a written claim therefore as provided in Article 11 or 12.

9.6. Rejection Defective Work: ENGINEER will have authority to disapprove or 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 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 13.9, whether or not the Work is fabricated, installed or completed.

9.7. Shop Drawings: In connection with ENGINEER's authority as to Shop Drawings and Samples, see paragraphs 6.24 through 6.28 inclusive.

9.8. Change Orders: In connection with ENGINEER's authority as to Change Orders, see Articles 10, 11, and 12.

9.9. Payments: In connection with ENGINEER's authority as to Applications for payment, see Article 14.

9.10. Determinations for Unit Prices: 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 upon OWNER and CONTRACTOR, unless, within ten days after the date of any such decision, either OWNER or CONTRACTOR delivers to the other and to ENGINEER written notice of intention to appeal from ENGINEER's decision and:

9.10.1 An appeal from ENGINEER's decision is taken within the time limits and in accordance with the

procedures set forth in Exhibit GC-A, "Dispute Resolution Agreement," entered into between OWNER and CONTRACTOR pursuant to Article 16, or

9.10.2 If no such Dispute Resolution Agreement has been entered into, a formal proceeding is instituted by the appealing party in a forum of competent jurisdiction to exercise such rights or remedies as the appealing party may have with respect to ENGINEER's decision, unless otherwise agreed in writing by OWNER and CONTRACTOR. Such appeal will not be subject to the procedures of paragraph 9.11.

9.11. Decisions on Disputes: ENGINEER will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work there under. Claims, disputes and other matters relating to the acceptability of the Work or the interpretation of the requirements of the Contract Documents pertaining to the performance and furnishing of the Work and Claims under Articles 11 and 12 in respect of changes in the Contract Price or Contract Times will be referred initially to ENGINEER in writing with a request for a formal decision in accordance with this paragraph. Written notice of each such claim, dispute or other matter will be delivered by the claimant to ENGINEER and the other party to the Agreement promptly (but in no event later than thirty days) after the start of the occurrence or event giving rise thereto, and written supporting data will be submitted to ENGINEER and the other party within sixty days after the start of such occurrence or event unless ENGINEER allows an additional period of time for the submission of additional or more accurate data in support of such claim, dispute or other matter. The opposing party shall submit any response to ENGINEER and the claimant within thirty days after receipt of the claimant's last submittal (unless ENGINEER allows additional time). ENGINEER will render a formal decision in writing within thirty days after receipt of the opposing party's submittal, if any, in accordance with this paragraph. ENGINEER's written decision on such claim, dispute or other matter will be final and binding upon OWNER and CONTRACTOR unless:

9.11.1 An appeal from ENGINEER's decision is taken within the time limits and in accordance with the procedures set forth in EXHIBIT GC-A, "Dispute Resolution Agreement," entered into between OWNER and CONTRACTOR pursuant to Article 16, or

9.11.2 If no such Dispute Resolution Agreement has been entered into, a written notice of intention to appeal from ENGINEER's written decision is delivered by OWNER or CONTRACTOR to the other and to ENGINEER within thirty days after the date of such decision and a formal proceeding is instituted by the appealing party in a forum of competent jurisdiction to exercise such rights or remedies as the appealing party may have with respect to such claim, dispute or other matter in accordance with applicable Laws and Regulations within sixty days of the date of such decision, unless otherwise agreed in writing by OWNER and CONTRACTOR.

9.12. When functioning as interpreter and judge under paragraphs 9.10 and 9.11 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. The rendering of a decision by ENGINEER pursuant to paragraphs 9.10 or 9.11 with respect to any such claim, dispute or other matter (except any which have been waived by the making or acceptance of final payment as provided in paragraph 14.16) will be a condition precedent to any exercise by OWNER or CONTRACTOR of such rights or remedies as either may otherwise have under the Contract Documents or by Laws or Regulations in respect of any such claim, dispute or other matter pursuant to Article 16.

9.13. Limitations on ENGINEER'S Authority and Responsibilities:

9.13.1. 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 owed by ENGINEER to CONTRACTOR, any Subcontractor, any Supplier, any other person or organization, or to any surety for or employee or agent of any of them.

9.13.2 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 furnishing or performance of the Work. ENGINEER will not be responsible for CONTRACTOR'S failure to perform or furnish the Work in accordance with the Contract Documents.

9.13.3. ENGINEER will not be responsible for the acts of omissions of CONTRACTOR or of any Subcontractor, any Supplier, or of any other person or organization performing or furnishing any of the Work.

9.13.4. ENGINEER'S review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds and certificates of inspection, tests and approvals and Other documentation required to be delivered by paragraph 14.12 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.

9.13.5. The limitations upon authority and responsibility set forth in this paragraph 9.13 shall also apply to ENGINEER's Consultants, Resident Project Representative and assistants.

## **ARTICLE 10 - CHANGES IN THE WORK**

10.1. Without invalidating the Agreement and without notice to any surety, OWNER may, at any time or from time to time, order additions, deletions or revisions in the Work. Such additions, deletions or revisions will be authorized by a Written Amendment, 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).

10.2. If OWNER and CONTRACTOR are unable to agree as to the extent, if any, of an adjustment in the Contract Price or an adjustment of the Contract Times that should be allowed as a result of a Work Change Directive, a claim may be made therefore as provided in Article 11 or Article 12.

10.3. 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 and supplemented as provided in paragraphs 3.5 and 3.6 except in the case of an emergency as provided in paragraph 6.23 or in the case of uncovering Work as provided in paragraph 13.9.

10.4. OWNER and CONTRACTOR shall execute appropriate Change Orders recommended by ENGINEER (or Written Amendments) covering:

10.4.1. changes in the Work which are:

10.4.1.1 ordered by OWNER pursuant to paragraph 10.1,

10.4.1.2 required because of acceptance of defective Work under paragraph 13.13 or correcting defective Work under paragraph 13.4, or

10.4.1..3 agreed to by the parties;

10.4.2. changes in the Contract Price or Contract Times which are agreed to by the parties; and

10.4.3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by ENGINEER pursuant to paragraph 9.11;

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 6.29.

10.5. If notice 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) is required by the provisions of any Bond to be given to a surety, the giving of any such notice will be CONTRACTOR'S responsibility, and the amount of each applicable Bond will be adjusted accordingly.

## **ARTICLE 11 - CHANGE OF CONTRACT PRICE**

11.1. The Contract Price constitutes the total compensation (subject to authorized adjustments) payable to CONTRACTOR for performing the Work. All duties, responsibilities and obligations assigned to or undertaken by CONTRACTOR shall be at CONTRACTOR'S expense without change in the Contract Price.

11.2. The Contract Price may only be changed by a Change Order or by a Written Amendment. Any claim for an adjustment in the Contract Price shall be based on written notice delivered by the party making the claim to the other party and to ENGINEER promptly (but in no event later than thirty days) after the start of the occurrence or event giving rise to the claim and stating the general nature of the claim. Notice of the amount of the claim with supporting data shall be delivered within sixty days after the start of such occurrence or event (unless ENGINEER allows additional time for claimant to submit additional or more accurate data in support of the claim) and shall be accompanied by claimant's written statement that the adjustment claimed covers all known amounts to which the claimant is entitled as a result of said occurrence or event. All claims for adjustment in the Contract Price shall be determined by ENGINEER in accordance with paragraph 9.11 if OWNER and CONTRACTOR cannot otherwise agree on the amount involved. No claim for an adjustment in the Contract Price will be valid if not submitted in accordance with this paragraph 11.2.

11.3. 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:

11.3.1. 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 paragraphs 11.9.1 through 11.9.3. inclusive);

11.3.2. 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 11.6.2);

11.3.3. 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 11.3.2, on the basis of the Cost of the Work (determined as provided in paragraphs 11.4 and 11.5) plus a CONTRACTOR'S fee for overhead and profit (determined as provided in paragraph 11.6).

11.4. Cost of the Work: The term Cost of the Work means the sum of all costs necessarily incurred and paid by CONTRACTOR in the proper performance of the Work. 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 include only the following items and shall not include any of the costs itemized in paragraph 11.5:

11.4.1. Payroll costs for employees in the direct employ 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 at the site. 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 after regular working hours on Saturday, Sunday or legal holidays, shall be included in the above to the extent authorized by OWNER.

11.4.2. 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.

11.4.3. Payments made by CONTRACTOR to the Subcontractors for Work performed or furnished 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 accepted. 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 paragraphs 11.4, 11.5, 11.6 and 11.7. All subcontracts shall be subject to the other provisions of the Contract Documents insofar as applicable.

11.4.4. 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.

11.4.5. Supplemental costs including the following:

11.4.5.1. The proportion of necessary transportation, travel and subsistence expenses of CONTRACTOR'S employees incurred in discharge of duties connected with the Work.

11.4.5.2. Costs, 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.

11.4.5.3. 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, installation, dismantling and removal thereof all 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.

11.4.5.4. Sales, consumer, use or similar taxes related to the Work, and for which CONTRACTOR is liable, imposed by Laws and Regulations.

11.4.5.5. 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.

11.4.5.6. 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 and furnishing of the Work (except losses and damages within the deductible amounts of property insurance established by OWNER in accordance with paragraph 5.9), provided they 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. If, however, any such loss or damage requires reconstruction and CONTRACTOR is placed in charge thereof, CONTRACTOR shall be paid for services a fee proportionate to that stated in paragraph 11.6.2.

11.4.5.7. The cost of utilities, fuel and sanitary facilities at the site.

11.4.5.8. Minor expenses such as telegrams, long distance telephone calls, telephone service at the site, expressage and similar petty cash items in connection with the Work.

11.4.5.9. Cost of premiums for additional Bonds and insurance required because of changes in the Work.

11.5. The term Cost of the Work shall not include any of the following:

11.5.1. Payroll costs and other compensation of CONTRACTOR'S officers, executives, principals (of partnership and sole proprietorships), general 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 a branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in paragraph 11.4.1 or specifically covered by paragraph 11.4.4, all of which are to be considered administrative costs covered by the CONTRACTOR'S fee.

11.5.2. Expenses of CONTRACTOR'S principal and branch offices other than CONTRACTOR'S office at the site.

11.5.3. Any part of CONTRACTOR'S capital expenses, including interest on CONTRACTOR'S capital employed for the Work and charges against CONTRACTOR for delinquent payments.

11.5.4. Cost of premiums for all Bonds and for all insurance whether or not CONTRACTOR is required by the Contract Documents to purchase and maintain the same (except for the cost of premiums covered by subparagraph 11.4.5.9 above).

11.5.5. 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.

Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in paragraph 11.4.

11.6. The CONTRACTOR'S fee allowed to CONTRACTOR for overhead and profit shall be determined as follows:

11.6.1. a mutually acceptable fixed fee: or

11.6.2. 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:

11.6.2.1. for costs incurred under paragraphs 11.4.1 and 11.4.2, the CONTRACTOR'S fee shall be fifteen percent;

11.6.2.2. for costs incurred under paragraph 11.4.3, the CONTRACTOR'S fee shall be five percent;

11.6.2.3. 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 11.4.1, 11.4.2, 11.4.3 and 11.6.2 is that the Subcontractor who actually performs or furnishes the Work, at whatever tier, will be paid a fee of fifteen percent of the costs incurred by such Subcontractor under paragraphs 11.4.1 and 11.4.2 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;

11.6.2.4. no fee shall be payable on the basis of costs itemized under paragraphs 11.4.4, 11.4.5 and 11.5;

11.6.2.5. 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

11.6.2.6. 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 11.6.2.1 through 11.6.2.5, inclusive.

11.7. Whenever the cost of any Work is to be determined pursuant to paragraphs 11.4 and 11.5, CONTRACTOR will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in form acceptable to ENGINEER an itemized cost breakdown together with supporting data.

11.8. Cash Allowance: 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 furnished and performed for such sums as may be acceptable to OWNER and ENGINEER. CONTRACTOR agrees



that:

11.8.1. the 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

11.8.2. CONTRACTOR'S costs for unloading and handling on the site, labor, installation costs, overhead, profit and other expenses contemplated for the 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.

11.8.3. 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.

#### 11.9. Unit Price Work:

11.9.1. 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 established unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement. 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 in accordance with paragraph 9.10.

11.9.2. 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.

11.9.3. OWNER or CONTRACTOR may make a claim for an adjustment in the Contract Price in accordance with Article 11 if:

11.9.3.1. 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

11.9.3.2. there is no corresponding adjustment with respect to any other item of Work; and

11.9.3.3. if 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 TIMES**

12.1. The Contract Times (or Milestones) may only be changed by a Change Order or a Written Amendment. Any claim for an adjustment of the Contract Times (or Milestones) shall be based on written notice delivered by the party making the claim to the other party and to ENGINEER promptly (but in no event later than thirty days) after the occurrence of the event giving rise to the claim and stating the general nature of the claim. Notice of the extent of the claim with supporting data shall be delivered within sixty days after such occurrence (unless ENGINEER allows an additional period of time to ascertain more accurate data in support of the claim) and shall be accompanied by the claimant's written

statement that the adjustment claimed is the entire adjustment to which the claimant has reason to believe it is entitled as a result of the occurrence of said event. All claims for adjustment in the Contract Times (or Milestones) shall be determined by ENGINEER in accordance with paragraph 9.11 if OWNER and CONTRACTOR cannot otherwise agree. No claim for an adjustment in the Contract Times (or Milestones) will be valid if not submitted in accordance with the requirements of this paragraph 12.1.

12.2. All time limits stated in the Contract Documents are of the essence of the Agreement.

12.3. Where CONTRACTOR is prevented from completing any part of the Work within the Contract Times (or Milestones) due to delay beyond the control of CONTRACTOR, the Contract Times (or Milestones) will be extended in an amount equal to the time lost due to such delay if a claim is made therefore as provided in paragraph 12.1. 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. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of CONTRACTOR.

12.4. Where CONTRACTOR is prevented from completing any part of the Work within the Contract Times (or Milestones) due to delay beyond the control of both OWNER and CONTRACTOR, an extension of the Contract Times (or Milestones) in an amount equal to the time lost due to such delay shall be CONTRACTOR'S sole and exclusive remedy for such delay. In no event shall OWNER be liable to CONTRACTOR, any Subcontractor, any Supplier, any other person or organization, or to any surety for or employee or agent of any of them, for damages arising out of or resulting from

12.4.1 Delays caused by or within the control of CONTRACTOR, or

12.4.2 Delays beyond the control of both parties including but not limited to fires, floods, epidemics, abnormal weather conditions, acts of God or acts or neglect by utility owners or other contractors performing other work as contemplated by Article 7.

### **ARTICLE 13 - TESTS AND INSPECTIONS: CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK**

13.1. Notice of Defects: Prompt notice of all defective Work of which OWNER or ENGINEER have actual knowledge will be given to CONTRACTOR. All defective Work may be rejected, corrected or accepted as provided in this Article 13.

13.2. Access to Work: OWNER, ENGINEER, ENGINEER's Consultants, other representatives and personnel of OWNER, independent testing laboratories and governmental agencies with jurisdictional interests will have access to the Work at reasonable times for their observation, inspecting and testing. CONTRACTOR shall provide them proper and safe conditions for such access and advise them to CONTRACTOR'S site safety procedures and programs so that they may comply therewith as applicable.

13.3. Tests and Inspections: 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.

13.4. 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:

13.4.1. for inspections, tests or approvals covered by paragraph 13.5 below;

13.4.2. that costs incurred in connection with tests or inspections conducted pursuant to paragraph 13.9 below shall be paid as provided in said paragraph 13.9; and

13.4.3. as otherwise specifically provided in the Contract Documents.

13.5. 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. CONTRACTOR shall also 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 of materials, mix designs, or equipment submitted for approval prior to CONTRACTOR'S purchase thereof for incorporation in the Work.

13.6. 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, it must, if requested by ENGINEER, be uncovered for observation.

13.7. Uncovering Work as provided in paragraph 13.6 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.

13.8. Uncovering Work: 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.

13.9. 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. If it is found that such Work is defective; CONTRACTOR shall pay all claims, costs, losses and damages caused by, arising out of or resulting from 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, and, if the parties are unable to agree as to the amount thereof, may make a claim therefore as provided in Article 11; If, however, such 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 Milestones), or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement and reconstruction; and, if the parties are unable to agree as to the amount or extent thereof, CONTRACTOR may make a claim therefore as provided in Articles 11 and 12.

13.10. Owner May Stop the Work: If the Work is defective, or CONTRACTOR fails to supply sufficient skilled workers or suitable materials or equipment, or fails to furnish or 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 or any surety or other party.

13.11. Correction or Removal of Defective Work: If required by ENGINEER, CONTRACTOR shall promptly, as directed, either correct all defective Work, whether or not fabricated, installed or completed, or, if the Work has been rejected by ENGINEER, remove it from the site and replace it with Work that is not defective. CONTRACTOR shall pay all claims, costs, losses and damages caused by or resulting from such correction or removal (including but not limited to all costs of repair or replacement of work of others).

13.12. Correction Period:

13.12.1. If within one year after the date of Substantial Completion or such longer period of time as may be prescribed by Laws or Regulations or 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. CONTRACTOR shall promptly, without cost to OWNER and in accordance with OWNER'S written instructions:

13.12.1.1 correct such defective Work, or, if it has been rejected by OWNER, remove it from the site and replace it with Work that is not defective, and

13.12.1.2 satisfactorily correct or remove and replace any damage to other Work or the work of others resulting there from.

If CONTRACTOR does not promptly comply with the terms of such instructions, or in an emergency where delay would cause serious risk of loss or damage, OWNER may have the defective Work corrected or the rejected Work removed and replaced, and all claims, costs, losses and damages caused by or resulting from such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by CONTRACTOR.

13.12.2. 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 or by Written Amendment.

13.12.3. Where defective Work (and damage to other Work resulting therefrom) has been corrected, removed or replaced under this paragraph 13.12, 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.

13.13. Acceptance of Defective Work: If, instead of requiring correction or removal and replacement of, defective Work, OWNER (and, prior to ENGINEER'S recommendation of final payment, also ENGINEER) prefers to accept it, OWNER may do so. CONTRACTOR shall pay all claims, costs, losses and damages attributable to OWNER'S evaluation of and determination to accept such defective Work (such costs to be approved by ENGINEER as to reasonableness). 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, and, if the parties are unable to agree as to the amount thereof, OWNER may make a claim therefore as provided in Article 11. If the acceptance occurs after such recommendation, an appropriate amount will be paid by CONTRACTOR to OWNER.

13.14. OWNER May Correct Defective Work: 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 13.11, 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 and remedy any such deficiency. In exercising the rights and remedies under this paragraph OWNER shall proceed expeditiously. In connection with such corrective and 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. All claims, costs, losses and damages incurred or sustained by OWNER in exercising such rights and remedies 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, and, if the parties are unable to agree as to the amount thereof, OWNER may make a claim therefore as provided in Article 11. 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. CONTRACTOR shall not be allowed an extension of the Contract Times (or Milestones) because of any delay in the performance of the Work attributable to the exercise by OWNER of OWNER'S rights and remedies hereunder.

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

14.1. Schedule of Values: The schedule of values established as provided in paragraph 2.9 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.

14.2. Application for Progress Payment: At least twenty days before the date established 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 and other arrangements to protect OWNER'S interest therein, all of which will be satisfactory to OWNER. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

14.3. CONTRACTOR'S Warranty of Title: CONTRACTOR warrants 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.

14.4. Review of Applications for Progress Payment: ENGINEER will, within ten 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. Ten days after presentation of the Application for Payment to OWNER with ENGINEER'S recommendation, the amount recommended will (subject to the provisions of the last sentence of paragraph 14.7) become due and when due will be paid by OWNER to CONTRACTOR.

14.5. ENGINEER's recommendation of any payment requested in an Application for Payment will constitute a representation by ENGINEER to OWNER, based on ENGINEER's on-site 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:

14.5.1. the Work has progressed to the point indicated.

14.5.2. 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, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under paragraph 9.10. and to any other qualifications stated in the recommendation), and

14.5.3. 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.

However, by recommending any such payment ENGINEER will not thereby be deemed to have represented that:

14.5.4. exhaustive or continuous on-site inspections have been made to check the quality or the quantity of the Work beyond the responsibilities specifically assigned to ENGINEER in the Contract Documents or

14.5.5. that 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.

14.6. ENGINEER's recommendation of any payment, including final payment, shall not mean that ENGINEER is 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 furnishing or performance of Work, or for any failure of CONTRACTOR to perform or furnish Work in accordance with the Contract Documents.

14.7. 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 referred to in paragraph 14.5. ENGINEER may also refuse to recommend any such payment, or, because of subsequently discovered evidence or the results of subsequent inspections or tests, nullify any such payment previously recommended, to such extent as may be necessary in ENGINEER's opinion to protect OWNER from loss because:

14.7.1. the Work is defective, or completed Work has been damaged requiring correction or replacement.

14.7.2. the Contract Price has been reduced by Written Amendment or Change Order.

14.7.3. OWNER has been required to correct defective Work or complete Work in accordance with paragraph 13.14, or

14.7.4. ENGINEER has actual knowledge of the occurrence of any of the events enumerated in paragraphs 15.2.1 through 15.2.4 inclusive, OWNER may refuse to make payment of the full amount recommended by ENGINEER because:

14.7.5. claims have been made against OWNER on account of CONTRACTOR'S performance or furnishing of the Work.

14.7.6. 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.

14.7.7. there are other items entitling OWNER to a set-off against the amount recommended, or

14.7.8. OWNER has actual knowledge of the occurrence of any of the events enumerated in paragraphs 14.7.1 through 14.7.3 or paragraphs 15.2.1 through 15.2.4. inclusive;

but OWNER must give CONTRACTOR immediate written notice (with a copy to ENGINEER) stating the reasons for such action and promptly pay CONTRACTOR the amount so withheld, or any adjustment thereto agreed to by OWNER and CONTRACTOR, when CONTRACTOR corrects to OWNER'S satisfaction the reasons for such action.

14.8. Substantial Completion: 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. Within a reasonable time thereafter, 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 therefore. If ENGINEER considers the Work substantially complete, ENGINEER will prepare and 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 fourteen days after submission of the tentative certificate to OWNER notify CONTRACTOR in writing, stating the reasons therefore. If, after consideration of OWNER'S objections, ENGINEER considers the Work substantially complete, ENGINEER will within said fourteen 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. At the time of delivery of the tentative certificate of Substantial Completion ENGINEER will deliver to OWNER and CONTRACTOR written recommendation as to division of responsibilities pending final payment between OWNER and CONTRACTOR with respect to security, operation, safety, 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.

14.9. OWNER shall have the right to exclude CONTRACTOR from the Work after the date of Substantial Completion, but OWNER shall allow CONTRACTOR reasonable access to complete or correct items on the tentative list.

14.10. Partial Utilization: Use by OWNER at OWNER'S option of any substantially completed part of the Work which: (I) has specially been identified in the Contract Documents, or (ii) 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, may be accomplished prior to Substantial Completion of all the Work subject to the following:

14.10.1. OWNER at any time may request CONTRACTOR in writing to permit OWNER to use any such part of the Work which OWNER believes to be ready for its intended use and substantially complete. If CONTRACTOR agrees that such part of the Work is substantially complete, CONTRACTOR will certify to OWNER and ENGINEER that such part of the Work is substantially complete and request ENGINEER to issue a certificate of Substantial Completion for that part of the Work. 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. 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 therefore. If ENGINEER considers that part of the Work to be substantially complete, the provisions of paragraphs 14.8 and 14.9 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.

14.10.2. No occupancy or separate operation of part of the Work will be accomplished prior to compliance with the requirement of paragraph 5.15 in respect of property insurance.

14.11. Final Inspection: Upon written notice from CONTRACTOR that the entire Work or an agreed portion thereof is complete. ENGINEER will 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.

14.12. Final Application for Payment: After CONTRACTOR has completed all such corrections to the satisfaction of ENGINEER and delivered in accordance with the Contract Documents all maintenance and operating instructions, schedules, guarantees, Bonds, certificates or other evidence of insurance required by paragraph 5.4, certificates of inspection, marked-up record documents (as provided in paragraph 6.19) and other documents, CONTRACTOR may make application for final payment following the procedure for progress payments. The final Application for Payment shall be accompanied (except as previously delivered) by:

14.12.1. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by subparagraph 5.4.13;

14.12.2. consent of the surety, if any, to final payment, and

14.12.3. complete and legally effective releases or waivers (satisfactory to OWNER) of all liens arising out of or filed in connection with the Work.

In lieu of such releases or waivers of Liens and as approved by OWNER, CONTRACTOR may furnish receipts or releases in full and an affidavit of CONTRACTOR that:

14.12.4. the releases and receipts include all labor, services, material and equipment for which a Lien could be filed, and



14.12.5. all payrolls, material and equipment bills other indebtedness connected with the Work for which OWNER or OWNER'S property might in any way be responsible 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.

14.13. Final Payment and Acceptance: If, on the basis of ENGINEER's observation of 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's will, within ten days after receipt of the final Application for Payment, indicate in writing ENGINEER's recommendation of payment and present the Application 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 14.15. Otherwise, ENGINEER will return the Application 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. Thirty days after the presentation to OWNER of the Application and accompanying documentation in appropriate form and substance and with ENGINEER's recommendation and notice of acceptability, the amount recommended by ENGINEER will become due and will be paid by OWNER to CONTRACTOR.

14.14. 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 and recommendation of ENGINEER, and without terminating the Agreement, 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 5.1, 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.

14.15. Waiver of Claims: The making and acceptance of final payment will constitute:

14.15.1. 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 14.11, 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

14.15.2. a waiver of all claims by CONTRACTOR against OWNER other than those previously made in writing and still unsettled.

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

15.1. OWNER May Suspend Work: At any time and without cause, OWNER may suspend the Work or any portion thereof for a period of not more than ninety 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 allowed an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if CONTRACTOR

makes an approved claim therefore as provided in Articles 11 and 12.

15.2. OWNER May Terminate: Upon the occurrence of any one or more of the following events:

15.2.1. if CONTRACTOR persistently fails 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 2.9 as adjusted from time to time pursuant to paragraph 6.6);

15.2.2. if CONTRACTOR disregards Laws or Regulations of any public body having jurisdiction;

15.2.3. if CONTRACTOR disregards the authority of ENGINEER; or

15.2.4. if CONTRACTOR otherwise violates in any substantial way any provisions of the Contract Documents;

OWNER may, after giving CONTRACTOR (and the surety, if any,) seven days' written notice and to the extent permitted by Laws and Regulations, terminate the services of CONTRACTOR, 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), 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 finish the Work as OWNER may deem expedient. In such case CONTRACTOR shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Price exceeds all claims, costs, losses and damages sustained by OWNER arising out of or resulting from 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, provided that when exercising any rights or remedies under this paragraph OWNER shall not be required to obtain the lowest price for the Work performed.

15.3. 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.

15.4. Upon seven days' written notice to CONTRACTOR and ENGINEER, OWNER may, without cause and without prejudice to any other right or remedy of OWNER, elect to terminate the Agreement. In such case, CONTRACTOR shall be paid (without duplication of any items):

15.4.1. for 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;

15.4.2. for 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;

15.4.3. for all claims, costs, losses and damages incurred in settlement of terminated contracts with Subcontractors, Suppliers and others; and

15.4.4. for reasonable expenses directly attributable to termination.

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.

15.5. CONTRACTOR May Stop Work and Terminate: If, through no act or fault of CONTRACTOR, the Work is suspended for a period of more than ninety days by OWNER or under an order of court or other public authority, or ENGINEER fails to act on any Application for Payment within thirty days after it is submitted or OWNER fails for thirty 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 Agreement and recover from OWNER payment on the same terms as provided in paragraph 15.4. In lieu of terminating the Agreement and without prejudice to any other right or remedy, if ENGINEER has failed to act on an Application for Payment within thirty days after it is submitted, or OWNER has failed for thirty days to pay CONTRACTOR any sum finally determined to be due, CONTRACTOR may upon seven day's written notice to OWNER and ENGINEER stop the Work until payment of all such amounts due CONTRACTOR, including interest thereon. The provisions of this paragraph 15.5 are not intended to preclude CONTRACTOR from making claim under Articles 11 and 12 for an increase in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to CONTRACTOR'S stopping Work as permitted by this paragraph.

## **ARTICLE 16 - DISPUTE RESOLUTION**

If and to the extent that OWNER and CONTRACTOR have agreed on the method and procedure for resolving disputes between them that may arise under this Agreement, such dispute resolution method and procedure, if any, shall be as set forth in Exhibit GC-A, "Dispute Resolution Agreement," to be attached hereto and made a part hereof. If no such agreement on the method and procedure for resolving such disputes has been reached, and subject to the provisions of paragraphs 9.10, 9.11, and 9.12, OWNER and CONTRACTOR may exercise such rights or remedies as either may otherwise have under the Contract Documents or by Laws or Regulations in respect of any dispute.

## **ARTICLE 17 - MISCELLANEOUS**

17.1. Giving Notice: Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if 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 if delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice:

17.2 Computation of Times:

17.2.1. 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.

17.2.2. A calendar day of twenty-four hours measured from midnight to the next midnight will constitute a day.

17.3. Notice of Claim: Should OWNER or CONTRACTOR suffer injury or damage to person or property because of any error, omission or act of the other party or of any of the other party's employees

or agents or others for whose acts the other party is legally liable, claim will be made in writing to the other party within a reasonable time of the first observance of such injury or damage. The provisions of this paragraph 17.3 shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitations or repose.

17.4. Cumulative Remedies: The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto, and, in particular but without limitation, the warranties, guarantees and obligations imposed upon CONTRACTOR by paragraphs 6.12, 6.16, 6.30, 6.31, 6.32, 13.1, 13.12, 13.14, 14.3 and 15.2 and all of the rights and remedies available to OWNER and ENGINEER there under, 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, and 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.

17.5. Professional Fees and Court Costs Included: Whenever reference is made to "claims, costs, losses and damages," it shall include in each case; but not be limited to all fees and charges of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs.

#### **EXHIBIT GC-A**

To General Conditions of the Agreement Between  
OWNER and CONTRACTOR

Dated:

For use with EJCDC No. 1910-8 (1990 ed.)

#### **DISPUTE RESOLUTION AGREEMENT**

OWNER and CONTRACTOR hereby agree that Article 16 of the General Conditions to the Agreement between OWNER and CONTRACTOR is amended to include the following agreement of the parties;

16.1. All claims, disputes and other matters in question between OWNER and CONTRACTOR arising out of or relating to the Contract Documents or the breach thereof (except for claims which have been waived by the making or acceptance of final payment as provided by Paragraph 14.15) will be decided by arbitration in accordance with the Customary Arbitration Rules of the American Arbitration Association then obtaining, subject to the limitations of this Article 16. This agreement so to arbitrate and any other agreement or consent to arbitrate entered into in accordance herewith as provided in this Article 16 will be specifically enforceable under the prevailing law of any court having jurisdiction.

16.2. No demand for arbitration of any claim, dispute or other matter that is required to be referred to ENGINEER initially for decision in accordance with paragraph 9.11 will be made until the earlier of (a) the date on which ENGINEER has rendered a written decision or (b) the thirty-first day after the parties have presented their evidence to ENGINEER if a written decision has not been rendered by ENGINEER before that date. No demand for arbitration of any such claim, dispute or other matter will be made later than thirty days after the date on which ENGINEER has rendered a written decision in respect thereof in accordance with paragraph 9.11; and the failure to demand arbitration within said thirty days' period will result in ENGINEER's decision being final and binding upon OWNER and CONTRACTOR. If ENGINEER renders a decision after arbitration proceedings have been initiated, such decision may be rendered as evidence but will not supersede the arbitration proceedings, except where the decision is

acceptable to the parties concerned. No demand for arbitration of any written decision of ENGINEER rendered in accordance with paragraph 9.10 will be made later than ten days after the party making such demand has delivered written notice of intention to appeal as provided in paragraph 9.10.

16.3. Notice of the demand for arbitration will be filed in writing with the other party to the Agreement and with the American Arbitration Association, and a copy will be sent to ENGINEER for information. The demand for arbitration will be made within the thirty-day or ten-day period specified in paragraph 16.2 as applicable, and in all other cases within a reasonable time after the claim, dispute or other matter in question has arisen, and in no event shall any such demand be made after the date when institution of legal or equitable proceedings based on such claim, dispute or other matter in question would be barred by the applicable statute of limitations.

16.4. Except as provided in paragraph 16.5 below, no arbitration arising out of or relating to the Contract Documents shall include by consolidation, joinder or in any other manner any other person or entity (including: ENGINEER, ENGINEER's Consultant and the officers, directors, agents, employees or consultants of any of them) who is not a party to this contract unless:

16.4.1. the inclusion of such other person or entity is necessary if complete relief is to be afforded among those who are already parties to the arbitration, and

16.4.2. such other person or entity is substantially involved in a question of law or fact which is common to those who are already parties to the arbitration and which will arise in such proceedings, and

16.4.3. the written consent of the other person or entity sought to be included and of OWNER and CONTRACTOR has been obtained for such inclusion, which consent shall make specific reference to this paragraph; but no such consent shall constitute consent to arbitration of any dispute not specifically described in such consent or to arbitration with any party not specifically identified in such consent.

16.5. Notwithstanding paragraph 16.4 if a claim, dispute or other matter in question between OWNER and CONTRACTOR involves the Work of a Subcontractor, either OWNER or CONTRACTOR may join such Subcontractor as a party to the arbitration between OWNER and CONTRACTOR hereunder. CONTRACTOR shall include in all subcontracts required by paragraph 6.11 a specific provision whereby the Subcontractor consents to being joined in an arbitration between OWNER and CONTRACTOR involving the Work of such Subcontractor. Nothing in this paragraph 16.5 nor in the provision of such subcontract consenting to joinder shall create any claim, right or cause of action in favor of Subcontractor and against OWNER, ENGINEER or ENGINEER'S Consultants that does not otherwise exist.

16.6. The award rendered by the arbitrators will be final. Judgment may be entered upon it in any court having jurisdiction thereof, and it will not be subject to modification or appeal.

16.7 OWNER and CONTRACTOR agree that they shall first submit any and all unsettled claims, counterclaims, disputes and other matters in question between them arising out of or relating to the Contract Documents or the breach thereof ("disputes"), to mediation by The American Arbitration Association under the Construction Industry Mediation Rules of the American Arbitration Association prior to either of them initiating against the other a demand for arbitration pursuant to paragraphs 16.1 through 16.6, unless delay in initiating arbitration would irrevocably prejudice one of the parties: The respective thirty and ten day time limits within which to file a demand for arbitration as provided in paragraphs 16.2 and 16.3 above shall be suspended with respect to a dispute submitted to mediation within those same applicable time limits and shall remain suspended until ten days after the termination of the mediation. The mediator of any dispute submitted to mediation under this Agreement shall not serve as arbitrator of such dispute unless otherwise agreed.

**SECTION 00800  
SUPPLEMENTARY CONDITIONS**

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction contract (No. 1910-8, 1990 ed.) and other provisions of the Contract Documents as indicated below. All provisions which are not so amended or supplemented remain in full force and effect.

**ARTICLE 1 - DEFINITIONS**

SC-1.18 ENGINEER'S Consultant

No ENGINEER's Consultants are anticipated for this project.

**ARTICLE 2 - PRELIMINARY MATTERS**

SC-2.7 Delivery of Certificates of Insurance

Delete paragraph 2.7 of the General Conditions in its entirety and insert the following in its place:

Before any work at the site is started, CONTRACTOR shall deliver to the OWNER, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which the Owner or any additional insured may reasonably request) which CONTRACTOR is required to purchase and maintain in accordance with paragraphs 5.4, 5.6 and 5.7.

**ARTICLE 4 - AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS;  
REFERENCE POINTS**

SC-4.2 Subsurface and Physical Conditions

Delete paragraph 4.2.1 of the General Conditions in its entirety and insert the following in its place:

4.2.1 No explorations or tests of subsurface conditions at the site have been made. The CONTRACTOR will be responsible to make or obtain such explorations, tests and data concerning surface and subsurface conditions at or contiguous to the site, or otherwise which may affect cost, progress, performance or furnishing of the Work in accordance with the time, price and other terms and conditions of the Contract Documents.

Delete paragraph 4.2.2 of the General Conditions in its entirety and insert the following in its place:

4.2.2 No drawings of physical conditions in or relating to existing surface and subsurface structures which are at or contiguous to the site are known to be available.

**ARTICLE 5 - BONDS AND INSURANCE**

SC-5.4 CONTRACTOR'S Liability Insurance

Revise paragraph 5.4 of the General Conditions to reflect the following conditions:

The limits of liability for the insurance required by paragraph 5.4 of the General Conditions shall provide the following coverage for not less than the following amounts or greater where required by Laws and Regulations:

5.4.1 and 5.4.2 Workers' Compensation, etc. under paragraphs 5.4.1 and 5.4.2 of the General Conditions:

- |                        |           |
|------------------------|-----------|
| (1) State:             | Statutory |
| (2) Applicable Federal |           |

(e.g., Longshoreman's):	Statutory
(3) Employer's Liability:	<u>\$500,000</u>

5.4.3, 5.4.4 and 5.4.5 and Contractor's Liability Insurance under paragraphs 5.4.3 through 5.4.5 of the General Conditions which shall also include completed operations and product liability coverage and eliminate the exclusion with respect to property under the care, custody and control of Contractor:

(1) General Aggregate (Except Products-Completed Operations)	<u>\$1,000,000</u>
(2) Products-Completed Operations Aggregate	<u>\$1,000,000</u>
(3) Personal and Advertising Injury (Per Person/Organization)	<u>\$1,000,000</u>
(4) Each Occurrence (Bodily Injury and Property Damage)	<u>\$2,000,000</u>
(5) Property Damage liability insurance will provide Explosion, Collapse and Underground coverage where applicable.	
(6) Excess Liability	
General Aggregate	<u>\$2,000,000</u>
Each Occurrence	<u>\$1,000,000</u>

5.4.6 Automobile Liability:

(1) Bodily Injury:	<u>\$ 500,000</u> Each Person
	<u>\$1,000,000</u> Each Accident
Property Damage:	<u>\$1,000,000</u> Each Accident

Or

(2) Combined Single Limit (Bodily Injury and Property Damage):	<u>\$2,000,000</u> Each Accident
--	----------------------------------

5.4.10 Contractual Endorsement

The Contractual Liability coverage required by paragraph 5.4.10 of the General Conditions shall provide coverage for not less than the following amounts:

(1) General Aggregate	<u>\$2,000,000</u>
(2) Each Occurrence (Bodily Injury and Property Damage)	<u>\$2,000,000</u>

SC-5.5 OWNER'S Liability Insurance

Delete paragraph 5.5 of the General Conditions in its entirety and insert the following in its place:

The OWNER has opted not to purchase liability insurance that would protect OWNER against claims which may arise from operations under the Contract Documents. The CONTRACTOR'S general liability insurance

shall include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER and ENGINEER'S consultants in the Work, all of whom shall be listed as insured or additional insured parties.

#### SC-5.6 Property Insurance

Delete Paragraph 5.6 of the General Conditions in its entirety and insert the following in its place:

5.6 CONTRACTOR 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 these Supplementary Conditions or required by Laws and Regulations). This insurance shall:

5.6.1 include the interests of OWNER, CONTRACTOR Subcontractors, ENGINEER, ENGINEER's Consultants and any other persons or entities identified in the Supplementary Conditions, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured;

5.6.2 be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss and damage to the Work, temporary buildings, false work and Work in transit and shall insure against at least the following perils: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage, and such other perils as may be specifically required by the Supplementary Conditions.

5.6.3 include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);

5.6.4 cover materials and equipment in transit for incorporation in the Work or 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; and

5.6.5 be maintained in effect until final payment is made unless otherwise agreed to in writing by OWNER, CONTRACTOR and ENGINEER with thirty days written notice to each other additional insured to whom a certificate of insurance has been issued.

The policies of insurance required to be purchased and maintained by CONTRACTOR in accordance with this paragraph 5.6 shall comply with the requirements of GC-5.8.

#### SC-5.7 Boiler and Machinery or Additional Property Insurance

Delete paragraph 5.7 of the General Conditions in its entirety.

#### SC-5.10 Other Special Insurance

Delete paragraph 5.10 of the General Conditions in its entirety.

#### SC-5.11 Waiver of Rights

##### SC-5.11.1

Amend the first line of the first sentence of paragraph 5.11.1 to read as follows:

CONTRACTOR intends that all



Amend the first and second lines of the third sentence of paragraph 5.11.1 to read as follows:

CONTRACTOR waives all rights against the OWNER and the OWNER's officers, directors,

Amend the fourth line of the fourth sentence of paragraph 5.11.1 to read as follows:

held by CONTRACTOR as trustee or otherwise payable under any

SC-5.12

Amend paragraph 5.12 as follows: Replace the word OWNER with the word CONTRACTOR at each place the word OWNER occurs in paragraph 5.12.

SC-5.13

Amend paragraph 5.13 as follows: Replace the words OWNER and OWNER's with the words CONTRACTOR and CONTRACTOR's respectively at each place the words OWNER or OWNER's occurs in paragraph 5.13.

## **ARTICLE 6 - CONTRACTOR' RESPONSIBILITIES**

SC-6.9.3 Add a new paragraph immediately after paragraph 6.9.2 of the General Conditions which is to read as follows:

6.9.3 OWNER or ENGINEER may furnish to any such Subcontractor, Supplier or other person or organization, to the extent practicable, information about amounts paid to CONTRACTOR in accordance with CONTRACTOR's Applications for Payment on account of the particular Subcontractor's Supplier's, other person's or other organization's Work.

## **ARTICLE 7 - OTHER WORK**

SC-7.5. Add a new paragraph immediately after paragraph 7.4.3 of the General Conditions which is to read as follows:

7.5 Should CONTRACTOR cause damage to the work or property of any separate contractor at the site, or should any claim arising out of CONTRACTOR's performance of the Work at the site be made by any separate contractor against CONTRACTOR, OWNER, ENGINEER, ENGINEER's Consultants, the Construction Coordinator or any other person, CONTRACTOR shall promptly attempt to settle with such other contractor by agreement, or to otherwise resolve the dispute by arbitration or at law. CONTRACTOR shall, to the fullest extent permitted by Laws and Regulations, indemnify and hold OWNER, ENGINEER, ENGINEER's Consultants and the Construction Coordinator harmless from and against all claims, damages, losses and expenses (including, but not limited to, fees of engineers, architects, attorneys and other professionals and court and arbitration costs) arising directly, indirectly or consequentially out of any action, legal or equitable, brought by any separate contractor against OWNER, ENGINEER, ENGINEER's Consultants or the Construction Coordinator to the extent based on a claim arising out of CONTRACTOR's performance of the Work. Should a separate contractor cause damage to the Work or property of CONTRACTOR or should the performance of Work by any separate contractor at the site give rise to any other claim, CONTRACTOR shall not institute any action, legal or equitable, against OWNER, ENGINEER, ENGINEER's Consultants or the Construction Coordinator or permit any action against any of them to be maintained and continued in its name or for its benefit in any court or before any arbiter which seeks to impose liability on or to recover damages from OWNER,

ENGINEER, ENGINEER's Consultants or the Construction Coordinator on account of any such damage or claim. If CONTRACTOR is delayed at any time in performing or furnishing Work by any act or neglect of a separate contractor and OWNER and CONTRACTOR are unable to agree as to the extent of any adjustment in Contract Times attributable thereto, CONTRACTOR may make a claim for an extension of times in accordance with Article 12. An extension of the Contract Times shall be CONTRACTOR's exclusive remedy with respect to OWNER, ENGINEER, ENGINEER's Consultants and Construction Coordinator for any delay, disruption, interference or hindrance caused by any separate contractor. This paragraph does not prevent recovery from OWNER, ENGINEER, ENGINEER's Consultant or Construction Coordinator for activities that are their respective responsibilities.

## **ARTICLE 8 – NEW MEXICO GROSS RECEIPTS TAX RATE SCHEDULE**

The Contractor will be responsible for submitting the appropriate Gross Receipts Tax payment to the State office in Santa Fe once all contract labor costs are determined. The Owner (EMW Gas Association) will have a contract pay item to compensate the Contractor for this expense. Please refer to the below hyperlink for access to the current State Tax Rate Schedule to determine to correct Tax rate for work completed on the project in Moriarty, Torrance County, New Mexico.

<https://s3.amazonaws.com/realFile34821a95-73ca-43e7-b06d-fad20f5183fd/89643cd0-2bc9-4aad-8f48-6c1e37a1bbf7?response-content-disposition=filename%3D%22GRT+Rate+Schedule+7+2020+v2.3.pdf%22&response-content-type=application%2Fpdf&AWSAccessKeyId=AKIAJBI25DHBYG7I7TA&Signature=ycNi3Y5A3VqluVcsm6csmB0soXc%3D&Expires=1596144160>

Also, please note quotations for equipment and material used for the CNG Public Access Fueling Station shall be exempt from Sales Tax (NM Gross Receipts Tax). EMW Gas Association will provide the Contractor a Sales Tax Exemption Letter to use for the purchase of all materials and supplies used for installation and integration of the new CNG station.

## **ARTICLE 9 - ENGINEER'S STATUS DURING CONSTRUCTION**

### **SC-9.3 Resident Project Representative**

Add the following paragraphs immediately after paragraph 9.3 of the General Conditions which are to read as follows:

9.3.1. General: If requested by the OWNER, the ENGINEER will furnish a Resident Project Representative (RPR) to assist ENGINEER in observing the performance of the Work RPR is ENGINEER'S agent at the site, will act as directed by and under the supervision of ENGINEER, and will confer with ENGINEER regarding RPR's actions, RPR's dealings in matters pertaining to the on-site work shall in general be with ENGINEER and CONTRACTOR keeping OWNER advised as necessary. RPR's dealings with subcontractors shall only be through or with the full knowledge and approval of CONTRACTOR. RPR shall generally communicate with OWNER with the knowledge of and under the direction of ENGINEER.

### **9.3.2. Duties and Responsibilities of RPR**

9.3.2.1. Schedules: Review the progress schedule, schedule of Shop Drawing submittals and schedule of values prepared by CONTRACTOR and consult with ENGINEER concerning acceptability.

9.3.2.2. Conferences and Meetings: Attend meetings with CONTRACTOR, such as preconstruction conferences, progress meetings, job conferences, and other project related meetings and prepare and circulate copies of minutes thereof.

9.3.2.3. Liaison: Serve as ENGINEER'S liaison with CONTRACTOR, working principally through CONTRACTOR'S superintendent and assist in understanding the intent of the Contract Documents and assist ENGINEER in serving as OWNER'S liaison with CONTRACTOR when CONTRACTOR'S operations affect OWNER'S on-site operations.

9.3.2.4. Shop Drawings and Samples:

9.3.2.4.1. Record date of receipt of Shop Drawings and samples.

9.3.2.4.2. Receive samples which are furnished at the site by CONTRACTOR, and notify ENGINEER of availability of samples for examination.

9.3.2.4.3. Advise ENGINEER and CONTRACTOR of the commencement of any work requiring a Shop Drawing or sample if the submittal has not been approved by ENGINEER.

9.3.2.5. Review of Work, Rejection of Defective Work, Inspections and Tests:

9.3.2.5.1. Conduct on-site observations of the Work in progress to assist ENGINEER in determining if the Work is in general proceeding in accordance with the Contract Documents.

9.3.2.5.2. Report to ENGINEER whenever RPR believes that any Work is unsatisfactory, faulty or defective or does not conform to the Contract Documents, or has been damaged, or does not meet the requirements of any inspection, test, or approval required to be made: and advise ENGINEER of Work the RPR believes should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection, or approval.

9.3.2.5.3. Verify that tests, equipment, and systems startups, and operating and maintenance training are conducted in the presence of appropriate personnel, and the CONTRACTOR maintains adequate records thereof; and observe, record, and report to ENGINEER appropriate details relative to the test procedures and startups.

9.3.2.5.4. Accompany visiting inspectors representing public or other agencies having jurisdictions over the project, record the results of these inspections and report to ENGINEER.

9.3.2.6. Interpretation of Contract Documents: Report to ENGINEER when clarifications and interpretations of the Contract Documents are needed and transmit to CONTRACTOR clarifications and interpretations as issued by ENGINEER.

9.3.2.7. Modifications: Consider and evaluate CONTRACTOR'S suggestions for modification in Drawings or Specifications and report with RPR'S recommendation to ENGINEER. Transmit to CONTRACTOR decisions as issued by ENGINEER.

9.3.2.8. Records:

9.3.2.8.1. Maintain at the job site orderly files for correspondence, reports of job conferences, Shop Drawings and samples, reproduction of original Contract Documents including all Work Directives Changes, Addenda, Change Orders, Field Orders, additional Drawings issued subsequent to the execution of the Contract, ENGINEER'S clarifications and interpretations of the Contract, progress reports, and other Project related

documents.

9.3.2.8.2. Keep a diary or log book, recording CONTRACTOR hours on the job site, weather conditions, data relative to questions of Work Directive Changes, Change Orders or changed conditions, list of job site visitors, daily activities, decisions, observations in general, and specific observations in more detail as in the case of observing test procedures; and send copies to ENGINEER.

9.3.2.8.3. Record names, addresses and telephone numbers of all CONTRACTORS, subcontractors, and main suppliers of materials and equipment.

9.3.2.9. Reports:

9.3.2.9.1. Furnish ENGINEER periodic reports as required of progress of the Work and of CONTRACTOR'S compliance with the progress schedule and schedule of Shop Drawing and sample submittals.

9.3.2.9.2. Consult with ENGINEER in advance of scheduled major tests, inspections, or start of important phases of the Work.

9.3.2.9.3. Draft proposed Change Orders and Work Directive Changes, obtaining backup material from CONTRACTOR and recommend to ENGINEER Change Orders, Work Directive Changes and Field Orders.

9.3.2.9.4. Report immediately to ENGINEER and OWNER upon the occurrence of any accident.

9.3.2.10. Payment Requests: Review applications for payment with CONTRACTOR for compliance with the established procedure for their submission and forward with recommendations to ENGINEER, noting particularly the relationship of the payment requested to the schedule of values, work completed and materials and equipment delivered at the site but not incorporated in the Work.

9.3.2.11. Certificates, Maintenance and Operation Manuals: During the course of the Work, verify that certificated, maintenance and operation manuals, and other data required to be assembled and furnished by CONTRACTOR are applicable to the items actually installed and in accordance with the Contract Documents and have this material delivered to ENGINEER for review and forwarding to OWNER prior to final payment for the Work.

9.3.2.12. Completion;

9.3.2.12.1. Before ENGINEER issues a Certificate of Substantial Completion, submit to CONTRACTOR a list of observed items requiring completion or correction.

9.3.2.12.2. Conduct final inspection in the company of ENGINEER, OWNER, and CONTRACTOR and prepare a final list of items to be completed or corrected.

9.3.2.12.3. Observe that all items on final list have been completed or corrected and make recommendations to ENGINEER concerning acceptance.

9.3.3. Limitations of Authority: Resident Project Representative:

9.3.3.1. Shall not authorize any deviation from the Contract Documents or substitution of materials or equipment, unless authorized by ENGINEER.

9.3.3.2. Shall not exceed limitations of ENGINEER's authority as set forth in the Agreement or the Contract

Documents.

9.3.3.3. Shall not undertake any of the responsibilities of CONTRACTOR, subcontractors or CONTRACTOR's superintendent.

9.3.3.4. Shall not advise on, issue directions relative to or assume control over any aspect of the means, methods, techniques, sequences or procedures of construction unless such advice or directions are specifically required by the Contract Documents.

9.3.3.5. Shall not advise on, issue directions regarding or assume control over safety precautions and programs in connection with the Work.

9.3.3.6. Shall not accept Shop Drawing or sample submittals from anyone other than CONTRACTOR.

9.3.3.7. Shall not authorize OWNER to occupy the Project in whole or in part.

9.3.3.8. Shall not participate in specialized field or laboratory tests inspections conducted by others except as specifically authorized by ENGINEER.

**ARTICLE 10 – NEW MEXICO DEPARTMENT OF PUBLIC WORKS DOCUMENTS**



STATE OF NEW MEXICO  
NEW MEXICO DEPARTMENT OF  
WORKFORCE SOLUTIONS  
Labor Relations Division  
121 Tijeras Ave NE, Suite 3000  
Albuquerque, NM 87102  
[www.dws.state.nm.us](http://www.dws.state.nm.us)

## PUBLIC WORKS PROJECT REQUIREMENTS

As a participant in a Public Works project valued at more than \$60,000 in the State of New Mexico, the following list addresses many of the responsibilities that are defined by statute or regulation to each project stakeholder.

### Contracting Agency

- Ensure that all Contractors wishing to bid on a Public Works project when the project is \$60,000 or more are actively registered with the Public Works and Apprenticeship Application (PWAA) website: <http://www.dws.state.nm.us/pwaa> (Contractor Registration) prior to bidding.
- Please submit Notice of Award (NOA) and Subcontractor List(s) to the PWAA website promptly after the project is awarded.
- Please update the Subcontractor List(s) on the PWAA website whenever changes occur.

### General Contractor

- Provide a complete Subcontractor List and Statements of Intent (SOI) to Pay Prevailing Wages for each Contractor to the Contracting Agency within 3 (three) days of award.
- Ensure that all Subcontractors wishing to bid on a Public Works project have an active Contractor Registration with the Public Works and Apprenticeship Application (PWAA) website: <http://www.dws.state.nm.us/pwaa> prior to bidding when their bid will exceed \$60,000.
- Submit bi-weekly certified payrolls to the Contracting Agency.
- Make certain the Public Works Apprentice and Training Act contributions are paid either to an approved Apprenticeship Program or to the Public Works Apprentice and Training Fund.
- Confirm the Wage Rate poster, provided in PWAA, is displayed at the job site in an easily accessible place.
- Make sure, when a project has been completed, the Affidavits of Wages Paid (AWP) are sent to the Contracting Agency.

### Subcontractor

- Ensure that all Subcontractors wishing to bid on a Public Works project have an active Contractor Registration with the Public Works and Apprenticeship Application (PWAA) website: <http://www.dws.state.nm.us/pwaa> prior to bidding when their bid will exceed \$60,000.
- Submit bi-weekly certified payrolls to the General Contractor(s).



STATE OF NEW MEXICO  
NEW MEXICO DEPARTMENT OF  
WORKFORCE SOLUTIONS  
Labor Relations Division  
121 Tijeras Ave NE, Suite 3000  
Albuquerque, NM 87102  
[www.dws.state.nm.us](http://www.dws.state.nm.us)

- Make certain the Public Works Apprenticeship and Training Act contributions are paid either to an approved Apprenticeship Program or to the Public Works Apprenticeship and Training Fund.

### **Additional Information**

Reference material and forms may be found at New Mexico Department of Workforce Solutions Public Works web pages at: [http://www.dws.state.nm.us/new/Labor\\_Relations/publicworks.html](http://www.dws.state.nm.us/new/Labor_Relations/publicworks.html).

### **CONTACT INFORMATION**

Contact the Labor Relations Division for any questions relating to Public Works projects by email at [public.works@state.nm.us](mailto:public.works@state.nm.us) or call (505) 841-4400.

**STATEMENT OF INTENT TO PAY PREVAILING WAGES**  
To Be Completed Before Construction Starts All FIELDS ARE REQUIRED  
**FORM MUST BE SENT TO THE CONTRACTING AGENCY WITHIN 3 DAYS OF THE AWARD**

<b>General Contractor Information</b>		
Company Name:		
Address:		
City :	State:	Zip:
Phone:	Fax:	E-Mail:
Estimated Start Date:	<b>State Wage Decision Number:</b>	
Project Title:	Project Physical Address:	
<b>Total Contract Amount:</b>	Estimated Completion Date:	
Print Name:	General Contractor Signature:	
<b>Sub-Contractor Information</b>	Sub Contract Amount:	Start date on this project:
Company Name:		
Address:		
City:	State:	Zip:
Phone:	Fax:	E-Mail:
Print Name:	Sub-Contractor Signature:	
<b>2<sup>nd</sup>, 3<sup>rd</sup>, etc. Tier Sub-Contractor Information</b>	Contract Amount:	Start date on this project:
Company Name:		
Address:		
City:	State:	Zip:
Phone:	Fax:	E-Mail:
Print Name:	Tier Signature:	

I hereby certify that the above information is correct and that all workers I employ on this public works project will be paid no less than the Prevailing Wage Rate(s) as determined by the Department of Workforce Solutions, Labor Relations Division for this project as identified by the State Wage Decision Number. I understand that contractors who violate Prevailing Wage Laws (i.e., incorrect job classification, improper payment of prevailing wages, and/or overtime, etc.), are subject to debarment procedures and shall be required to pay any back wages due to workers. (Ref. Labor Relations Division, Public Works Minimum Wage Act Policy Manual (11.1.2 NMAC) & Public Works Minimum Wage Act (13-4-11 through 13-4-18, NMSA 1978).



Contractor's Signature

Date

**INSTRUCTIONS FOR COMPLETING STATEMENT OF INTENT TO PAY  
PREVAILING WAGES**

GENERAL CONTRACTOR

1. Enter general contractor information and provide signature.
2. Enter State Wage Decision Number as listed in bid documents. (Example: BE-13-0123 B)
3. Enter project title - listed in bid documents.
4. Enter project physical address - exact location of project (job site).
5. Enter estimated start & completion dates of project.
6. Enter general contractor's contract amount.
7. All Statements must be sent to the Contracting Agency.

SUB CONTRACTOR

1. Enter general contractor information, but general contractor signature is not needed.
2. Enter sub-contractor information as indicated and provide signature.
3. Enter sub-contractor contract amount.

NOTE: A separate signed form is needed for each contractor.

2ND TIER SUB CONTRACTOR

1. Enter general contractor information, but general contractor signature is not needed.
2. Enter sub-contractor information; subcontractor signature not needed.
3. Enter 2nd tier sub information and provide signature.
4. Enter 2nd tier contractors contract amount.

3RD TIER AND HIGHER CONTRACTOR

1. Attach a copy of this completed form & list the 3rd tier contractor information under the 2nd tier

**PAYROLL STATEMENT OF COMPLIANCE**

Wage Decision No. : \_\_\_\_\_

I, \_\_\_\_\_ do hereby state:  
(Name of Signatory Party) (Title)

(1) that I pay or supervise the payment of the persons employed by: \_\_\_\_\_  
(Contractor or Subcontractor)

on the \_\_\_\_\_  
(Name of Project)

that during the payroll period commencing on the \_\_\_\_ day of \_\_\_\_\_, 20\_\_ and ending the \_\_\_\_ day of \_\_\_\_\_, 20\_\_, all persons employed on said project have been paid the full weekly wages earned, that no deductions have been or will be made either directly or indirectly to or on behalf of said \_\_\_\_\_ from the full weekly wages earned by any

(Contractor or Subcontractor)

person, other than deductions permitted by law. Anyone found in violation of the NM Public Works Minimum Wage Act [13-4-11 to 13-4-17 NMSA 1978] could be subject to penalties and debarment.

- (2) That any payrolls otherwise under this contract required to be submitted for the above period are correct and complete; that the wage rates for laborer or mechanic conform with the work he performed.
- (3) That any apprentice(s) employed in the above period are duly registered in a bona fide apprenticeship program registered with the State Apprenticeship agency recognized by the Bureau of Apprenticeship & Trng., US Dept. of Labor, or properly enrolled in a bona fide training program approved for application on public works construction projects by the appropriate state (SAC) and/or federal agency(ies) (BAT) if and as required by law & applicable federal regulation.

**(4) FRINGE BENEFITS: (Please Spell Out Any/All Acronyms)**

\_\_ (a) ARE PAID TO APPROVED PLAN, FUND, OR PROGRAM in addition to the basic hourly wage rates paid to each laborer or mechanic listed in the above-referenced payroll, payments of fringe benefits as listed in the contract have been or will be made to appropriate program for the benefit of such employees.

*If paid to an approved plan, fund, or program, please fill out name of program w/fringe breakdown per hour below:*

Name of Program Used for Fringe Benefits:				
Pension =	Health/Welfare =	Holiday/Vac. =	Life Ins. =	Training* =
(If additional space is needed for more programs/fringe breakdowns, please attach a separate page.)				

FRINGE BENEFITS:

1. Pension
2. Health/Welfare
3. Holiday/Vacation
4. Life Insurance
5. Training (not Apprenticeship) \*

FRINGE BREAKDOWN SAMPLE:

Fringe Benefit:	Amount:
401(K) Plan	\$8.98/hr.
Vacation	\$2.23/hr.

\_\_ (b) **Paid to Union Program** - If paid to a Union and fringe benefits differ from employee to employee, and/or job contract, please provide fringe breakdown for each employee and attach copy of Union contract.

\_\_ (c) ARE PAID IN CASH, each laborer or mechanic listed in the above-referenced payroll has been paid as indicated on the payroll, an amount not less than the sum of the applicable basic hourly wage rate plus the amount of the required fringe benefits as listed in the contract.

Section 13-1D-1 to Section 13-1D-8, NMSA 1978 provides for employers to agree to make contributions to approved apprentice & training programs in New Mexico in which the employer is a participant to the public works apprentice and training fund administered by the Public Works Bureau of the Labor & Industrial Division of the New Mexico State Department of Labor. Contributions shall be made in the same manner and in the same amount as apprentice and training contributions required pursuant to wage rate determinations made by the Labor & Industrial Division Director.

**APPRENTICESHIP CONTRIBUTIONS:** (Please check applicable blank)

\_\_ Check paid to: NM Public Works Apprenticeship & Training Fund - Public Works Bureau, Labor & Industrial Div.

\_\_ Check paid to: \_\_\_\_\_ (Program No.)  
(Name & address of approved Apprenticeship & Training Program)

Print Name of Certifying Official: \_\_\_\_\_ Signature of Certifying Official: \_\_\_\_\_ Title & Phone No.: \_\_\_\_\_ Date: \_\_\_\_\_

The willful falsification of any of the above statements may subject the contractor or subcontractor to civil or criminal prosecution. See Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.

Revised April/2006

WEEKLY PAYROLL

Revised Feb/2014

General Contractor Name:				Subcontractor Name:								
Address:				Phone:		Address:				Phone:		
Payroll No.	Week Ending	Payroll Pmt. Date	Project Name			Project Location:			Wage Decision No.			
		DAY AND DATE										
Employee Name	Work Classification	TOTAL FOR PERIOD	Hourly Rate	Hrly. Rate Pd. In Fringe Benefits	Subsistence Pay	Gross Amt. Earned this Payroll	Gross Amt. All Projects	Deductions				
& Address								With - holding	State Tax	Other: Union Dues	Net Amt. Pd.	
		HOURS WORKED										
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**AFFIDAVIT OF WAGES PAID  
To Be Completed After Construction Is Complete  
ALL FIELDS ARE REQUIRED  
FORM MUST BE SENT TO THE CONTRACTING AGENCY**

<b>General Contractor Information</b>		
Company Name:		
Address:		
City:	State:	Zip:
Phone:	Fax:	E-Mail:
Estimated Completion Date:	<b>State Wage Decision Number:</b>	
Project Title:	Project Physical Address:	
Print Name:	General Contractor Signature:	
		Date you completed work on this project:
<b>Sub Contractor Information</b>		
Company Name:		
Address:		
City:	State:	Zip:
Phone:	Fax:	E-Mail:
Print Name:	Sub Contractor Signature:	
		Date you completed work on this project:
<b>2<sup>nd</sup>, 3<sup>rd</sup>, etc. Tier Sub Contractor Information</b>		
Company Name:		
Address:		
City:	State:	Zip:
Phone:	Fax:	E-Mail:
Print Name:	Tier Signature:	

I hereby certify that the above information is correct and that all workers I employ on this public works project were paid no less than the Prevailing Wage Rate(s) as determined by the Department of Workforce Solutions, Labor Relations Division for this project as identified by the State Wage Decision Number. I understand that contractors who violate Prevailing Wage Laws (i.e., incorrect job classification, improper payment of prevailing wages, and/or overtime, etc.), are subject to debarment procedures and shall be required to pay any back wages due to workers. (Ref. Labor Relations Division Public Works Minimum Wage Act Policy Manual (11.1.2 NMAC) & Public Works Minimum Wage Act (13-4-11 through 13-4-18, NMSA 78)).

\_\_\_\_\_ Date

Contractor's Signature

(Revised 08/23/13)



**TYPE "A" - STREET, HIGHWAY, UTILITY & LIGHT ENGINEERING**  
**Effective January 1, 2020**

Trade Classification	Base Rate	Fringe Rate
Bricklayer/Block layer/Stonemason	24.46	8.81
Carpenter/Lather	24.63	11.24
Carpenter- Los Alamos County	27.80	13.19
Cement Mason	17.42	6.81
Ironworker	27.00	15.75
Painter- Commercial	17.00	6.88
Plumber/Pipefitter	30.76	11.62
<b>Electricians- Outside Classifications: Zone 1</b>		
Ground man	23.27	12.67
Equipment Operator	33.39	15.35
Lineman/ Technician	39.28	16.91
Cable Splicer	43.21	17.95
<b>Electricians-Outside Classifications: Zone 2</b>		
Ground man	23.27	12.67
Equipment Operator	33.39	15.35
Lineman/ Technician	39.28	16.91
Cable Splicer	43.21	17.95
<b>Electricians-Outside Classifications: Los Alamos</b>		
Ground man	23.94	12.85
Equipment Operator	34.35	15.60
Lineman/ Technician	40.41	17.21
Cable Splicer	44.45	18.28
<b>Laborers</b>		
Group I- Unskilled	12.26	6.22
Group II- Semi-Skilled	12.56	6.22
Group III- Skilled	12.96	6.22
Group IV- Specialty	13.21	6.22
<b>Operators</b>		



Group I	18.79	6.34
Group II	19.72	6.34
Group III	19.82	6.34
Group IV	19.93	6.34
Group V	20.03	6.34
Group VI	20.21	6.34
Group VII	20.37	6.34
Group VIII	20.66	6.34
Group IX	28.16	6.34
Group X	31.41	6.34
<b>Truck Drivers</b>		
Group I-IX	16.45	7.87

**NOTE: All contractors are required to pay SUBSISTENCE, ZONE AND INCENTIVE PAY according to the particular trade. Details are located in a PDF attachment at [WWW.DWS.STATE.NM.US](http://WWW.DWS.STATE.NM.US). Search Labor Relations/Labor Information/Public Works/Prevailing Wage Rates.**

For more information about the Subsistence, Zone, and Incentive Pay rates, or to file a wage claim, contact the Labor Relations Division at (505) 841-4400 or visit us online at [www.dws.state.nm.us](http://www.dws.state.nm.us).

## SECTION 01000

### SUMMARY OF THE WORK - CNG STATION EQUIPMENT INSTALLATION

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Project name is **Public Access CNG Fueling Station Installation**. This work includes providing a new quick fill Compressed Natural Gas (CNG) fueling station for the E.M.W Gas Association in the City of Moriarty, Torrance County, New Mexico.

##### 1.02 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Project will consist of connection and integration of Owner supplied CNG fueling station equipment including one (1) natural gas dryer, two (2) CNG compressor skids, one (1) CNG Station Priority Panel System, one (1) Site Control, two (2) fast fill CNG dispensers with one (1) card reader for dispenser actuation, two (2) 3 sphere CNG storage assemblies, and one (1) 3 tube CNG stack. Work also includes providing and installing one (1) four post fueling canopy, communications & ESD system with security/video surveillance. Finally, the Project will include all related site development and construction work to provide new concrete entrance off of Business Loop 40, CMU station enclosure wall with gates, concrete fueling pad and paved driveway loop. The Project is located at 614 US Route 66 (W) in Moriarty, Torrance County, New Mexico.

##### 1.03 WORK BY OWNER

- A. The Contractor will furnish Labor, installation, materials, equipment, and tools for Construction.

##### 1.04 OWNER OCCUPANCY

- A. The Owner's site is vacant and unoccupied. The Contractor will establish a construction entrance off of Business Loop 40 for installation work. The Contractor shall coordinate his activities with the Owner and his representative in such a manner as to assure minimum interference.

1.05 OWNER-FURNISHED EQUIPMENT – One (1) JW Power CNG Compressor Skid, One (1) ANGI 50 CNG Compressor Skid, two (2) 3 sphere CNG Storage vessel skids, one (1) 3 tube CNG storage vessel stack, one (1) Xebec Gas Dryer, one (1) Gilbarco 2 hose CNG dispenser, one (1) TGT 2 hose CNG Dispenser, one (1) FuelMaster card reader, priority panel system components, and Slave style site controller.

##### 1.06 SALVAGED MATERIALS - None

##### 1.07 PROJECT UTILITY SOURCES

- A. See Project Plans.

##### 1.07 SALES TAX. See Section 00800

#### PART 2 - PRODUCTS (NOT APPLICABLE)

#### PART 3 – EXECUTION

### 3.01 WORK QUALIFICATIONS

- A. The Project Work involves the installation of specialty equipment in the form of Compressed Natural Gas fueling equipment. To demonstrate qualifications to perform the Work, each Bidder must be prepared to submit within five days after Bid opening upon Owner's request detailed written evidence such as financial data, previous project experience, present commitments, and other such data. Each Bid must contain evidence of Bidder's qualification to do business in the State of New Mexico or covenant to obtain such qualification prior to award of the contract.

### 3.02 WORK RESTRICTIONS

- A. General: The Contractor shall limit his use of the premises of the work indicated, so as to allow for Owner access and occupancy (adjoining private drives, parking lots).
- B. Use of the Site: Confine operations at the site to the areas permitted under the Contract. Portions of the site beyond areas on which work is indicated are not to be disturbed. Conform to site rules and regulations affecting the work while engaged in project construction.
  - 1. Keep existing driveways and roadways open to traffic at all times. Coordinate open cut crossings of roads to allow at least one lane of through traffic at all times.
  - 2. Do not unreasonably encumber the site with materials or equipment. Confine stockpiling of materials and location of storage sheds to the areas indicated. If additional storage is necessary, obtain and pay for such storage off site.
  - 3. Lock automotive-type vehicles, such as passenger cars, trucks, mechanized or other motorized equipment, when parked and unattended, so as to prevent unauthorized use. Do not leave such vehicles or equipment unattended with the motor running or the ignition key in place.

### 3.03 WORK SEQUENCE:

- A. General: Construction sequence shall be in accordance with requirements herein subject to Owner's need for continuous operation of existing facilities:
  - 1. Short term interruption of utility service must be coordinated in advance with the Owner's staff.
- B. Continuous Service of Existing Facilities: Where the Work is on or adjacent to existing facilities, exercise caution and schedule operations to ensure that functioning of present facilities will not be endangered. Shutdown of Owner's operating facilities to perform the Work shall be held to a minimum length of time and shall be coordinated with Owner who shall have control over the timing and schedules of such shutdowns.
- C. Maintenance: Contractor shall be responsible to maintain existing roadways throughout the construction process including snow removal, temporary patching, and debris removal.
- D. Demolition Disposal: The Contractor shall make arrangement for disposal of removed asphalt and concrete pavement and miscellaneous concrete sections.
- E. Borrow Material: The Contractor shall locate a borrow site for acceptable material that can be used at the construction site.

END OF SECTION



## SECTION 01040

### PROJECT COORDINATION

#### PART 1 GENERAL

##### A. SUMMARY:

1. Minimum administrative and supervisory requirements necessary for coordination of work on the Project include but are not necessarily limited to the following:

- a. Coordination and meetings.
- b. Administrative and supervisory personnel.
- c. Surveys and records or reports.
- d. Limitations for use of site.
- e. Special reports.
- f. General installation provisions.
- g. Cleaning and protection.
- h. Conservation and salvage.

##### B. COORDINATION AND MEETINGS:

1. **General:** Prepare a written memorandum on required coordination activities. Include such items as required notices, reports and attendance at meetings. Distribute this memorandum to each entity performing work at the project site.

2. **Initial Coordination Meetings and Submittals:** Refer to the General Conditions.

3. **Coordination Meetings:** Hold general project coordination meetings every week at regularly scheduled times convenient to all parties involved. These meetings are in addition to specific meetings held for other purposes, such as regular project meetings, Progress Schedule status review meetings, and special pre-installation meetings. Request representation at each meeting by every party currently involved in coordination or planning for the work of the entire project. Conduct meetings in a manner, which will resolve coordination problems. Record results of the meeting and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

##### C. ADMINISTRATIVE/SUPERVISORY PERSONNEL:

1. **General:** In addition to a General Superintendent and other administrative and supervisory personnel required for performance of the work, provide specific coordinating personnel as specified herein.

2. **Project Coordinator:** Provide a Project Coordinator experienced in administration and supervision of the type of work contemplated herein. This Project Coordinator is hereby authorized to act as general coordinator of interfaced between units of work. For the purpose of this provision, "interface" is defined to include scheduling and sequencing of work, sharing of access to work spaces, installations, protection of each other's work, cutting and patching, tolerances, cleaning, selections for compatibility, preparation of coordination drawings, inspections, tests and temporary facilities and services.

3. **Submittal of Staff Names, Duties:** Prior to the Pre-construction meeting submit a listing of Contractor's principal staff assignments and consultants, naming persons and listing their addresses and telephone numbers.

#### **D. LIMITATIONS ON USE OF THE SITE:**

**1. General:** Limitations on site usage, as well as specified requirements that impact site utilization are indicated on the drawings and by other contract documents. In addition to these limitations and requirements, administer allocation of available space equitably among entities needing both access and space so as to produce the best overall efficiency in performance of the total work of the project. Schedule deliveries so as to minimize space and time requirements for storage of materials and equipment on site.

#### **E. SPECIAL REPORTS:**

**1. General:** Submit special reports directly to the Owner within one day of an occurrence. Submit a copy of the report to the Engineer and other entities that are affected by the occurrence.

**2. Reporting Unusual Events:** When an event of an unusual and significant nature occurs at the site, prepare and submit a special report. List chain of events, persons participating, responses by Contractor's personnel, an evaluation of the results or effect and similar pertinent information. Advise the Owner in advance when such events are known or predictable.

**3. Reporting Accidents:** Prepare and submit reports of significant accidents, at site and anywhere else work is in progress. Record and document all data and actions. For this purpose, a significant accident is defined to include events where personal injury is sustained or property loss of substance is sustained, or where the event posed a significant threat of loss or personal injury.

#### **PART 2 PRODUCTS - (NOT APPLICABLE)**

#### **PART 3 EXECUTION**

##### **A. GENERAL INSTALLATION PROVISIONS:**

**1. Pre-Installation Conferences:** Hold a pre-installation meeting at the project site well before installation of each major process or piece of equipment, which requires coordination with other work. Installer and representatives of the manufacturers and fabricators who are involved in or affected by that unit of work and with its coordination or integration with other work that has preceded or will follow shall attend this meeting. Advise Engineer of scheduled meeting dates.

At each meeting review progress of other work and preparations for the particular work under consideration including specific requirements for the following:

- a. Contract documents.
- b. Related change orders.
- c. Deliveries.
- d. Shop drawings, product data and quality control samples.
- e. Possible conflicts and compatibility problems.
- f. Time schedules.
- g. Weather limitations.
- h. Manufacturer's recommendations.
- i. Compatibility of materials.
- j. Temporary facilities.
- k. Space and access limitations.
- l. Governing regulations.

- m. Safety.
- n. Inspection and testing requirements.
- o. Required performance results.
- p. Recording requirements.
- q. Protection.

Record significant discussions of each conference and record agreements and disagreements along with the final plan of action. Distribute the record of meeting promptly to everyone concerned, including the Owner and Engineer.

Do not proceed with the work if the pre-installation conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the work and reconvene pre-installation conference at the earliest feasible date.

**2. Installer's Inspection of Conditions:** Require Installer of each major unit of work to inspect the site to receive work and conditions under which the work is to be performed.

**3. Manufacturer's Instructions:** Where installations include manufactured products, comply with the manufacturer's applicable instructions and recommendations for installation, to the extent that these instructions and recommendations are more explicit or more stringent than requirements indicated in the contract documents.

**4.** Inspect each item of materials or equipment immediately prior to installation. Reject damaged and defective items.

**5.** Provide attachment and connection devices and methods for securing work. Secure work true to line and level, and within recognized industry tolerances. Allow expansion and building movement. Provide uniform joint width in exposed work. Arrange joints in exposed work to obtain the best visual effect. Refer questionable visual-effect choices to the Engineer for final decision.

**6.** Recheck measurements and dimensions of the work as an integral step of starting each installation.

**7.** Install each unit of work during weather conditions and project status, which will ensure the best possible results in coordination with the entire work. Isolate each unit of work from incompatible work as necessary to prevent deterioration.

**8.** Coordinate enclosure of the work with required inspections and tests so as to minimize the necessity of uncovering work for that purpose.

**9. Mounting Heights:** Where mounting heights are not indicated, mount individual units of work at industry recognized standard mounting heights for the particular application indicated. Refer questionable mounting height choices to the Engineer for final decision.

## **B. CLEANING AND PROTECTION:**

**1. General:** During handling and installation of work at the project site, clean and protect work in progress and adjoining work on the basis of continuous maintenance. Apply protective covering on installed work where it is required to ensure freedom from damage or deterioration at time of substantial completion.

Clean and perform maintenance on installed work as frequently as necessary through the

remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

**2. Limiting Exposures of Work:** To the extent possible through reasonable control and protection methods, supervise performance of the work in such a manner and by such means which will ensure that none of the work, whether completed or in progress, will be subjected to harmful, dangerous, damaging or otherwise deleterious exposure during the construction period. Such exposures include, where applicable, but not by way of limitation, the following:

- a. Excessive static or dynamic loading.
- b. Excessive internal or external pressures.
- c. Excessively high or low temperatures.
- d. Thermal shock.
- e. Excessively high or low humidity.
- f. Air contamination or pollution.
- g. Water or ice.
- h. Solvents.
- i. Chemicals.
- j. Light.
- k. Radiation
- l. Puncture.
- m. Abrasion.
- n. Heavy traffic.
- o. Soiling.
- p. Bacteria.
- q. Insect infestation.
- r. Combustion.
- s. Electrical current.
- t. High speed operation, improper lubrication, unusual wear or other misuse.
- u. Incompatible interface.
- v. Destructive testing.
- w. Misalignment.
- x. Excessive weathering.
- y. Unprotected storage.
- z. Improper shipping or handling.
- aa. Theft
- bb. Vandalism

### **C. CONSERVATION AND SALVAGE:**

**1. General:** It is requirement for supervision and administration of the work that construction operations be carried out with the maximum possible consideration given to conservation of energy, water and materials. In addition, maximum considerations shall be given to salvaging materials and equipment involved in performance of the work but not incorporated therein. Refer to other sections for required disposition of salvage materials, which are the Owner's property.

END OF SECTION

## **SECTION 01100**

### **PROGRESS AND PAYMENT**

#### **PART 1 GENERAL**

##### **1.01 CONSTRUCTION PROCEDURE**

A. Engineer and Contractor shall follow established policies of the industry to give quality of construction in accordance with the contract requirements and best modern practice.

##### **1.02 CONSTRUCTION SCHEDULE**

A. Before work is started, the Contractor shall prepare a critical path method detailed schedule of all construction operations that shall indicate the sequence of the work and also the time of starting and completing each part. The schedule shall be submitted to the Engineer for his approval in accordance with Article 2 of the GENERAL CONDITIONS.

##### **1.03 DIMENSIONS AND ELEVATIONS**

A. Contractor shall verify in the field all dimensions and elevations which are required. Elevations indicated and referred to in the specification and on the Drawings are based on the benchmark datum shown on the drawings.

##### **1.04 SHOP DRAWINGS**

A. Shop drawings shall be submitted in accordance with requirements of the GENERAL CONDITIONS and SECTION 01330 - SUBMITTAL PROCEDURES.

##### **1.05 POSITION, GRADIENT, AND ALIGNMENT**

A. Competent survey personnel employed and paid by the Contractor will layout and stake out all control points required for construction of the work. The Contractor shall carefully preserve all monuments, benchmarks, and reference points shown on the Drawings and in case of destruction, Contractor shall be charged with replacement.

B. All work performed under this contract shall conform with the lines, grades, elevations, and any tolerances shown on the drawings and with any tolerances which may be set forth in the Detailed Specifications.

C. All work done without being properly located and established from the base line and bench marks shown on the drawings may be ordered removed and replaced at the Contractor's cost and expense.

##### **1.06 LOSSES FROM NATURAL CAUSES**

A. All loss or damage arising out of the nature of the work to be done, or from the action of the elements, or from floods or overflows, or from ground water, or from unusual obstructions or difficulties, or any other natural or existing circumstances either known or unforeseen, which may be encountered in the prosecution of the said work shall be sustained and borne by the Contractor at his own cost and expense.

## **1.07 UNFAVORABLE CONSTRUCTION CONDITIONS**

A. During unfavorable weather, or other unfavorable conditions for construction operations, the Contractor shall pursue only such portions of the work as will not be damaged thereby. No portions of the work, the satisfactory quality or efficiency of which will be affected by any unfavorable conditions, shall be constructed while these conditions exist, unless by special means or precautions approved by the Owner's Representative, the Contractor shall be able to perform the work in a proper and satisfactory manner.

## **1.08 PROTECTION AND MAINTENANCE OF PUBLIC AND PRIVATE PROPERTY**

A. Known underground structures, telephone conduit, gas, water and sewer pipes, etc., close enough to be affected by the work, are shown on the plans, although others may exist. The locations are believed to be reasonably correct, but do not purport to be absolutely so. Before starting work, the Contractor shall notify all utilities involved, and shall request them for cooperation in locating lines in advance of the work. The Contractor shall make reasonable effort to avoid breaking utility lines. The utility shall be notified immediately should a break occur in a line during construction under this contract. Any lines so broken by the Contractor shall be repaired according to the utility company's standards at the expense of the Contractor.

B. Wherever the work is along existing pavement, which is to be retained, traction equipment with lugs will not be permitted. The Contractor shall use utmost care not to damage or destroy any existing pavement. Any pavement damaged or destroyed due to the operations of the Contractor, which is not within the Contract limits shall be replaced in accordance with these specifications.

C. The Contractor shall be held responsible for all damage to roads, highways, shoulders, ditches, bridges, culverts, and other property, caused by him or his subcontractors in transporting materials to or from the site of work, regardless of the location of such damage, and shall pay for or replace such damaged property to the satisfaction of the Owner of such property.

D. The Contractor will exercise care to prevent damage to existing roadways, highways, ditches, shoulders, structures, and underground utilities adjacent to construction. Any damage resulting from Contractor's operations or operations of subcontractors shall be restored or replaced at the Contractor's expense.

## **1.09 STORAGE SPACE**

A. The Contractor shall provide his own storage sheds for material requiring protection and shall have someone available to receive all materials and equipment delivered to the site of the work by truck. The Contractor shall cooperate with the Owner to the fullest extent to maintain the storage yard in a neat and orderly manner. Particular care shall be taken to avoid damaging structures, curbs and sod.

## **1.10 MAINTENANCE OF TRAFFIC**

A. All trenching, excavation and other construction work shall be made in manner to cause the least interruption to traffic. Where permits are required of the Contractor to excavate or obstruct public property, he shall in all ways comply with the provisions or requirements of the proper authorities issuing such permits including, but not limited to, their requirements as to time, notice required, warning devices and temporary structures required.

## **1.11 CONNECTIONS TO EXISTING FACILITIES**

A. The Contractor shall make all necessary connections to existing gas lines. Thoroughly plan such connections in advance and perform as expeditiously as possible. The Drawings indication location of known existing gas lines as could best be determined. Such locations are not guaranteed and the Contractor shall verify measurements for all connections on the site.

## **1.12 SITE SAFETY**

A. Barricades and Lights: The Contractor shall erect and maintain such barricades, construction signs, torches, red lanterns and guards as may be required to protect persons from injury and to avoid property damage during the construction period and until it is safe for traffic to use the facilities. Rules and regulations of the local authorities respecting safety provisions shall be observed. All excavated material shall be piled in a manner that will not endanger the work and that will avoid obstructing sidewalks or driveways. Gutters shall be kept clear or other satisfactory provisions made for street drainage. All construction signs and traffic controls shall be in accordance with the "Manual on Uniform Traffic Control Devices" (DOT-FHWA).

B. The Contractor shall maintain and enforce all safety precautions required by the Occupational Safety and Health Act including rules 29 CFR Part 1926. Subpart P regarding excavations and trenches and 29 CFR 1910.146 regarding confined spaces.

C. Contractor shall observe at all times all Federal, State, County, and Municipal laws or ordinances that in any manner affect the Work herein specified. Contractor shall comply with all such laws with respect to inspection of equipment and licensing standards applicable to such work promulgated pursuant to the Federal "Occupational Safety and Health Act of 1970". Contractor shall require all subcontractors, representatives, and employees to observe and comply with said laws and ordinances, and Contractor expressly binds himself to indemnify and to hold harmless Owner and its officers, agents, employees, and Engineer against all claims, demands, suits or actions of every kind and nature presented or brought for any claim or liability arising from or based on the violation of such law or ordinance on the part of Contractor, or its subcontractors or the agents or employees of Contractor or its subcontractors.

## **1.13 CLEARING AND CLEANING UP**

A. The Contractor shall do all necessary clearing and demolition preparatory to excavation for the proposed construction. The Contractor shall not allow the site of the work to become littered with trash and waste material but shall maintain same in a neat and orderly condition during the process of the work to completion in accordance with Article 6 of the GENERAL CONDITIONS. The Contractor shall clean up all dirt from paved surfaces, not allow same to pack on the roadway or create a traffic nuisance.

## **1.14 MEASUREMENT AND PAYMENT**

A. Payment shall be to the Contractor for work completed in accordance with applicable sections of Article 14 of the "GENERAL CONDITIONS", and as amended or supplemented in the Section "01270 UNIT PRICES".

## **PART 2 PRODUCTS - NOT APPLICABLE**

## **PART 3 EXECUTION - NOT APPLICABLE**

END OF SECTION

## SECTION 01250

### SUBSTITUTION PROCEDURES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
  - 1. Section 01600 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

##### 1.2 DEFINITIONS

- A. of construction from those required by the Contract Documents and proposed by Contractor.

##### 1.3 ACTION SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  - 1. Substitution Request Form: Use CSI Form 13.1A.
  - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    - a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
    - b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors necessary to accommodate proposed substitution.
    - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
    - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
    - e. Samples, where applicable or requested.
    - f. Certificates and qualification data, where applicable or requested.
    - g. List of similar installations for completed projects with project names and addresses and names and addresses of engineers and owners.



- h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
  - i. Research reports evidencing compliance with building code in effect for Project, from IBC 2009.
  - j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
  - k. Cost information, including a proposal of change, if any, in the Contract Sum.
  - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
  - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Engineer's Action: If necessary, Engineer will request additional information or documentation for evaluation within five (5) days of receipt of a request for substitution. Engineer will notify Contractor of acceptance or rejection of proposed substitution within ten (10) days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Engineer's Supplemental Instructions for minor changes in the Work.
  - b. Use product specified if Engineer does not issue a decision on use of a proposed substitution within time allocated.

#### 1.4 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

### **PART 2 - PRODUCTS**

#### 2.1 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than ten (10) days prior to time required for preparation and review of related submittals.
  - 1. Conditions: Engineer will consider Contractor's request for substitution when the following conditions are satisfied:
    - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.

- b. Requested substitution will not adversely affect Contractor's construction schedule.
  - c. Requested substitution has received necessary approvals of authorities having jurisdiction.
  - d. Requested substitution is compatible with other portions of the Work.
  - e. Requested substitution has been coordinated with other portions of the Work.
  - f. Requested substitution provides specified warranty.
  - g. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Engineer will consider requests for substitution if received within thirty (30) days after the Notice to Proceed.
- 1. Conditions: Engineer will consider Contractor's request for substitution when the following conditions are satisfied:
    - a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Engineer for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
    - b. Requested substitution does not require extensive revisions to the Contract Documents.
    - c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    - d. Requested substitution will not adversely affect Contractor's construction schedule.
    - e. Requested substitution has received necessary approvals of authorities having jurisdiction.
    - f. Requested substitution is compatible with other portions of the Work.
    - g. Requested substitution has been coordinated with other portions of the Work.
    - h. Requested substitution provides specified warranty.
    - i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

**PART 3 - EXECUTION (Not Used)**

END OF SECTION

## Section 01270

### UNIT PRICES

#### PART 1 - GENERAL

##### 1.01 QUANTITIES AND UNIT PRICES:

A. The quantities as given in the Bid Form are not guaranteed to be the exact or total quantities required for the completion of the Work shown on the drawings and described in the specifications. Increases or decreases may be made over or under the Bid Form estimated quantities to provide for needs that are determined by the Owner during the process of the Work. Contract unit prices shall apply to such increased or decreased quantities. The Bidder is warned against unbalancing his bid, since the unit prices will apply to deductions as well as additions. The Owner has the privilege of omitting or adding to any unit items in the Bid Form.

B. The Vendor/Supplier agrees that he will make no claim for damages, anticipated profits, or otherwise, on account of any difference between the amounts of Work actually performed and materials actually furnished and the estimated amounts thereof. The Owner will not pay for or be responsible for unused materials, which may have been ordered by the Vendor/Supplier in accordance with the estimated quantities listed in the Bid Form.

C. It is the intent of the Contract Documents that all costs in connection with the Work, including furnishing of all materials, equipment, supplies and appurtenances; providing all construction plant, equipment, and tools; and performing of all necessary labor to fully complete the Work, shall be included in the unit and lump sum prices named in the Bid Form. No item of Work that is required by the Contract Documents for the proper and successful completion of the Contract will be paid for outside of or in addition to the prices submitted in the Bid Form. All Work not specifically set forth in the Bid Form as a pay item shall be considered a subsidiary obligation of the Contract, and all cost in connection therewith shall be included in the process named in the Bid Form.

D. Even though the details for measurement and payment of a particular item are outlined in the following articles, if said item does not appear in the Bid Form, or if said item is a part of another item listed in the Bid Form, it will not be measured for payment.

E. Whenever in the Bid Form there is a discrepancy between unit prices and extensions or totals, the unit prices will govern, and the extensions or totals will be corrected accordingly.

F. Items for payment will be measured in accordance with the stipulations of these specifications and as further shown on the drawings. Pay limits given are maximum, and where actual quantities of work items are less than as computed by said pay limits, the Vendor/Supplier will be paid only for the actual quantities.

G. Payment will be made as the sum of the following:

1. Final authorized quantity of each item in the Bid Form multiplied by the contract unit price therefore.

END OF SECTION

## SECTION 01330

### SUBMITTAL PROCEDURES

#### PART 1 - GENERAL

##### 1.01 SUMMARY

A. General: This section specified procedural requirements for non-administrative submittals including shop drawings, product data, samples, and other miscellaneous work-related submittals. Shop drawings, product data, samples, and other work-related submittals are required to amplify, expand, and coordinate the information contained in the Contract Documents.

B. Shop drawings are technical drawings and data that have been specially prepared for this project, including but not limited to the following items:

1. Fabrication and installation drawings, showing foundation details, anchor bolt sizes and locations, base plate sizes, location of Owner's connections, and all clearances required for erection, operation, and disassembly for maintenance.

2. Setting diagrams.

3. Shop work manufacturing instructions.

4. Templates.

5. Patterns.

6. Coordination Drawings (for use on-site).

7. Design mixer formulas.

8. Contractor's engineering calculations.

9. Electrical routing drawings, internal wiring diagrams, one-line diagrams, etc.

Standard information prepared without specific reference to a project is not considered to be shop drawings.

C. Miscellaneous submittals are work-related, non-administrative submittals that do not fit in the three previous categories including but not limited to the following:

1. Specially prepared and standard printed warranties.

2. Maintenance agreements.

3. Workmanship bonds.

4. Survey data and reports.

5. Project photographs.
6. Testing and certification reports.
7. Record drawings.
8. Field measurement data.
9. Operating and maintenance manuals.
10. Keys and other security protection devices.
11. Maintenance tools and spare parts.
12. Overrun stock.

## **1.02 SUBMITTAL PROCEDURES**

A. Contractor shall prepare for Engineer's concurrence a schedule for submission of all shop drawings specified or necessary for Engineer's approval of the use of equipment and materials proposed for incorporation in the Work or needed for proper installation, operation, or maintenance. The schedule shall accompany the procurement schedule and Work progress schedule submitted to the Engineer. Submission of all submittals shall be scheduled to permit review, fabrication, and delivery in time to cause no delay in the Work of Contractor or his Subcontractors or any other contractors as described herein.

1. Contractor, in establishing his schedule for Compliance Submittals, shall consult requirements of the General Conditions.

2. The schedule shall indicate the anticipated dates of original submission for each item and Engineer's acceptance thereof and shall be based upon at least one resubmission of each item.

3. All submittals of equipment and materials furnished by Subcontractors, manufacturers, and suppliers shall be submitted to Engineer by Contractor.

4. All Compliance Submittals required prior to fabrication or manufacture shall be scheduled for submission sufficiently in advance of the installation dates for the corresponding items of materials or equipment. Compliance Submittals pertaining to storage, installation, and operation at the site shall be scheduled for Engineer's acceptance prior to delivery of the equipment or materials.

5. Compliance Submittals shall be resubmitted the number of times required for Engineer's "Approved." However, any need for resubmittals in excess of the number set forth in the accepted schedule, or any other delay in obtaining acceptance of submittals, will not be grounds for extension of the Contract Time provided Engineer completes his review within the times as noted in the General Conditions.

B. After checking and verifying all field measurements, Contractor shall transmit all Compliance Submittals to Engineer for Acceptance. Contractor shall:

1. Identify each submittal by Project name and number, Contract title and number, and the specification division and article number marked thereon or in the letter of transmittal. Unidentifiable submittals will be returned for proper identification.

2. Check and stamp submittals of Subcontractors, suppliers, and manufacturers with his approval prior to transmitting them to Engineer. Contractor's stamp of approval shall constitute a representation of Owner and Engineer that Contractor has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers and similar data, or he assumes full responsibility for doing so, and that he has coordinated each Compliance Submittal with the requirements of the Work and the Contract Documents.

3. At the time of each submission, call to the attention of Engineer in the letter of transmittal any deviations from the requirements of the Contract Documents.

4. All drawings, catalogs or parts thereof, manufacturer's specifications and data, samples, instructions, written guarantees and other information specified are necessary.

- a. For Engineer to determine that the equipment and materials conform with the design concept and comply with the intent of the Contract Documents.
- b. For the proper erection, installation, operation, and maintenance of the equipment and materials which Engineer will review for general content but not for substance.
- c. For Engineer to determine what supports, anchorages, structural details, connections, and services are required for the equipment and materials, and the effects on contiguous or related structures, equipment, and materials.

C. Data submitted shall be complete with respect to dimensions, design criteria, materials of construction, and the like, to enable Engineer to review the information effectively. Where standard drawings are furnished which cover a number of variations of the general class of equipment, each such drawing shall be individually annotated to describe exactly which parts of the drawing apply to the equipment being furnished. Such annotation shall also include proper identification of the submittal permanently attached to the drawing. Reproduction of copies of Contract Drawings or portions thereof will not be accepted as complete fabrication or erection drawings, but will be acceptable when used by Contractor as a drawing upon which to indicate information on erection or to identify detail drawings.

D. Equipment operation and maintenance manuals shall be prepared by the manufacturer with loose-leaf pages mounted in durable covers and shall include the following:

1. Index and tabs.
2. Instructions for installation, start-up, operation, inspection, maintenance, parts lists and recommended spare parts, and data sheets showing model numbers.
3. Applicable drawings.
4. Address of nearest manufacturer-authorized service facility.
5. All additional data specified.

E. Engineer will review and return submittals to Contractor with appropriate notations. Instruction books and similar submittals will be reviewed by Engineer for general content but not for substance. The approval for use of a separate item as such will not indicate approval for use of the assembly in which the

item functions. Contractor shall make all modifications noted or indicated by Engineer and shall return revised prints, copies or samples until accepted. Contractor shall direct specific attention in writing, or on revised submittals, to changes other than the modifications called for by Engineer on previous submittals. After submittals have been accepted, Contractor shall submit copies thereof for final distribution. Prints of accepted drawings transmitted for final distribution will not be further reviewed and are not to be revised. If errors are discovered during manufacture or fabrication, the submittal shall be corrected and resubmitted for review.

F. Following completion of the Work and prior to final payment, Contractor shall furnish those drawings necessary to indicate “as constructed” conditions, including field modifications, in the number of copies specified and furnish additional copies for insertion in equipment instruction books as required. All such copies shall be clearly marked “AS CONSTRUCTED.”

G. No Work requiring a Compliance Submittal shall be commenced or shipped until the submittal has been stamped “Approved” or “Approved as Noted” by Engineer. A copy or sample of each Compliance Submittal shall be kept in good order by Contractor at the site.

H. Engineer’s acceptance of Compliance Submittals will not relieve Contractor from his responsibility for any deviations from the requirements of the Contract Documents unless Contractor has in writing called Engineer’s attention to such deviation at the time of submission and Engineer has given written approval to the specific deviation, nor shall any acceptance by Engineer relieve Contractor from responsibility for errors or omission in Compliance Submittals.

I. Miscellaneous Submittals:

1. Inspection and Test Reports: Classify each inspection and test report as being either “shop drawings” or “product data” depending on whether the report is specially prepared for the project, or a standard publication of workmanship control testing at the point of production. Process inspection and test reports accordingly.

2. Project Photographs: Prior to any clearing or excavation on the project site, the Contractor shall make a photographic record of the site and adjacent property. Either a color videotape or a sufficient number of color photographs to continuously document the site conditions in detail will be acceptable. Submit one copy of the photographic record to the Engineer prior to construction.

3. Survey Data: Refer to section “Administrative Requirements” for specific general requirements on property surveys, field measurements, quantitative records of actual work, damage surveys and similar data required by the individual sections of these specifications. None of the specified copies will be returned.

4. Standards: Where submittal of a copy of standards is indicated and except the copies of standards are specified as an integral part of a “Product Data” submittal, submit a single copy of standards for the Engineer’s use. Where workmanship, whether at the project site or elsewhere, is governed by a standard, furnish additional copies of the standard to fabricators, installers, and others involved in the performance of the work.

5. Closeout Submittals: Refer to section “Closeout Procedures” and to individual sections of these specifications for specific submittal requirements of project closeout information, materials, tools, and similar items.

- a. Record Documents: Furnish set of original documents as maintained on the project site. Along with original marked-up record drawings, provide 2 photographic copies of marked-up drawings, which, at the Contractor's option, may be reduced to not less than half size.
- b. Operating and Maintenance Data: Furnish 3 bound copies of operating data and maintenance manuals.
- c. Materials and Tools: Refer to individual sections of these specifications for required quantities of spare parts, extra and overrun stock, maintenance tools and devices, keys, and similar physical unit to be submitted.

6. General Distribution: Provide additional distribution of submittals to subcontractor, suppliers, fabricators, installers, governing authorities, and others as necessary for the proper performance of the work. Include such additional copies of submittals in the transmittal to the Engineer where the submittals are required to receive "Action" marking before final distribution. Record distribution on transmittal forms.

### **1.03 ENGINEER'S ACTION**

- A. Except as otherwise specified, all manufacturer's or fabricator's drawings and specifications shall be transmitted as follows:
  1. Initial submittal - 4 copies to Engineer, 2 copies returned to Contractor.
  2. Re-submittals - 4 copies to Engineer, 2 copies returned to Contractor.
  3. Submittal for final distribution - 3 copies to Engineer, plus the number of copies required by Contractor.
  4. As-constructed prints - 2 copies to Engineer.
- B. Submittals of material samples, color charts, and similar items shall be as follows:
  1. Initial submittal - 4 to Engineer.
  2. Re-submittal - 4 to Engineer.Upon approval, 2 sample(s) will be returned to Contractor.
- C. Submittals of catalog cuts shall be as follows:
  1. Initial submittal - 4 copies to Engineer, 2 copies returned to Contractor.
  2. Re-submittals - 4 copies to Engineer, 2 copies returned to Contractor.
  3. Submittal for final distribution - 3 copies to Engineer, plus the number of copies required by Contractor.



- D. Submittals of equipment instruction books shall be as follows:
1. Initial submittal - 3 copies to Engineer, 1 copy returned to Contractor.
  2. Re-submittals - 3 copies to Engineer, 1 copy returned to Contractor.
  3. Submittal for final distribution - 3 copies to Engineer.
- E. Written guarantees shall be submitted in 4 copies, 2 copies returned to Contractor. Same number for re-submittals.
- F. Compliance Submittals for reference only will be submitted in 3 copies.
- G. Copies of equipment contractor's erection drawings and other Compliance Submittals required for the installation of equipment furnished by others under separate contract for installation under this Contract will be transmitted to Contractor by Engineer in the final distribution of such submittals.

Review status designations listed on Engineer's action stamp are defined as follows:

**APPROVED** - Signified equipment or material represented by the submittal conforms with the design concept and complies with the intent of the Contract Documents and is approved for incorporation in the Work. Contractor is to proceed with fabrication or procurement of the items and with related work. Copies of the submittal are to be transmitted to Engineer for final distribution.

**APPROVED AS NOTED** - Signified equipment or material represented by the submittal conforms with the design concept and complies with the intent of the Contract Documents and is approved for incorporation in the work in accordance with Engineer's notations. Contractor is to proceed with fabrication or procurement of the items and with related work in accordance with Engineer's notations and is to submit a revised submittal responsive to notations marked on the returned submittal or written in the letter of transmittal.

**REVISE AND RESUBMIT** - Signifies equipment or material represented by the submittal appears to conform with the design concept and comply with the intent of the Contract Documents but information is either insufficient in detail or contains discrepancies which prevent Engineer from completing his review. Contractor is to resubmit revised information responsive to Engineer's annotations on the returned submittal or written in the letter of transmittal. Fabrication or procurement of items represented by the submittal and related Work is not to proceed until the submittal is acceptable.

**NOT APPROVED (SUBMIT ANEW)** - Signified equipment or material represented by the submittal does not conform with the design concept or comply with the intent of the Contract Documents and is disapproved for use in the Work. Contractor is to submit compliance submittals responsive to the Contract Documents.

**FOR REFERENCE, NO ACCEPTANCE REQUIRED** - Signifies submittals, which are for supplementary information only: pamphlets, general information sheets, catalog

cuts, standard sheets, bulletins and similar data, all of which are useful to Engineer or Owner in design, operation, or maintenance, but which by their nature do not constitute a basis for determining that items represented thereby conform with the design concept or comply with the intent of the Contract Document. Engineer reviews such submittals for general content but not for substance.

**PART 2 - PRODUCTS - (NOT APPLICABLE)**

**PART 3 - EXECUTION (NOT APPLICABLE)**

END OF SECTION

## SECTION 01400

### TESTING LABORATORY SERVICES

#### PART 1 GENERAL

1.1 DESCRIPTION: The work included is as follows: Cooperation with the Owner's selected testing agency and all others responsible for testing and inspecting the Work. Provide such other testing and inspecting as are specified to be furnished by the Contractor in this section and/or elsewhere in the Contract Documents.

1.1.1 RELATED WORK: Documents affecting work of this Section include but are not necessarily limited to, General Conditions, Supplemental Conditions, and Sections in Division 1 of these Specifications.

1.1.2 WORK NOT INCLUDED: The Work not included is as follows: Selection of testing laboratory: The Owner will select a pre-qualified independent testing laboratory. Payment for initial testing: The Owner will pay for all initial services of the testing laboratory as further described in Section 2.1 of this Specification.

1.2 QUALITY ASSURANCE: The testing laboratory will be qualified to the Owner's approval. Testing, when required, will be in accordance with all pertinent codes and regulations, and with selected standards of the American Society for Testing and Materials (ASTM).

1.3 PRODUCT HANDLING: Promptly process and distribute required copies of test reports and related instructions to assure necessary retesting and replacement of material with the least possible delay in progress of the Work.

#### PART 2 PRODUCTS

2.1 PAYMENT FOR TESTING: The Owner will pay for initial testing services requested by the Owner. When initial tests indicate non-compliance with the Contract Documents, the costs of initial tests associated with that non-compliance will be deducted by the Owner from the Contract Sum.

2.2 CODE COMPLIANCE TESTING: Inspections and tests required by codes or ordinances, or by a plan approval authority, and which are made by a legally constituted authority, shall be the responsibility of and shall be paid for by the Contractor.

2.3 CONTRACTOR'S CONVENIENCE TESTING: Inspections and testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.

#### PART 3 EXECUTION

3.1 COOPERATION WITH TESTING LABORATORY: Representatives of the testing laboratory shall have access to the Work at all times and at all locations where the Work is in progress. Provide facilities for such access to enable the laboratory to perform its functions properly.

3.2 TAKING SPECIMENS: All specimens and samples for testing, unless otherwise provided in the Contract Documents, shall be taken by the testing personnel. All sampling equipment and personnel will be provided by the testing laboratory. All deliveries of specimens and samples to the testing laboratory will be performed by the testing laboratory.

### 3.3 SCHEDULES FOR TESTING:

3.3.1 ESTABLISHING SCHEDULES: By advance discussion with the testing laboratory selected by the Owner, determine the time required for the laboratory to perform its tests and issue each of its findings. Provide all required time within the construction schedule.

3.3.2 REVISING SCHEDULES: When changes of the construction schedule are necessary during construction, coordinate all such changes with the testing laboratory as required.

3.3.3 ADHERENCE TO SCHEDULE: When the testing laboratory is ready to test according to the established schedule, but is prevented from testing or taking specimens due to the incompleteness of the Work, all extra charges for testing attributable to the delay may be back charged to the Contractor and shall not be borne by the Owner.

## PART 4 MEASUREMENT AND PAYMENT

4.1 MEASUREMENT AND PAYMENT: The requirements of this section of specifications are considered incidental to the project and will not be measured or paid for separately.

## SECTION 01500

### TEMPORARY FACILITIES AND CONTROLS

#### PART 1 - GENERAL

**1.1 GENERAL:** The Work included in this section shall consist of the following: Provide temporary facilities and controls needed for the Work including, but not necessarily limited to:

Temporary utilities such as water, electricity, telephone, sanitary facilities, and barricades.

**1.2 RELATED WORK:** Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications. Except that equipment furnished by subcontractors shall comply with requirements of pertinent safety regulations, such equipment normally furnished by the individual trades in execution of their own portions of the Work are not part of this Section.

**1.3 PRODUCT HANDLING:** Maintain temporary facilities and controls in proper and safe condition throughout progress of the Work.

#### PART 2 - PRODUCTS

##### 2.1 UTILITIES:

**2.1.1 Water:** Provide necessary temporary piping and water supply and, upon completion of the Work, remove such temporary facilities. Provide and pay for water used in construction.

**2.1.2 Electricity:** Provide necessary temporary wiring and, upon completion of the Work remove such temporary facility. Provide area distribution boxes so located that the individual trades may furnish and use 100 feet maximum length extension cords to obtain power and lighting at points where needed for work, inspection, and safety. Provide and pay for electricity used in construction.

##### 2.2 FIELD OFFICES AND SHEDS

**2.2.1 Contractor's facilities:** Provide a field office building and sheds adequate in size and accommodation for Contractor's offices, supply, and storage. Within the contractor's facilities, provide enclosed space adequate for holding project meetings. Furnish with table, chairs, and utilities.

**2.2.2 Sanitary facilities:** Provide temporary sanitary facilities in the quantity required for use by all personnel. Maintain in a sanitary condition at all times.

**2.3 ENCLOSURES:** Provide and maintain for the duration of construction all scaffolds,

shoring, warning signs, steps, platforms, bridges, and other temporary construction necessary for proper completion of the Work in compliance with pertinent safety and other regulations.

### **PART 3 - EXECUTION**

#### **3.1 MAINTENANCE AND REMOVAL**

**3.1.1** Maintain temporary facilities and controls as long as needed for safe and proper completion of the Work.

**3.1.2** Remove such temporary facilities and controls as rapidly as progress of the Work will permit, or as directed by the Engineer.

### **PART 4 - MEASUREMENT AND PAYMENT**

**4.1 MEASUREMENT AND PAYMENT:** The requirements of this section of specifications are considered incidental to the project and will not be measured or paid for separately.

END OF SECTION

**SECTION 01570  
TRAFFIC CONTROL**

**PART 1 GENERAL**

**1.0 SUMMARY**

- A. Work included in this section shall provide all necessary signs, flagmen, and other traffic control devices to protect the work from damage by the traffic. During Construction operations access for local traffic must be maintained. Related items affecting work of this Section include Sections in Division 1 of these Specifications.

**PART 2 PRODUCTS**

**2.01 TRAFFIC CONTROL DEVICES**

- A. All traffic control devices shall meet the requirements of the Manual on Uniform Traffic Control Devices (MUTCD) - 2009 edition with Revisions 1 & 2, dated May 2012.

**PART 3 EXECUTION**

**3.01 EQUIPMENT**

- A. The CONTRACTOR shall furnish, install, maintain, clean, and relocate all sign, drums, cones, barricades, object markers, flashing arrow panels, channelizing devices, lights, and all other traffic control devices he deems necessary to safely maintain traffic over the project. The CONTRACTOR is responsible to provide and maintain all traffic control devices he considers necessary to adequately protect the public and the work.

**3.02 RIGHT-OF-WAY**

- A. The CONTRACTOR shall not be allowed to park equipment or vehicles, or store materials on pavements or shoulders being utilized by traffic. Nothing in this section of specifications shall relieve the CONTRACTOR of his responsibility to protect both the public and the Work.

**3.03 PRODUCT HANDLING**

- A. All traffic control devices shall be kept legible, in alignment and in good repair. All traffic control devices shall be covered, set aside, turned, removed, or relocated as the work progresses. All traffic control devices shall be removed after completion of construction and shall remain the property of the CONTRACTOR.

**PART 4 MEASUREMENT AND PAYMENT**

**4.01 MEASUREMENT AND PAYMENT**

- A. The requirements of this section of the specifications are considered incidental to the project and will not be measured or paid for separately.

END OF SECTION

## SECTION 01600

### PRODUCT REQUIREMENTS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
  - 1. Section 01250 "Substitution Procedures" for requests for substitutions.

##### 1.2 DEFINITIONS

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

##### 1.3 ACTION SUBMITTALS

- A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.



1. Engineer's Action: If necessary, Engineer will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Engineer will notify Contractor of approval or rejection of proposed comparable product request within ten (10) days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later.
  - a. Form of Approval: As specified in Section 01330 "Submittal Procedures."
  - b. Use product specified if Engineer does not issue a decision on use of a comparable product request within time allocated.
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01330 "Submittal Procedures." Show compliance with requirements.

#### 1.4 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

#### 1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
  1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
  2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
  3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
  4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.
- C. Storage:
  1. Store products to allow for inspection and measurement of quantity or counting of units.
  2. Store materials in a manner that will not endanger Project structure.
  3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
  4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
  5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
  6. Protect stored products from damage and liquids from freezing.

## 1.6 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
  - 1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
  - 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
  - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
  - 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
  - 3. Refer to other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 01770 "Closeout Procedures."

## **PART 2 - PRODUCTS**

### 2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
  - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
  - 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
  - 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
  - 4. Where products are accompanied by the term "as selected," Engineer will make selection.
  - 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
- B. Product Selection Procedures:
  - 1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

2. **Manufacturer/Source:** Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
  3. **Products:**
    - a. **Restricted List:** Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
    - b. **Nonrestricted List:** Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
  4. **Manufacturers:**
    - a. **Restricted List:** Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
    - b. **Nonrestricted List:** Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
  5. **Basis-of-Design Product:** Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
- C. **Visual Matching Specification:** Where Specifications require "match Owner's sample", provide a product that complies with requirements and matches Owner's sample. Owner's decision will be final on whether a proposed product matches.
1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 01250 "Substitution Procedures" for proposal of product.
- D. **Visual Selection Specification:** Where Specifications include the phrase "as selected by Owner from manufacturer's full range" or similar phrase, select a product that complies with requirements. Owner will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

## 2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: Engineer will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Engineer may return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents, and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of Engineers and owners, if requested.
5. Samples, if requested.

### **PART 3 - EXECUTION (Not Used)**

END OF SECTION

## SECTION 01770

### CLOSEOUT PROCEDURES

#### PART 1 - GENERAL

##### 1.01 SUMMARY

**A. Definitions:** Project closeout is the term to describe certain collective project requirements indicating completion of the Work that are to be fulfilled near the end of the Contract Time in preparation for final acceptance and occupancy of the Work by the Owner, as well as final payment settled to the Contractor.

1. Specific requirements for individual units of work are included in the appropriate sections in Division 2 through 16.
2. Time of closeout is directly related to “Substantial Completion”; therefore, the time of closeout may be either a single time period for the entire Work or a series of time periods for individual elements of the Work that have been certified as substantially complete at different dates. This time variation, if any, shall be applicable to the other provisions of this section.

##### 1.02 PREREQUISITES TO SUBSTANTIAL COMPLETION

**A. General:** Follow the requirements for Substantial Completion in accordance with the General Conditions. Complete the following before requesting the Engineer’s inspection for certification of substantial completion, either for the entire Work or for portions of the Work. List known exceptions in the request.

1. In the progress payment request that coincides with, or is the first request following, the date substantial completion is claimed, show either 100% completion for the portion of the Work claimed as “substantially complete,” or list incomplete items, the value of incomplete work, and reasons for the Work being incomplete. Include supporting documentation for completion as indicated in these contract documents.
2. Submit a statement showing an accounting of changes to the Contract Price.
3. Advise Owner of pending insurance changeover requirements.
4. Submit specific warranties, workmanship/maintenance bonds, maintenance agreements, final certifications, and similar documents.
5. Obtain and submit releases enabling the Owner’s full, unrestricted use of the Work and access to services and utilities. Where required, include occupancy permits, operating certificates, and similar releases.
6. Submit record drawings, maintenance manuals, final project photographs, and similar final record information.
7. Deliver tools, spare parts, extra stock of material, and similar physical items to the Owner.

8. Make the final changeover of locks and transmit the keys to the Owner. Advise the Owner's personnel of the changeover in security provisions.
9. Complete start-up testing of systems and instructions of the Owner's operating and maintenance personnel. Discontinue or change over and remove temporary facilities and services from the project site, along with construction tools and facilities, and similar elements.
10. Complete final cleaning up requirements, including touch-up painting of marred surfaces.

**B. Inspection Procedures:** Upon receipt of the Contractor's request for inspection, the Engineer will within 30 days either proceed with inspection or will advise the Contractor of unfulfilled prerequisites.

1. Following the initial inspection, the Engineer will either prepare the certificate of substantial completion, or will advise the Contractor of work which must be performed before the certificate will be issued. The Engineer will repeat the inspection when requested and when assured that the Work has been substantially completed.
2. Results of the completed inspection will form the initial "punch-list" for final acceptance.

### **1.03 PREREQUISITES TO FINAL ACCEPTANCE**

**A. General:** Complete the following before requesting the Engineer's final inspection for certification of final acceptance, and final payment as required by General Conditions. List known exceptions, if any, in the request.

1. Submit the final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
2. Submit an updated final statement, accounting for final additional changes to the Contract Price.
3. Submit certified copy of the Engineer's final punch-list of itemized work to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance and has been endorsed and dated by the Engineer.
4. Submit final meter readings for utilities, a measured record of stored fuel, and similar data either as of the date of substantial completion, or else when the Owner took possession and responsibility for corresponding elements of the Work.
5. Submit consent of surety.
6. Submit a final liquidated damages settlement statement, acceptable to the Owner.
7. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

**B. Re-inspection Procedure:** The Engineer will re-inspect the Work upon receipts of the Contractor's notice that the work, including punch-list items resulting from earlier inspections, has been completed, except for those items whose completion has been delayed because of circumstances that are

acceptable to the Engineer.

1. Upon completion of re-inspection, the Engineer will either prepare a certificate of final acceptance, or will advise the Contractor of work that is incomplete, or of obligations that have not been fulfilled, but are required for final acceptance.
2. If necessary the re-inspection procedure will be repeated.

#### **1.04 RECORD DOCUMENT SUBMITTALS**

**A. General:** Specific requirements for record documents are indicated in the individual sections of these specifications. Other requirements are indicated in the General Conditions. General submittal requirements are indicated in the various “submittals” sections.

**B. Record Drawings:** Maintain a record set of blue or black line white- prints of Contract Drawings and shop drawings in a clean, undamaged condition. Mark up the set of record documents to show the actual installation where the installed work varies substantially from the work as originally shown. Mark whichever drawing is most capable of showing the actual “field” condition fully and accurately; however, where shop drawings are used for mark-up, record a cross-reference at the corresponding location on the working drawings. Give particular attention to concealed work that would be difficult to measure and record at a later date.

1. Mark record sets with red erasable pencil and, where feasible, use other colors to distinguish between variations in separate categories of work.
2. Mark up new information, which is known to be important to the Owner, but for some reason was not shown on either Contract Drawings or shop drawings.
3. Note related change order numbers where applicable.
4. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.

**C. Record Specifications:** Maintain one complete copy of the Contract Documents, including specifications and addenda, and one copy of other written construction documents such as change orders and similar modifications issued in printed form during construction. Mark these documents to show substantial variations in the actual work performed in comparison with the text of the specifications and modifications as issued. Give particular attention to substitutions, selection of options and similar information on work where it is concealed or cannot otherwise be readily discerned at a later date by direct observation. Note related record drawing information and product data, where applicable.

Upon completion of the Work, submit record specifications to the Engineer for the Owner’s records.

**D. Record Product Data:** Maintain one copy of each product data submittal. Mark these documents to show significant variations in the actual Work performed in comparison with the submitted information. Include both variations in the products as delivered to the site and variations from the manufacturer’s instructions and recommendations for installation. Give particular attention to concealed products and portions of the Work, which cannot otherwise be readily discerned at a later date by direct observation. Note related change orders and mark-up of record drawings and specifications.

Upon completion of mark-up, submit complete set of record product data to the Engineer for the Owner's records.

**E. Record Sample Submitted:** Immediately prior to the date or dates of substantial completion, the Contractor will meet at the site with the Engineer and the Owner's personnel, if desired, to determine which, if any, of the submitted samples that have been maintained by the Contractor during progress of the Work, are to be transmitted to the Owner for record purposes. Comply with delivery to the Owner's sample storage area.

**F. Miscellaneous Record Submittals:** Refer to other sections of these specifications for requirements of miscellaneous record keeping and submittals in connection with the actual performance of the Work. Immediately prior to the date or dates of substantial completion, complete miscellaneous records and place in good order, properly identified and bound or filled, ready for continued use and reference. Submit to the Engineer for the Owner's records.

**G. Operation and Maintenance Manuals:** Organize operating and maintenance data into suitable sets of manageable size. Bind data into individual binders, properly identified and indexed. Bind each set of data in a heavy-duty 2", 3-ring vinyl- covered binder, with pocket folders for folded sheet information. Mark the appropriate identification on both front and spine of each binder.

1. Include the following types of information in operation and maintenance manuals:

- Emergency instructions.
- Spare parts listing.
- Copies of warranties.
- Wiring diagrams.
- Recommended "turn-around" cycles.
- Inspection procedures.
- Shop drawings and product data (see Section 01330).

## **PART 2 - PRODUCTS - (NOT APPLICABLE)**

## **PART 3 - EXECUTION**

### **3.01 FINAL CLEANING**

**A. General:** Special cleaning requirements for specific units of Work are included in the appropriate sections of Divisions 2 through 16. General cleaning during the course of the Work is required by the General Conditions and is included under section "Temporary Facilities and Controls.

**B. Cleaning:** Provide final cleaning of the Work at the time indicated. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of work to the condition expected from a normal, commercial building cleaning and maintenance program. Comply with the manufacturer's instructions for operations.

**C. Cleaning Operations:** Complete the following cleaning operations before requesting the Engineer's inspections for certification of substantial completion.

1. Remove labels which are not required as permanent labels.



2. Clean transparent materials, including mirrors and glass in doors and windows, to a polished condition. Remove putty and other substances, which are noticeable as vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
3. Clean exposed exterior and interim hard-surfaced finished to a dust-free condition, free of dust, stains, film and similar noticeable distracting substances. Restore reflective surfaces to their original reflective condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.
4. Wipe surfaces of mechanical and electrical equipment clean. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
5. Clean the project site, including landscape development areas, of rubbish, litter and other foreign substances. Sweep paved areas to a broom-clean condition; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted to a smooth even-textured surface.

**D. Removal of Protection:** Except as otherwise indicated or requested by the Engineer, remove temporary protection devices and facilities, which were installed during the course of the work to protect previously, completed work during the remainder of the construction period.

**E. Compliance:** Comply with safety standards and governing regulations for cleaning operations. Do not burn waste materials at the site. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile or other harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.

1. While extra materials of value remaining after completion of associated work have become the Owner's property, dispose of these material to the Owner's best advantage as directed.

END OF SECTION

## SECTION 02220

### EXCAVATION AND BACKFILL FOR STRUCTURES

#### PART 1 GENERAL

1.1 DESCRIPTION: The work shall consist of furnishing all labor, materials, equipment, and tools necessary for excavating the foundations of all structures, the removing and disposing of all excavated materials, the backfilling around the completed structures, and all related work as shown on the plans or as necessary to complete the project.

#### PART 2 PRODUCTS

2.1 EMBANKMENT: Material used for embankment shall be material excavated at the project site and free of trees, stumps, rubbish and other deleterious material.

2.2 TOPSOIL: Topsoil stripped, stored, and placed shall be fertile, friable, with liberal content of humus, and capable of sustaining vigorous plant growth. If the stripped topsoil is not adequate to complete the work, sufficient topsoil shall be furnished and shall be a natural, fertile, friable soil, possessing characteristics representative of productive soils in the vicinity. It shall be obtained from naturally well-drained areas. It shall not be excessively acid or alkaline (except for those plants requiring acid soil) nor contain toxic admixture of subsoil and shall be cleaned and reasonably free from clay lumps, stumps, roots, or similar substances, debris, or other objects which might be hindrance to placing operations.

#### PART 3 EXECUTION

3.1 FOUNDATION PREPARATION: Methods used in excavating for foundations of structures shall insure maintaining the stability of the material adjacent to the excavation. Care shall be taken to avoid disturbing the material below the bottom of the footings where the structure is founded on material other than rock, and final removal to grade shall not be made until just prior to placing concrete. Foundations for structures and retaining wall shall be free of loose, shaly, or disintegrated rock, and the footing shall be placed on undisturbed material. Concrete footings for structures shall be placed on reasonably dry foundation material. Footings shall be keyed not less than 6 inches into hard, solid rock and not less than 18 inches into soft rock or shale or the suitable material specified for spread footings. Excavation in rock or shale for the key shall be made as near as practicable to the size of the footing, or of the key as shown on the plans. When placing the footing, the key portion shall be cast against the vertical, undisturbed face of the rock or shale. If side forms are necessary for footings, they shall be removed approximately 24 hours after placing the concrete, and the excavation immediately backfilled to the top of the footing. All cavities or crevices shall be cleaned out and filled with concrete. All holes, pits, or sumps resulting from excavating operations shall be kept drained or pumped out until the completion of the work. No ponding of water around footings on other than rock will be permitted.

3.2 ROCK ENCOUNTERED IN EXCAVATION: If rock is encountered under a portion of the bottom slab of a concrete box-type structure, the rock shall be removed to at least 6 inches below the bottom of the slab and curtain walls, and backfilled with material similar to that under the remainder of the structure.

3.3 SHEETING, SHORING OR BRACING: Sheeting, shoring or bracing shall be placed by the

Contractor wherever necessary for the proper preserving of any excavation, embankment or structure. Where the ground is of such a character or other conditions are such as to render it necessary, the sheeting shall be closely driven and to such depth below the lowest point of the final excavation as may be required. The Contractor shall be held responsible for the sufficiency of all sheeting and bracing used and for property damaged as the result of improper quality, strength, placing, maintaining or removing the same. No extra compensation will be made for sheeting and bracing whether left in place or removed. The Contractor shall, at his own expense, shore up, protect and insure from injury all building, retaining walls, piers and footings, storm sewers, sanitary sewers, gas lines, water lines, fences, curbs, streets or other property liable to be injured during the process of the work, and he will be held responsible for all damage which may occur by reason of prosecution of the Work. Sheeting, shoring and bracing shall be provided, installed, and maintained to protect the excavation and insure open trench operations.

3.4 COFFERDAMS: Cofferdams shall, in general, be carried will below the bottom of the footings, and shall be well braced and as watertight as practicable. The interior dimensions of cofferdams shall provide sufficient clearance for the construction of forms and ample room for a sump and for pumping outside the footing forms. Cofferdams which have been tilted or moved laterally during the process of sinking shall be corrected to provide the necessary clearance. They shall be constructed to protect the work against damage from sudden rising of the stream and to prevent damage to the foundation by erosion. Cofferdams, with all sheeting and bracing, shall be removed after the completion of the substructure unit, unless specific authority is given for then to be left in place. The Contractor, upon request, shall submit drawings showing his proposed method of cofferdam construction and other details open to his choice or not fully shown on the plans. Pumping from the interior of any foundation enclosure shall be done in a manner to preclude the possibility of the movement of water, or other fluids or semi-fluids, through any fresh concrete. If necessary, the footing form shall be made watertight and shall be sealed around the bottom, and all pumping done between the footing form and the wall of the enclosure.

3.5 SEAL COURSES: Seal courses will be required if indicated on the plans or if conditions are encountered which, in the judgment of the Engineer, render it impracticable to dewater the foundation area. Pumping will not be permitted while excavating, driving piling, or placing the seal course, and not until, by determination of the Engineer, the seal course has attained sufficient strength to withstand the hydrostatic pressure. If seal courses are shown on the plans, and it develops that the footings may be satisfactorily placed without sealing, the Contractor will be required to dewater any completed excavation for investigation purposes. Seal courses, other than those on the plans, will not be authorized or permitted except for extreme cases where it is impracticable to dewater the footing area by other means, and then only with the written permission of the Engineer.

3.6 BACKFILL: Backfill material shall be of an acceptable quality and shall be free from large or frozen lumps, wood, or other extraneous material. All spaces excavated and not occupied by the new structure or by porous backfill shall be refilled with earth to the original ground surface or to the finished ground lines shown on the plans. All backfill shall be thoroughly compacted and its top surface neatly graded. The backfill at end bents, walls, or other units which falls within the limits of a roadbed shall be placed in successive 6-inch layers and compacted to the same density required for the adjacent roadbed. Special precaution shall be taken to prevent any wedging action against the masonry. The slope bounding the excavation, if steeper than six horizontal to one vertical, shall be stepped or serrated. Backfill placed around culverts and piers shall be kept at approximately the same elevation on opposing sides. Drains consisting of 5 cubic feet of coarse aggregate shall be placed at weep holes except where porous backfill is required. Backfill material shall not be placed against end bents of bridges, sides of box culverts, or back of retaining walls until the concrete has attained the specified strength. Backfill material shall not be

placed higher behind than in front of end bents until the superstructure is in place. Until the grade is in place, drainage shall be maintained away from the end bent backwall by constructing a 6 to one or steeper slope away from the backwall for a minimum distance of 3 feet and providing a lateral path for all water to flow off the roadbed section. Excavation and embankment lying adjacent to tunnels, basements and retaining walls shall be extended six feet beyond the outside of the structure and sloped back on a 1 to 1 slope. Adequate backfill material shall be stockpiled as close to the structure as possible without interfering with other ongoing work.

3.6.1 UNSUITABLE MATERIAL: Excavated material which is unsuitable for backfill and embankments, and excess material not required for either, shall be disposed of. It shall not be dumped into the channel of a stream without the written authorization of the Engineer.

3.6.2 FOUNDATION STABILIZATION AND TESTS: The Contractor shall furnish and place sand, rock, gravel, or other suitable backfill material to replace unsuitable material encountered below the foundation elevation of the structures. He shall stabilize suitable foundation material or form the bottom of pile footings if necessary to obtain a stable foundation. He shall furnish assistance in driving sounding rods or drilling test holes to permit an adequate inspection of the foundation. The depth of the excavation, the character of the material, and the condition of the foundation shall be approved by the Engineer before any concrete is placed in the footing. A testing frequency of one field density for each 2500 square foot of fill lift within building areas and one field density for each 5000 square foot of fill lift for all other areas is required. Moisture content shall be restricted to  $\pm 2$  percent of optimum.

3.7 CLASSIFICATION: All excavation shall be considered as unclassified excavation.

3.8 FINISH GRADING: All areas disturbed by the excavation and backfilling operations shall be machine graded with a small tractor equipped with a box blade or similar equipment. All rocks larger than three inches in diameter shall be removed. Tolerance shall be  $\pm 0.1$  foot.

3.11 EXCAVATION CLASSIFICATION: Unless otherwise shown on the plans, excavation for structures will be classified as Class 1, Class 2, or Class 3 Excavation. In general, Class 1 and Class 2 Excavation will apply to excavation for bridges and large retaining walls. Class 3 Excavation will apply to excavation for culverts, concrete box-type structures classed as bridges, sewers, small retaining walls, and other miscellaneous structures. Class 3 Excavation will also apply to material excavated in cleaning out culverts which are to be used in place. Class 1 Excavation will include all excavation above a specified elevation indicated on the plans while Class 2 Excavation will include all excavation below this specified elevation.

MEASUREMENT AND PAYMENT: Excavation and embankment for structures shall not be measured and paid for as a separate item but shall be included in the cost of each structure for which excavation and backfill is required.

**SECTION 02221**  
**TRENCHING, BACKFILLING, AND COMPACTING**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. The work shall consist of furnishing all labor, materials, equipment, and tools for excavation of trenches, pits and associated incidental elements relating to the construction of underground lines and appurtenances and the backfilling of these excavations as shown on the plans or as necessary to complete the project.

**PART 2 PRODUCTS**

**2.01 EARTH BACKFILL**

- A. Earth backfill shall be earth previously excavated from the trench, free from perishable matter, frozen soil, stone over six (6) inches in its largest dimension and other matter liable to become unstable when saturated with water and compacted.

**2.02 SELECT BACKFILL**

- A. Where previously excavated earth is determined by the Engineer to be unsuitable for backfill, the Contractor shall obtain and place earth from an approved source.

**2.03 GRANULAR BACKFILL**

- A. Granular backfill shall meet the requirements of detail on the Plans.

**PART 3 EXECUTION**

**3.01 TRENCH EXCAVATION**

- A. All trench excavation shall be made with a sufficient working space to permit the placing, inspection, and completion of all work contemplated in the Contract. Excavated material that is unsuitable for backfill and all boulders exposed by trenching shall be removed from the work area. Trench excavation shall in all cases be continuous from the ground surface to the established trench depth. Materials excavated shall be stockpiled at the sides of the trench and within established area limits so as to minimize inconvenience to the public and damage to vegetation and structures in the area. When unstable ground is encountered, the trenching shall be carried out utilizing trench shoring, bracing and shields to prevent cave-ins. Trench width from six inches below the pipe flowline to six inches above the pipe joint shall be held to 24" minimum or 1.4 times the pipe O.D. plus 12 inches. Trench width above these levels may be wider to accommodate shoring, bracing and shields, but shall be kept within practical limits and shall be subject to the Engineer's approval.

**3.02 LINES AND GRADE FOR TRENCH EXCAVATION**

- A. The Contractor shall furnish and set all stakes for the lines as shown on the plans. The Contractor shall be held responsible for verification of lines as established and shown on the plans. The Engineer may check the line and depth at any given point in the trench. The

Contractor shall furnish and set up for underground construction, all batter boards required therefore and shall provide all required labor for setting stakes and boards.

### **3.03 SHEETING, SHORING OR BRACING**

- A. Sheeting, shoring or bracing shall be placed by the Contractor wherever necessary for the proper preserving of any excavation, embankment or structure. Where the ground is of such a character or other conditions are such as to render it necessary, the sheeting shall be closely driven and to such depth below the lowest point of the final excavation as may be required. The Contractor shall be held responsible for the sufficiency of all sheeting and bracing used and for property damaged as the result of improper quality, strength, placing, maintaining or removing the same. No extra compensation will be made for sheeting and bracing whether left in place or removed. The Contractor shall, at his own expense, shore up, protect and insure from injury all building, retaining walls, piers and footings, storm sewers, sanitary sewers, gas lines, water lines, fences, curbs, streets or other property liable to be injured during the process of the work, and he will be held responsible for all damage which may occur by reason of prosecution of the Work. Sheeting, shoring and bracing shall be provided, installed, and maintained to protect the excavation and insure open trench operations.

### **3.04 BACKFILLING**

- A. Material used for all backfilling shall be free from perishable matter and from other material liable to become unstable when saturated with water after having been compacted. No frozen materials shall be used in the backfill. Care shall be taken to prevent damage to the pipe and structures. Special precautions shall be taken in backfilling over pipes. No backfill shall be placed over any portion of pipes and/or joints not inspected by the Engineer. Backfill shall be carefully deposited in uniform layers not exceeding six inches in depth and each layer shall be carefully and solidly tamped with mechanical tampers in such a manner as to avoid damage to pipe or disturbing the completed work. Backfill for the remainder of the trench shall use previously excavated gravel, sand, or earth, and containing no stone over six (6) inches in its largest dimension. Stones below that size may be used in proportion not exceeding one part of stone and three parts of earth in any place.

### **3.05 UNSUITABLE MATERIAL**

- A. Whenever in the opinion of the Engineer the material excavated from the trenches is not suitable for backfilling or there is a deficiency of material, the Contractor shall at his own expense provide suitable material.

### **3.06 GROUNDWATER**

- A. When groundwater is found which, in the opinion of the Engineer, affects the usefulness or satisfactory operation of any of the permanent Work, he may direct special provisions to be taken.

### **3.07 INSPECTION**

- A. After completion of excavations, the Contractor shall notify the Engineer that the trench or excavation may be inspected; and prior to placement of materials other than shoring, bracing or sheeting, the excavation shall be observed by the Engineer.

### **3.08 FIELD QUALITY CONTROL**

- A. All backfill shall be deposited and spread in layers and solidly tamped to 95 percent of maximum density as determined by ASTM D698. The method of securing adequate compaction will be approved by the Engineer. Density of compacted backfill shall be determined by an independent testing laboratory. Density shall be determined by either ASTM Method D2167, latest revision, or ASTM Test Method D1557, latest revision, or D2922, latest revision. If test results indicate required densities have not been attained, compaction shall continue and soil retested until density is achieved.

### **3.09 CLEANING OF RIGHT-OF-WAYS & EASEMENTS**

- A. All excess excavation materials or blasting debris shall be cleaned up by the Contractor as directed. As the trenches are backfilled, the Contractor shall remove all surplus material and re-grade the surface leaving all rights-of-way and streets clear and in good order. Upon completion of any portion of the Work, all the land and right-of-way shall be cleaned of all surplus material, earth, rubbish, etc., and left in a condition acceptable to the Owner. At all times adequate clean-up shall be provided to enable normal passage of traffic to occur on all streets, alleys, and private driveways.

### **3.10 PROTECTION OF ADJACENT PROPERTY**

- A. The Contractor shall protect all excavations and trenches from settlement or displacement by approved means of bracing and shoring. All existing underground utilities and structures and surface improvements and structures shall be protected and their functional purpose preserved.

### **3.11 MAINTENANCE PERIOD FOR BACKFILLED TRENCHES**

- A. All backfilled trenches shall be maintained by the Contractor for a period of one year after acceptance of the work by the Owner. Where required due to settlement of the trench, the Contractor shall fill the trench to the same level as the adjacent unsettled area and make any repairs to the disturbed area as required by the Engineer and the property owner. All work required for repair of the settled trenches during the maintenance period shall be at the Contractor's expense and no additional payment will be made.

### **3.12 CLASSIFICATION**

- A. All material excavated shall be considered as unclassified excavation which shall consist of all material of whatever character encountered in the work, including soil, solid rock, fragmented rock, water, or other.

## **PART 4 MEASUREMENT AND PAYMENT**

### **4.01 MEASUREMENT AND PAYMENT**

- A. Excavation, backfill, and compaction will not be measured or paid for as a separate item but shall be included in the cost of construction.

END OF SECTION

**SECTION 02370  
DUST AND EROSION CONTROL**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. This item shall consist of temporary control measures during the life of a contract to control air pollution, soil erosion, and siltation through the use of berms, dikes, dams, sediment basins, fiber mats, gravel mulches, grasses, slope drains, and other erosion control devices or methods.
- B. The temporary erosion control measures contained herein shall be coordinated with the permanent erosion control measures specified as part of this contract to the extent practical to assure economical, effective, and continuous erosion control throughout the construction period.
- C. Temporary control may include work outside the construction limits such as borrow pit operations, equipment and material storage sites, waste areas, and temporary plant sites.

**PART 2 PRODUCTS**

**2.01 MATERIALS**

- A. Grass. Grass which will not compete with the grasses sown later for permanent cover shall be a quick-growing species (such as ryegrass, Italian ryegrass, or cereal grasses) suitable to the area providing a temporary cover.
- B. Mulches. Mulches may be hay, straw fiber mats, netting, bark, wood chips, or other suitable material reasonably clean and free of noxious weeds and deleterious materials.
- C. Fertilizer. Fertilizer shall be a standard commercial grade and shall conform to all Federal and state regulations and to the standards of the Association of Official Agricultural Chemists.
- D. Slope Drains. Slope drains may be constructed of pipe, fiber mats, rubble, portland cement concrete, bituminous concrete, or other materials that will adequately control erosion.
- E. Straw Bales or Silt Fences. Straw bales or silt fences shall be constructed in accordance with the plans.
- F. Other. All material shall meet commercial grade standards and shall be approved by the Engineer before being incorporated into the project.

**PART 3 EXECUTION**

**3.01 GENERAL**

- A. In the event of a conflict between these requirements and pollution control laws, rules, or regulations of other Federal, state, or local agencies, the more restrictive laws, rules, or regulations shall apply.



- B. The Contractor shall be responsible for assuring compliance to the extent that construction practices, construction operations, and construction work are involved.

### **3.02 SCHEDULE**

- A. Prior to the start of construction, the Contractor shall submit schedules for accomplishment of temporary and permanent erosion control work, as are applicable for clearing and grubbing; construction; paving; and structures at watercourses. The Contractor shall also submit a proposed method of erosion and dust control on haul roads and borrow pits and a plan for disposal of waste materials. Work shall not be started until the erosion control schedules and methods of operation for applicable construction have been accepted by the Engineer.

### **3.03 METHODS**

- A. Several methods of controlling dust and other pollutants include, but are not limited to, the following:
  1. Exposing the minimum area of erodible earth.
  2. Applying temporary mulch with or without seeding.
  3. Using water sprinkler trucks.
  4. Using covered haul trucks.
  5. Using dust palliatives or penetration asphalt on haul roads.
  6. Using plastic sheet coverings.
  7. Using gravel.

### **3.04 AUTHORITY OF ENGINEER**

- A. The Engineer has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, to limit the surface area of erodible earth material exposed by excavation, borrow and fill operations, and to direct the Contractor to provide immediate permanent or temporary erosion control measures to minimize loss of soil due to erosion and contamination of adjacent streams or other watercourses, lakes, ponds, or other areas of water impoundment.

### **3.05 CONSTRUCTION DETAILS**

- A. Prior to clearing and grubbing operations for the project, the Contractor shall identify all areas where the potential for loss of soil due to erosion exists, and shall line the downhill side of the construction site within these areas with straw bales or silt fences to minimize eroded materials from leaving the site. These shall be maintained throughout the construction period and removed when the permanent erosion control features into the project at the earliest practicable time as outlined in the accepted schedule. Except where future construction operations will damage slopes, the Contractor shall perform the permanent seeding and mulching and other specified slope protection work in stages, as soon as substantial areas of exposed slopes can be

made available. Temporary erosion and pollution control measures will be used to correct conditions that develop during construction that were not foreseen during the design stage; that are needed prior to installation of permanent control features; or that are needed temporarily to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project.

- B. When erosion is likely to be a problem, clearing and grubbing operations should be scheduled and performed so that grading operations and permanent erosion control features can follow immediately thereafter if the project conditions permit; otherwise, temporary erosion control measures may be required between successive construction stages.
- C. The Engineer will limit the area of clearing and grubbing, excavation, borrow, and embankment operations in progress, commensurate with the Contractor's capability and progress in keeping the finish grading, mulching, seeding, and other such permanent control measures current in accordance with the accepted schedule. Should seasonal limitations make such coordination unrealistic, temporary erosion control measures shall be taken immediately to the extent feasible and justified.
- D. In the event that temporary erosion and pollution control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as part of the work as scheduled or are ordered by the Engineer, such work shall be performed by the Contractor at his/her own expense.
- E. The Engineer may increase or decrease the area of erodible earth material to be exposed at one time as determined by analysis of project conditions.

#### **PART 4 MEASUREMENT AND PAYMENT**

##### **4.01 MEASUREMENT AND PAYMENT**

- A. Dust and erosion control shall be paid as a lump sum item as indicated on the Bid Schedule.

END OF SECTION

## SECTION 02515

### PORTLAND CEMENT CONCRETE PAVING

#### PART 1 - GENERAL

1.1 DESCRIPTION: This work shall consist of a pavement composed of portland cement concrete, with or without reinforcement as specified, constructed on a prepared subgrade in accordance with these specifications and in conformity with the lines, grades, thicknesses, and typical cross sections shown on the plans or established by the Engineer.

#### PART 2 - PRODUCTS

2.1 STEEL WIRE FABRIC FOR CONCRETE PAVEMENT: Welded steel wire fabric reinforcement for concrete pavement shall meet the requirements of AASHTO M 55, except the requirements for weld shear tests and the variation of diameter of transverse wires shall be waived. It shall be in mats of the size and design shown on the plans, It will be permissible to furnish longitudinally hinged wire fabric for sheets of a required width of 8 feet or greater. The hinge shall be made by looping the transverse wires around a longitudinal wire, and shall be capable of developing the full strength of the transverse wire. The hinge shall be located within one foot of the center of the width of the sheet. All steel wire fabric shall be free from dirt, paint, oil, grease, thick rust, and other foreign substances. Thin powdery rust need not be removed.

2.2 LIQUID MEMBRANE-FORMING COMPOUNDS: Liquid membrane-forming compounds shall conform to the requirements to AASHTO M 148 for Type 1-D, clear or translucent with fugitive dye, or Type 2, white pigmented, curing compounds. The vehicle shall be Class A.

A. MANUFACTURER'S CERTIFICATION AND GUARANTEE FOR WHITE PIGMENTED CURING COMPOUND: The manufacturer shall submit a certification and guarantee to the Engineer, setting forth the brand name and designation, the composition or description of the curing material, and the manner in which it will be identified on the containers. The manufacturer shall further certify that the material conforms to the requirements of these specifications and shall list typical values of current test for consistency, drying time, reflectance, and moisture retention. The manufacturer shall also guarantee that as long as material is furnished under that brand and designation, it will be of the same composition as that originally approved, and in no way will be altered or changed.

B. SAMPLING: Each lot or batch of liquid membrane-forming compound shall be sampled, tested and approved prior to use.

2.3 WATERPROOF PAPER: Waterproof paper shall comply with the requirements of AASHTO M 171.

A. CERTIFICATION AND ACCEPTANCE: The Contractor shall furnish to the Engineer, a manufacturer's certification in triplicate that the material supplied conforms to the requirements specified.

2.4 POLYETHYLENE SHEETING: Polyethylene sheeting shall be white and shall comply with the requirements of AASHTO M 171 or PS 17.

A. CERTIFICATION AND ACCEPTANCE: The contractor shall furnish to the Engineer, a manufacturer's certification in triplicate that the material supplied conforms to the requirements specified.

2.5 WHITE BURLAP-POLYETHYLENE SHEETING: White burlap-polyethylene sheeting shall conform to the requirements of AASHTO M 171.

2.6 BURLAP AND MATS OF JUTE OR COTTON: Burlap shall be fabric made from jute or other suitable fibers. Jute mats shall consist of two plies of burlap stitched together to maintain the shape and stability of the unit. Cotton mats shall consist of filler or cotton batts covered with unsized cloth or burlap, and tufted or stitched to maintain the shape and stability of the unit. Burlap and mats shall, in the judgment of the Engineer, be of such construction and in such condition as required to adequately maintain free moisture on the surface of the concrete with the type of system being used to provide the water. Material shall be free from deleterious matter harmful to concrete.

2.7 DOWEL BARS: Dowels for transverse joints shall meet the requirements for Plain Rounds of AASHTO M 321, AASHTO M 42, or AASHTO M 53. They shall be smooth, round, and have all cutting burrs, loose mill scale, rust, grease, and oil removed. The free end of the dowel bar for a length of at least 11 inches shall be coated with a suitable paint such as red lead, regular or quick-drying; basic lead silico chromate primer; zinc chromate-iron oxide or other approved zinc chromate primer, followed by an approved coating of powdered graphite or graphite grease. Graphite grease shall contain a minimum of 25 per cent graphite and shall be certified to by the manufacturer or shown on the container label. If powdered graphite is used, it shall be applied by dusting or dipping, just before the paint dries to touch. If graphite grease is used, it shall be applied in a manner that will result in a thorough covering of the painted section of the bar with a thin uniform coating. Dowel supporting units shall conform to one of the types shown on the plans.

2.8 TIE BARS: Tie bars for longitudinal joints and construction joints shall be round, deformed, and shall meet the requirements of AASHTO M 31, AASHTO M 42, or AASHTO M 53, except that tie bars which are to be bent and straightened shall conform to the requirements of AASHTO M 31, Grade 40.

2.9 CONCRETE JOINT SEALER, HOT-POURED ELASTIC TYPE: The sealer material shall conform to the requirements of AASHTO M 173, together with the additional requirements and modifications contained herein.

A. PHYSICAL PROPERTIES: The sealer material shall conform to the following requirements:

Penetration at 77 F, 150 g, 5 sec.	50-90
Flow at 140 F, 75 degree angle, 5 hr, cm	0-1.0
Bond at 0 F, 100 percent extension, 5 cycles	Pass (all 3)
Resilience, percent recovery, min.	25

The sealer material may be subjected to any or all of the above tests after prolonged heating of the material for 6 hours with constant mixing in a laboratory melter at the manufacturer's recommended pouring temperature. After such heating, the material shall meet the above specified requirements.

B. PACKING AND MARKING: The joint sealer material shall be packed and shipped in suitable commercial containers clearly marked with the name of the material, the name of the manufacturer, brand name, weight, batch number, pouring temperature recommended by the manufacturer, and maximum safe heating temperature.

C. METHODS OF TEST:

Flow

AASHTO T 187

Penetration (Use 6 ounce can)

AASHTO T 187

Bond, Resilience

MHTD Test Methods

T2 and T9

2.10 PREFORMED FIBER EXPANSION JOINT FILLER: This material shall conform to the requirements of AASHTO M 213.

2.11 All materials, proportioning, air-entrainment, mixing, slump, and transporting for portland cement concrete shall be in accordance with Section 03300.

2.12 EQUIPMENT: Equipment and tools necessary for handling materials and performing all parts of the work shall be approved by the Engineer as to design, capacity, and mechanical condition. The equipment shall be at the job site sufficiently ahead of the start of construction operations to be examined thoroughly for approval and shall comply with the following requirements.

A. BATCHING PLANT AND MIXER: The mixer, water measuring equipment, and weighing and batching equipment shall conform to the requirements of Section 03300.

B. HAULING: Batch trucks used for transporting unmixed batches from the plant to the paver shall have compartments of size and construction adequate to prevent loss of material and spillage or contamination from one compartment to the other. Cement shall be handled in such manner as to prevent loss during the loading, hauling, and unloading process. To prevent loss of cement, the material shall be transported by:

(a) batch trucks equipped with separate metal or metal-lined bulk cement containers kept closed while the material is in transit, or

(b) batch truck compartments equipped with rigid, tight-fitting covers to be kept closed while the material is in transit and opened when the batches are being discharged, and in which at least a portion of the aggregate is placed prior to placing the cement, or

(c) placing the cement on the coarse aggregate and adequately covering with sand when rigid compartment covers or separate cement containers are not used, or

(d) other methods specifically approved by the Engineer.

1) Trucks for transporting mixed concrete shall meet the requirements of Sec. 03300. Consideration will be given for the use of an approved type of nonagitating equipment for transporting central mixed concrete provided the discharge of the concrete is completed within 30 minutes after the introduction of the mixing water to the cement and aggregates. Bodies of nonagitating hauling equipment shall be smooth, mortar-tight metal containers capable of discharging the concrete at a satisfactory, controlled rate without segregation. If unloading the concrete is accomplished by tilting the body, baffles may be required to retard the discharge. Covers shall be provided when needed for protection.

C. FORMS: Side forms, except as otherwise permitted, shall be on metal, of an approved

section, with a base width not less than the height, except a 9-inch base width will be permitted for 10-inch pavement. The height shall be equal to the edge thickness of the pavement. Each form section shall be straight and free from bends and warps. No section shall show a variation greater than 1/8 inch in 10 feet from the true plane surface on the top, and 1/4 inch in 10 feet along the face of the form. The method of connecting form sections shall insure a tight, neat joint. Built-up metal forms may be used by rigidly attaching a wood or metal section of suitable width and thickness to the bottom of the form providing an increase in depth of not more than 20 percent.

1) Forms for curved form lines shall comply with the grade and alignment requirements of Sec. 03100, except that straight steel form sections 10 feet or less in length may be used for form lines having a radius greater than 200 feet. Special forms of wood or steel will be permitted for curved form lines having a radius of 200 feet or less, and may be permitted if approved by the Engineer in other special cases where it is not practicable to use standard pavement forms. Straight steel form sections 5 feet long will be acceptable for curved form lines having a radius of not less than 100 feet. Forms shall be of sufficient rigidity to prevent distortion in edge alignment due to pressure of the concrete. Wood forms shall not be used as a track for operating paving and finishing equipment.

D. FORM LINE GRADER: Except as considered impracticable by the Engineer for the type or quantity of work involved, the form line for all forms supporting mechanical finishing equipment shall be excavated substantially to line and grade by a machine designed for this purpose. In lieu of the form line grader, consideration will be given for granting approval for use of other mechanical equipment producing similar results.

E. MECHANICAL FORM TAMPER: Except as considered impracticable by the Engineer for the type or quantity of work involved, a mechanical form tamper constructed in such manner that each side of the form will be tamped simultaneously shall be used on all forms supporting mechanical finishing equipment.

F. SUBGRADE MACHINE: The subgrade machine shall be of an approved type. Written approval may be given by the Engineer for the use of a subgrade planed in lieu of the subgrade machine if the planed is considered adequate for the particular work involved.

G. SUBGRADE PLANED: An approved subgrade planed rolling on the side forms shall be provided.

H. CHECK TEMPLATE: An approved heavy metal check template rolling on the side forms shall be provided. The template shall have a square edge for checking the subgrade surface. Scratch templates with spikes or teeth will not be permitted.

I. STRIKE-OFF FOR REINFORCEMENT: An approved strike-off template to level the concrete prior to placing wire fabric reinforcement or tie bars shall be provided when a mechanical concrete spreader is not used.

J. VIBRATORS: Vibrators, for full width vibration of the concrete, may be either the surface pan-type or the internal-type with either tube or multiple spuds. They may be attached to the spreader or the finishing machine, or may be mounted on a separate carriage. They shall not come in contact with the reinforcement, load transfer devices, subgrade, or side forms. Vibrating equipment shall be operated in accordance with the manufacturer's recommendation at a frequency to provide satisfactory results, but the

frequency of the surface vibrators shall not be less than 3600 impulses per minute and the frequency of the internal-type shall not be less than 4500 impulses per minute. Hand vibrators shall have a frequency of not less than 4500 impulses per minute. The contractor shall have a satisfactory tachometer available at all times for checking the vibration frequency.

K. FINISHING MACHINE. The finishing machine, when in operation, shall be equipped with at least two oscillating-type transverse screeds supported by the forms. It shall satisfactorily handle and finish the mixes required for this type of construction and shall not displace the reinforcement, side forms, or joints. Final approval of the machine will be based upon satisfactory performance during actual construction.

L. MECHANICAL FLOAT: Either a suspended pan-type transverse float or a reciprocating longitudinal float will be required. The machine shall be of an approved design, in satisfactory working condition, and accurately adjusted to the specified crown.

M. SURFACE FINISHING EQUIPMENT:

1) WIRE COMB: A wire comb shall be not less than 10 feet long with a single line of wires exposed to a length of approximately 4 inches. The wire shall be blue tempered and polished spring steel with nominal dimensions of 0.028 inch thick and 0.100 to 0.125 inch wide. The wires shall be spaced to provide 1/2 inch clear space between wires and securely mounted in a rigid head with the width of each wire parallel to the longitudinal center line of the head. The wire comb shall be mechanically operated with the length of the comb parallel to the pavement center line and capable of traversing the full width of pavement in a single pass at a uniform speed and at a uniform depth. Final approval of the wire comb will be based on satisfactory performance during actual use. Texturing equipment, other than a wire comb, may be approved provided it produces a texture equivalent to that produced by a wire comb and upon satisfactory performance during actual use.

2) FABRIC DRAG: If the contract specifies concrete to be tinted, a fabric drag consisting of a seamless strip of burlap or cotton of not less than the width of the pavement shall be provided. To obtain a satisfactory finish, it may be necessary to ravel out the cross threads of the trailing 2 or 3 inches of the drag. Brooms of an approved type may be provided in lieu of the fabric drag. The brooms shall be not less than 18 inches wide, made from good quality bass or bassine fiber not more than 5 inches long.

N. CONCRETE SAW: If sawed joints are required, equipment complete with either an abrasive wheel or a diamond-edge water-cooled blade, capable of providing a groove of the specified dimensions in the hardened concrete shall be provided.

O. EQUIPMENT FOR SEALING JOINTS: An approved double boiler-type heating kettle equipped with a mechanical agitator and a satisfactory temperature indicating device will be required. The equipment shall be capable of heating the joint sealing material uniformly without damage.

P. Auxiliary equipment shall be available at all times as follows:

(a) Two footbridges so designed that they can be readily transported from place to place and which have no part in contact with the pavement.

(b) Two or more 10 foot straightedges of an approved type. Blades shall be replaced when edges become wavy or warped.

(c) Long-handled floats, each having a blade at least 3 feet long and 6 inches wide.

(d) Sufficient burlap, waterproof paper, or plastic film for the protection of the pavement in case of rain or breakdown of the curing equipment.

(e) A manually operated long handle wire comb approximately 2 feet wide with wire size and spacing in accordance with the requirements of Section 2.12 M.1.

### PART 3 - EXECUTION

3.1 WEATHER LIMITATIONS: Unless otherwise authorized in writing by the Engineer, mixing and concreting operations shall be discontinued when a descending ambient temperature away from artificial heat reaches 40 F and not resumed until an ascending ambient temperature away from artificial heat reaches 35 F. If approval has been granted for the Contractor to place the concrete while the ambient temperature is at or lower than 40 F, the Contractor shall take precautionary measures to prevent damage by freezing, such as heating mixing water, heating aggregates, or applying heat directly to the contents of the mixer. Aggregates shall not be heated higher than 150 F, and the temperature of the aggregates and mixing water combined shall be not higher than 100 F, when the cement is added. Unless otherwise authorized, the temperature of the mixed concrete when heating is employed shall not be less than 50 F and not more than 80 F at the time of placement. Cement or fine aggregate containing lumps or crusts of hardened material or frost shall not be used. Concrete shall not be placed upon a frozen subgrade except with written approval of the Engineer.

A. PROTECTION: All concrete shall be effectively protected from freezing for a period of at least 5 days after it has been placed and until a minimum compressive strength of 3,000 pounds per square inch has been attained. Protection will be required for not more than 10 days. Regardless of precautions taken, the Contractor shall assume all risks, and all frozen concrete shall be replaced at his expense.

3.2 SETTING FORMS: Forms shall be set so that they rest firmly throughout their length upon the thoroughly compacted subgrade. Any subgrade which is more than 1/2 inch below the established grade at the form line shall be brought to grade for a sufficient width, outside the area required by the pavement, to support the forms adequately, and shall be thoroughly rolled. Any variations, whether below or above grade, shall be brought to true grade.

A. Forms shall be staked into place with not less than three pins for each 10 foot section. A pin shall be placed at each side of every joint. Form sections shall be tightly locked, free from play or movement in any direction. After the forms have been set to correct grade, the material at both the inside and outside edges of the base of the forms shall be thoroughly tamped. Immediately prior to any tamping operations, a small ridge of approved fine graded material shall be placed along each side of the forms as necessary for use during tamping operations. If the subgrade becomes soft and yielding after the forms have been set and before the concrete is placed, the forms shall be reset on a stable foundation. If in the judgment of the Engineer, the subgrade for the forms has been cut sufficiently accurate with automatically controlled equipment as to eliminate the need for tamping, the requirement may be waived.

B. Both straight and curved forms shall be supported in such position that the face of the form



shall be vertical on tangents and perpendicular to the superelevated section on curves. The top of the form shall not vary more than 1/8 inch from the true grade line during placing, compacting, and finishing operations. The form alignment shall not vary more than 1/4 inch from the true alignment.

C. Unless otherwise permitted, sufficient forms shall be provided so that at least 500 feet of forms on each side of the roadbed are accurately set at all times in their required final position in advance of the point where concrete is being placed. Each time forms are used, they shall be cleaned thoroughly and oiled before reuse.

3.3 CONDITIONING OF SUBGRADE: When forms have been securely set to grade, the subgrade shall be brought to proper cross section. The final checking for proper crown and elevation of the subgrade by means of the check template shall be performed in the presence of the Engineer after all equipment traffic on the subgrade has ceased and as close as in practicable to the area of current concrete placement. If calibrated rod measurements taken when the surface of the pavement has been finished indicate that pavement thickness is less than specified on the plans, the subgrade planer and template shall be immediately adjusted.

A. Low areas of treated bases shall be filled only with concrete integral with the pavement. No direct payment will be made for the concrete used to fill these low areas.

3.4 PLACING CONCRETE: The concrete shall be deposited over the entire width of the subgrade between forms in such manner as to prevent segregation and to require as little rehandling as practicable. Mixers used for pavement construction, including truck mixers and trucks used for transporting concrete, will not be permitted to discharge concrete by chute or by dumping directly on the subgrade, prepared base, or previously placed concrete except for areas to be hand finished or for isolated pavement lanes less than 2000 feet long. Concrete shall be thoroughly vibrated along the forms or sides and along expansion and key type longitudinal joints. Attachments on finishing machines to vibrate the concrete adjacent to forms and longitudinal joints will be permitted provided satisfactory results are attained. Care shall be taken that the vibrator does not penetrate the subgrade or dislodge or move the joints. The vibrating shall be sufficient to produce a smooth pavement edge. Honeycomb in the edge may be cause for rejection of the pavement.

3.5 STRIKE-OFF CONCRETE AND PLACEMENT OF REINFORCEMENT: Following the placing of the concrete, it shall be struck off so that when the concrete is properly consolidated and finished, the surface of the pavement will be at the proper elevation and cross section. Reinforced concrete pavement shall be placed in two layers. The entire width of the bottom layer shall be struck off to such length and depth that the sheet of wire fabric may be laid full length on the concrete in its final position without further manipulation. The reinforcement shall be placed directly upon the concrete, and the top layer of the concrete placed, struck off, and screeded. Any portion of the bottom layer of concrete which has been placed more than 30 minutes without being covered with the top layer shall be removed and replaced with freshly mixed concrete at the Contractor's expense.

A. Tie bars shall be supported in the proper position by chairs driven into the subgrade, or may be placed by approved mechanical methods prior to the consolidation of the concrete after it has been struck-off.

B. Wire fabric and tie bars shall be free from dirt, oil, paint, grease, loose mill scale, and thick rust which could impair bond of the steel with the concrete. Thin, powdery rust need not be removed.

3.6 FINAL STRIKE-OFF, CONSOLIDATION, AND FINISHING: Machine finishing by vibrating and screeding process will be required for all pavement except as permitted by Sec. 3.6 I. After the final course of the concrete has been placed it shall be struck off and thoroughly vibrated until concrete of a uniform and satisfactory density is attained. The surface of the pavement shall be screeded as many times and at such intervals as necessary to leave a surface of uniform texture to the proper grade and typical section. Excessive screeding over a given area shall be avoided. Finishing machines shall be kept in satisfactory repair and adjustment and shall be operated without lift, wobbling, or other variation tending to affect a precision finish. While operating, a roll of concrete shall be maintained in front of the full length of all screeds so that the vibrating and screeding work will be fully effective.

A. CONSOLIDATION: Concrete shall be consolidated by vibrating the mass promptly following placement. Vibrating tubes shall extend into the concrete the distance necessary to provide adequate consolidation. Approved pan-type vibrators operated on the surface of the concrete may be used in lieu of tube-type internal vibrators. Vibrators shall be operated only when the machine to which they are attached is moving.

B. MACHINE FLOATING: After the finishing machine operations have been completed, the concrete surface shall be smoothed and consolidated by mechanical floating, either longitudinal or transverse, leaving the pavement finished to the required cross section, elevation, and surface smoothness. Mechanical floats shall be adjusted and so operated that the float or screed will have a small quantity of concrete in front of its full length at all times for filling depressions. The screed or float shall not be raised or lowered for the purpose of maintaining the proper quantity of concrete in front of the float. The longitudinal float shall pass over each area of pavement at least two times.

C. ADDED FINISHING WATER: When emergency conditions exist and it becomes necessary to apply additional moisture to the surface of the pavement in order to complete the final finishing operation, water may be applied but only in the form of a fine pressure spray. Under such conditions, placement of additional concrete on the subgrade shall be discontinued until the emergency conditions cease to exist. Under normal working conditions moisture shall not be applied to the surface of the pavement in any form.

D. STRAIGHT EDGE TESTING AND SURFACE CORRECTION: Immediately following the machine floating and while the concrete is still plastic, the Contractor shall test the pavement surface for trueness by means of a 10 foot straightedge. Straightedging shall be done by holding the straightedge in contact with the concrete surface, parallel to the pavement center line, and drawing the straightedge lightly across the surface. Advance along the pavement shall be in successive stages of not more than one-half the length of the straightedge. All variations shall be eliminated by filling depressions with freshly mixed concrete or striking off projections, and the areas so corrected shall be consolidated and refinished by means of a long-handled float. The surface shall again be checked by the Contractor by means of the 10 foot straightedge and any irregularities eliminated.

E. SURFACE FINISH:

1) NON-TINTED CONCRETE: After surface irregularities have been removed, the concrete shall be given a uniformly roughened surface finish by use of a wire comb or other approved texturing device which produces a texture similar to that produced by a wire comb. The texturing operation shall be executed so that the transverse corrugations will be uniform in appearance. Successive passes of the comb or other approved device shall be overlapped the minimum necessary to attain a continuously textured surface. The surface texture produced shall have the characteristics of a texture produced using a

wire comb as specified in Sec. 2.12.M.1), and which has an average texture depth of approximately 0.125 inch. Texturing shall be completed while the concrete is in such condition that it will not be torn or unduly roughened, and before it has attained its initial set. The texturing device shall be cleaned or replaced as often as necessary to attain the required surface texture. Upon completion of texturing, the pavement surface shall be uniform in appearance and free from surplus water, rough or porous spots, irregularities, depressions, and other objectionable features. Small or irregular areas, or areas not suitable for machine texturing when adjacent surrounding concrete is ready for texturing, shall be textured with a hand operated device producing a textured surface equivalent to that required for machine combing.

2) TINTED CONCRETE: If the contract requires concrete to be tinted and after surface irregularities have been removed, the concrete shall be given a uniformly roughened surface finish by the use of a fabric drag or a broom. The damp fabric drag shall be dragged in a longitudinal direction. Brooms shall be drawn across the surface from the center line toward each edge with the broom held perpendicular to the surface, each stroke slightly overlapping the preceding stroke. The brooming operation shall be executed so that the corrugations will be uniform in appearance and not more than 1/16 inch deep. A machine capable of producing a finished surface similar to that required for hand brooming may be used. Brooming or dragging shall be completed before the concrete is in a condition that it will be torn or unduly roughened and before the concrete has attained its initial set. The brooms or the fabric shall be cleaned or replaced as often as necessary to obtain the required surface texture. Upon completion of brooming or dragging, the surface of the pavement shall be uniform in appearance and shall be free from surplus water, rough or porous spots, irregularities, depressions, and other objectionable features.

F. EDGING AT FORMS AND JOINTS: After the final finish, but before the concrete has taken its initial set, the edges of the pavement along each form line, and on each side of transverse expansion joints and construction joints shall be worked with an edging tool having a radius of approximately 3/8 inch. A well-defined and continuous radius having a smooth, dense finish shall be produced. The surface of the pavement shall not be unduly disturbed by tilting of the tool during use. Tool marks on the pavement shall be eliminated by brooming or dragging the surface. In doing this, the rounding of the corner of the pavement shall not be disturbed. All concrete on top of the joint filler shall be completely removed. All joints shall be tested with a straightedge before the concrete has set, and correction made if one side of the joint is higher than the other.

G. MODIFIED MACHINE FINISHING: For isolated pavement lanes over 200 feet long but less than 2000 feet long, all machine finishing equipment will be required except that a mechanical spreader will not be required. The final surface texture may be applied manually with a wire comb meeting the requirement of Sec. 2.12.P.

H. HAND FINISHING: Compacting and finishing pavement by hand methods will be permitted:

- (a) for all curves having a form line radius of less than 200 feet or where wood forms are used.
- (b) for all irregular shaped areas.
- (c) for isolated pavement lanes less than 200 feet long.
- (d) for pavement lanes less than 10 feet wide.
- (e) for bridge approach and pavement to first expansion joint.
- (f) when a breakdown of the mechanical compacting and finishing equipment occurs or in the event of some other emergency. After a breakdown, only material which has already been proportioned and which may become unsatisfactory for use may be finished

by hand.

Hand finishing shall consist of all operations required under Sec 3.6 except mechanical finishing equipment will not be required. If the mechanical finishing machine is not used, a vibrating screed or a tamping template, the face of which is at least 4 inches wide, having a length slightly in excess of the width of the pavement, and having sufficient rigidity to maintain the true cross section of the pavement shall be used. The final surface texture may be applied manually with a wire comb meeting the requirements of Sec. 2.12.P.

3.7 JOINTS: Joints shall be of the specified type and dimensions and constructed at the locations shown on the plans or as approved by the Engineer. Where joints are preformed, the form or joint shall be set and securely fastened to ensure the joint being in the required position when the concrete is finished. Dowels and tie bars in their final position shall be parallel to the subgrade and perpendicular to the line of the joint. Dowel supporting assemblies shall conform to one of the types shown on the plans. The concrete shall be placed so that it will not displace or disarrange the joint installations.

A. EXPANSIONS JOINTS: Expansion joints shall extend for the full cross section of the concrete pavement. Filler placed prior to the placement of the concrete shall be installed with a removable cap or edging bar to serve as a guide for edging the joint and protection for the filler during the placing and finishing of the concrete. Joints constructed after the placement of concrete shall be sawed full depth and the exposed edges shall be ground to a chamfer of 3/8 inch. The filler shall rest snugly on the subgrade from form to form. The joints shall be sealed as specified in Sec. 3.7.D. Upon removal of the forms any struts or fins of concrete extending across the joint shall be removed to the full thickness of the pavement.

B. CONSTRUCTION JOINTS: Construction joints shall be made at the close of each day's work or when the work is stopped or interrupted for more than 30 minutes. No traverse construction joint shall be constructed within 10 feet of an expansion or contraction joint. Construction joints shall be constructed perpendicular to the top surface and the center line of the pavement. Construction joints may be formed with a timber header or may be sawed full depth. The final joint shall conform to the cross section of the pavement. Before paving operations are resumed, all surplus concrete and other refuse shall be removed from the subgrade.

C. SAWING: Unless otherwise provided all transverse contraction and all longitudinal joints in the pavement shall be sawed with the joint groove cut to the dimensions shown on the plans. If the groove for poured type transverse joints is cut prior to removal of the forms, the groove shall be cut as close as is practicable to the pavement edge, and the resulting crescent shaped plug in the groove, immediately adjacent to the form, will be acceptable. For intersections, and irregular pavement, joints shall be sawed at locations as specified by the Engineer. Sawing of the joints shall begin as soon as the concrete has hardened sufficiently to permit sawing without excessive raveling. All joints shall be sawed before uncontrolled shrinkage cracking takes place. The sawing of any joint shall be omitted if a crack occurs at or near the joint location prior to the time of sawing. Sawing shall be discontinued when a crack develops ahead of the saw. In general, all joints should be sawed in sequence. The Engineer reserves the right to have the Contractor install preformed type joints on multiple width construction when the use of sawed joints fails to prevent random cracking.

D. SEALING JOINTS: All sawed contraction joints and sawed or formed expansion joints shall be sealed with joint sealing material before the pavement is opened to traffic, including construction traffic, and as soon after completion of a minimum curing period of 72 hours as is practicable. Immediately prior

to sealing, the joints shall be thoroughly cleaned and dried. The sealing material shall be heated to the pouring temperature recommended by the manufacturer. Any material which has been heated above the maximum safe heating temperature will be rejected.

The sealing material shall be installed in such a way as to fill the joint opening completely and uniformly from the bottom to the top, and any excess material shall be removed from the pavement surface.

E. JOINT FILLER AT RAILROAD CROSSINGS: Bituminous filler for use between railroad crossing approach slabs and the timber crossing shall be composed of a mixture of RC-800 liquid asphalt and air-dried sawdust from wood such as oak, pine, cypress, fir or black walnut. The sawdust shall be relatively free of particles larger than 1/4 inch. Coarse, shredded, fibrous sawdust in which the particles are long and slender will not be accepted. It shall be air-dried so that the particles will be free of surface moisture. The mixture shall be prepared using the proportion of one volume of liquid asphalt to two dry, loose volumes of air-dried sawdust. The proportion may be varied as specified by the Engineer to obtain a dense mixture. The mixture shall be such that free asphalt will not bleed out when tamped into a firm and compacted state. Mixing may be aided by slightly and carefully heating the mixture.

3.8 CURING: Immediately after the finishing operations have been completed and as soon as marring of the concrete will not occur, the entire surface of the newly placed concrete shall be covered and cured in accordance with one of the following methods. The concrete shall not be left exposed for more than 1/2 hour between stages of curing or during the curing period.

A. WHITE PIGMENTED MEMBRANE: After the free water has left the pavement surface, the entire surface shall be sealed by hand or machine spraying with a uniform application of white pigmented membrane curing material. The Contractor shall provide satisfactory equipment to insure uniform coverage of curing material, without loss, on the pavement at the rate of one gallon for each 150 square feet. If rain falls on the newly coated pavement before the film has dried sufficiently to resist damage, or if the film is damaged in any other way, the Contractor will be required to apply additional curing material to the affected portions. All areas cut by finishing tools subsequent to the application of the curing material shall immediately be given new applications at the rate specified above. If hair-checking develops before the membrane can be applied, the concrete shall be initially cured with wet burlap as specified in Sec.3.8D. before the membrane is placed.

B. WATERPROOFED PAPER, POLYETHYLENE SHEETING, AND POLYETHYLENE-BURLAP SHEETING. As soon as the concrete has set sufficiently to prevent marring, the top surface of the pavement shall be covered with units of waterproofed paper, white polyethylene sheeting, or white polyethylene-burlap sheeting, which shall be lapped not less than 18 inches. If polyethylene-burlap sheeting is used, the burlap shall be thoroughly dampened prior to placing and shall be placed next to the concrete. All coverings shall be so placed and weighted that they remain in contact with the pavement surface and edges for not less than 72 hours after the concrete has been placed. If hair-checking develops before the covering can be applied, the concrete shall be initially cured with wet burlap as specified in Sec. 3.8.D before the covering is placed.

C. MATS OF JUTE OR COTTON: New mats of jute or cotton, and any such mats that have been used for purposes other than the curing of concrete, shall be thoroughly washed before being used. The use of mats contaminated with earth or other deleterious substances will not be permitted. The top surface of the pavement shall be completely covered with mats as soon as the concrete has set sufficiently to prevent marring of the surface. Prior to being placed, the mats shall be damp throughout and shall be

placed with the wettest side down. The mats shall be handled in such manner that contact with earth or other deleterious substances is avoided, and they shall be so placed that they remain in contact with the pavement surface and edges. The covering shall be kept wet and maintained in position for not less than 72 hours after the concrete has been placed. If hair-checking develops before the mats can be applied, the concrete shall initially cured with wet burlap as specified in Sec. 3.8.D before the mat covering is placed.

D. BURLAP: The top surface of the pavement shall be temporarily covered with thoroughly damp burlap after the concrete has set sufficiently to prevent marring of the surface. Burlap shall be handled in such manner that contact with earth or other deleterious substances is avoided. All new or contaminated burlap and all burlap which has been used for purposes other than the curing of concrete shall be thoroughly washed before being used. The burlap shall be kept thoroughly wet until removed for application of the final curing material. Neither the top nor the edge of the pavement shall be left unprotected for more than 1/2 hour. When the burlap is removed, curing shall be continued by one of the approved methods.

E. STRAW: The pavement shall be initially cured with wet burlap. As soon as the burlap is removed, the surface shall be covered with not less than 6 inches of straw, the thickness being measured after wetting. The straw shall be kept saturated for not less than 72 hours after the concrete has been placed. When removed, the straw shall be disposed of but shall not be burned on the pavement or in close proximity to the edges.

3.9 REMOVING FORMS: Forms shall be removed carefully so as to avoid damage to the pavement. Honeycombed areas will be considered as defective work and shall be immediately repaired. If the forms are removed prior to 72 hours after placing concrete, the sides of the pavement shall be cured by one of the methods specified above. Any trench excavated for the forms shall be entirely backfilled so no water will stand next to the pavement.

3.10 SURFACE TEST: As soon as practicable the pavement surface will be thoroughly straightedged by the Engineer and all variations exceeding 1/8 inch in 10 feet will be plainly marked. Areas more than 1/8 high shall be removed by an approved device consisting of multiple cutting edges leaving a grooved surface finish comparable to that produced by the wire comb. The use of a bush hammer or other impact device will not be permitted.

3.11 OPENING TO TRAFFIC: The concrete pavement shall not be opened for light traffic until the concrete is at least 72 hours old and has attained a minimum compressive strength of 3000 pounds per square inch. The pavement shall not be opened to all types of traffic until the concrete is at least 120 hours old and has attained a minimum compressive strength of 3500 pounds per square inch. If high early strength concrete is used, the pavement may be opened to all types of traffic when the concrete has attained a minimum compressive strength of 3500 pounds per square inch. Compressive strength will be determined by tests made in accordance with Missouri Highway and Transportation Department methods. Pavement shall be cleaned prior to opening to opening to traffic.

3.12 SLIP-FORM CONSTRUCTION: At the option of the Contractor, pavement may be constructed by the use of sliding form methods. All applicable provisions of Sec. 02515 shall be followed. In addition, the following provisions shall apply.

A. SUBGRADE AND BASE: If an aggregate base course is specified for the pavement, it shall be constructed in accordance with the requirements of Sec. 02232. The slip-form paver shall operate on the aggregate base. After the grade or base has been placed and compacted to the specified density, the areas

which will support the paving machine shall be cut to the proper elevation by means of an approved machine. The subgrade on which the pavement is to be constructed shall be brought to the proper profile by means of an approved subgrade machine or subgrade planer. An approved check template shall be used to determine if the finished subgrade conforms to the required cross section. The use of a check template may be waived by the Engineer where the subgrade is prepared by full-width equipment using automatic controls operating from an established grade reference line.

B. PLACING CONCRETE: A self-propelled concrete spreader equipped with a power-driven device for spreading the concrete uniformly across the subgrade transversely shall be used to place the concrete. The spreader shall also be equipped with an adjustable strike-off blade capable of striking off the surface of the concrete in the longitudinal direction of the pavement at any required elevation. For isolated pavement lanes over 200 feet long but less than 2000 feet long, a mechanical spreader will not be required. The final surface texture may be applied manually with a wire comb meeting the requirements of Sec. 2.12.D. Concrete for reinforced pavement shall be placed in two layers.

C. CONSOLIDATING AND FINISHING EQUIPMENT: The concrete shall be consolidated and finished by an approved slip-form paver designed to spread, consolidate, and shape the concrete in one complete pass of the machine in such a manner that a minimum of hand finishing will be necessary to provide a dense and homogenous pavement in conformance with the plans and specifications. The slip-form paver shall be fully energized, self-propelled, and crawler mounted. It shall be of sufficient weight and power to construct the maximum specified concrete paving lane width as shown on the plans at an adequate forward speed, and without transverse, longitudinal, or vertical instability or displacement. The slip-form paver shall provide one oscillating transverse belt or other approved device that will produce a surface reasonably free of surface voids and tears. The machine shall vibrate the concrete for the full width and depth of the pavement being placed. Such vibration shall be accomplished with vibrating tubes or arms working in the concrete or with a vibrating screed or pan operating on the surface of the concrete. The sliding forms shall be rigidly held together laterally to prevent spreading of the forms. The forms shall trail behind the paver for such distance that no apparent slumping of the concrete will occur 6 inches in from the pavement edge. The slip-form paver shall be operated with as nearly a continuous forward movement as possible and all operations of mixing, delivering, and spreading concrete shall be so coordinated as to provide uniform progress with stopping and starting of the paver held to a minimum. If, for any reason, it is necessary to stop the forward movement of the paver, the vibratory and tamping elements shall also be stopped immediately.

D. FORMS: Unless otherwise permitted by the Engineer, approved side forms will be required 20 to 30 feet back and ahead of transverse expansion and construction joints. The forms shall incorporate a keyway where required and shall be sufficiently rigid to produce a pavement with plan section.

1) Longitudinal tongue and groove joints of the specified type and size shall be constructed at locations shown on the plans or approved by the Engineer. Groove type joints shall be formed with approved metal forms that will produce a keyway with plan location and dimensions. The form shall remain in place for sufficient time to prevent slump and may be left in place with permission of the Engineer. Tongue type joints may be constructed without forms provided the plan section of the pavement and joint can be maintained.

2) Where tie bars are required, they shall be used with groove type joints. The bars shall be positioned before pavement consolidation.

F. PROTECTION AGAINST RAIN: In order that the concrete may be properly protected against the effects of rain before the concrete is sufficiently hardened, the Contractor will be required to have available at all times materials for the protection of the edges and surface of the unhardened concrete. Protective material may consist of sheets of burlap, paper, or plastic film. Planks or other material with suitable stakes that can be used as temporary forms shall also be on hand. It is the Contractor's responsibility to protect the pavement from damage due to rain. Failure to properly protect unhardened concrete may constitute cause for the removal and replacement of defective pavement at the Contractor's expense.

3.13 TOLERANCE IN PAVEMENT THICKNESS: It is the intent of these specifications that pavement shall be constructed strictly in accordance with the thickness shown on the plans. The thickness of the pavement will be measured, and where any pavement is found deficient in thickness, it may be compensated for at an adjusted unit price or shall be removed and replaced.

A. Metal plates will be placed on the subgrade at points selected by the Engineer in areas where the planer has cut or leveled off the subgrade or at any points where conditions are conducive to deficient pavement thickness. When the surface of the pavement has been finished to final grade, the Engineer will, for informational purposes, check the thickness of the completed pavement by measuring the distance from the surface of the pavement to the metal plates by use of a calibrated rod. The surface of the pavement shall be satisfactorily restored by the Contractor after thickness measurements have been made. The Contractor shall, if necessary, furnish a bridge to facilitate the taking of the measurements. The Engineer reserves the right to core drill the finished pavement to determine the thickness of the pavement. Cores may be drilled at the same locations as rod measurements or at any other locations. The Contractor may require check cores to verify thicknesses determined by the Engineer, and all costs of check core drilling shall be borne by the Contractor. If the check cores erroneously resulted in deductions for, or removal of, thin pavement, the cost of drilling the check cores will not be charged to the Contractor.

B. The thickness of the pavement will be determined by average caliper measurement of cores in accordance with the procedure established by the Engineer.

C. For the purpose of determining the constructed thickness of the pavement, 10 cores per mile will be taken at random intervals in each traffic lane. In addition, cores will be taken at all locations where thickness measurements taken during construction indicate a thickness deficiency sufficient to justify a deduction from the contract unit price, or at any other locations as may be determined by the Engineer. If the measurement of any core is deficient in excess of 2/10 inch from the plan thickness, additional cores will be taken at 20-foot intervals parallel to center line ahead and back of the affected location until the extent of the deficiency has been determined.

D. It will be assumed that each core is representative of the pavement thickness for a distance extending one-half the distance to the next core, measured along center line, or in the case of a beginning or ending core, the distance will extend to the end of the pavement section.

E. The drilling of cores in irregular areas, or on projects involving less than 2500 square yards of concrete pavement, may be waived by the Engineer. In this case the designed thickness will be considered as the measured thickness.

#### PART 4 - MEASUREMENT AND PAYMENT



4.1 MEASUREMENT: Pavement areas will be computed to the nearest 1/10 square yard. Final measurement of the completed pavement will not be made except for authorized changes during construction, or where appreciable errors are found in the contract quantity.

4.2 PAYMENT:

A. If any core measurement of thickness is deficient, the Contractor shall have the option of removing and replacing the pavement at his expense or of leaving the pavement in place and receiving the following deductions in payment.

	Deductions, Deficiency in Thickness Percent of Contract	Unit Price
0 inch to 2/10 inch	None	
Over 2/10 inch and not over 4/10	15	
Over 4/10 inch and not over 6/10	60	
Over 6/10 inch	100	

The above deductions will be applied to a section of pavement 20 feet long and extending from the edge of the pavement to a longitudinal joint or between longitudinal joints in that section of pavement in which the deficient measurement was found. Deductions for deficient thickness or damaged pavement may be entered on any estimate after the information becomes available.

B. If pavement which is deficient in thickness in excess of 6/10 inch may, in the judgment of the Engineer, seriously impair traffic service of the pavement, the Contractor will be required to remove the pavement and to replace it with one of a satisfactory quality and thickness which, when accepted, will be included in the pay quantity. No payment will be made for any costs incurred in the removal of the pavement deficient in thickness. If, in the judgment of the Engineer, there is no probability of immediate failure, he may allow the Contractor the choice of leaving the deficient pavement in place and receiving no payment or of removing and replacing the pavement as provided herein.

C. In removing pavement, it shall be removed from the edge to a longitudinal joint, or between longitudinal joints, and on each side of the deficient measurement until no portion of the exposed cross sections is more than 2/10 inch deficient, except that there shall not be less than 10 linear feet of pavement removed. If there remains less than 10 feet of acceptable pavement between the section that has been removed and a transverse contraction, expansion, or construction joint, the Contractor shall remove the pavement to the joint.

D. For marred surface areas or slightly damaged concrete that remains in the completed pavement, a minimum deduction of 20 percent of the contract unit price will be made for the areas affected. The deduction will be applied to a section of pavement extending from edge of the pavement to a longitudinal joint or between longitudinal joints in that section of pavement affected. If the length of the section affected is less than 10 feet, the deduction will be computed for 10 feet.

E. The contract unit price for portland cement concrete pavement will be considered as full compensation for all materials and other items including reinforcement entering into the construction

of the pavement, and no additional compensation will be allowed for any excess thickness.

F. The accepted quantities of portland cement concrete pavement will be paid for at the contract unit price with proper allowance made for any deductions for deficiency in thickness, low spots, or marred surface.

## SECTION 02533

### SIDEWALKS AND EXTERIOR CONCRETE SLABS

#### PART 1 GENERAL:

1.1 DESCRIPTION: This work shall consist of construction of all exterior curb and gutter, sidewalks, equipment pads and miscellaneous concrete slabs.

#### PART 2 PRODUCTS:

2.1 CONCRETE: 4000 psi ready-mixed concrete (5% to 8% air-entrained) in accordance with Division 3 of these specifications.

2.2 REINFORCEMENT: Steel bars and steel welded wire fabric as per Div. 3 of these specifications.

#### PART 3 EXECUTION:

3.1 Mix, place, reinforce, finish and cure concrete in accordance with Div. 3 of these specifications.

3.2 For sidewalks, pads and slabs. Provide 1/2" premolded asphalt expansion joint material full depth of concrete at intervals not exceeding 30 ft. and where abutting curbs, pavings and buildings. Provide 1/2" premolded asphalt expansion joint material as called for on curb and gutter details. See details for control and expansion joint placement.

3.2 Form edges. Moisten fill before placing concrete. Tool edges, cross-score to 1/4 depth of slab at uniform intervals as shown on plan. In areas not shown cross-scoring shall be on five foot centers. Form curb & gutter to elevations indicated. Reinforce as indicated.

3.3 Construct walks and stoops 4" thick. Place steel reinforcement 2" below top surface. Concrete shall be rodded and tamped at the form line to produce a consistent smooth edge when forms are removed.

3.4 Texture sidewalks, pads and slabs with "light broom finish" after hard steel trowel surfacing.

3.5 For curb and gutter broom finish by drawing fine-hair broom across concrete surface. Repeat operation if required to provide fine line texture.

#### PART 4 MEASUREMENT AND PAYMENT

##### 4.1 MEASUREMENT:

A. Measurement shall be on a square yard basis for each size and type of sidewalk, handicap ramp, concrete slab, equipment pad, concrete flume or paved approach.

##### 4.2 PAYMENT:

A. Payment for concrete sidewalks, handicap ramps, concrete slabs, equipment pads, concrete flumes and paved approaches shall be made at the unit price call out in the Bid Schedule for the sizes set forth, and shall be considered full compensation for all labor, equipment, materials, aggregate base and incidentals to provide the items complete and in place.

**Section 02710A - GAS MATERIALS**

**GENERAL**

All materials specified in these specifications are required to construct the system in accordance with these specifications. The materials shall be installed by the Contractor. All materials shall be approved by the Engineer prior to installation.

**STEEL PIPE**

All steel installed in the system shall be new and unused, manufactured in the United States and shall be qualified according to the USDS Code B31.8.

- 8.625" O.D. - API Grade B .219" W.T. - ERW - P.E. - CW
- 8.625" O.D. - API Grade B .188" W.T. - ERW - P.E. - CW
- 6.625" O.D. - API Grade B .188" W.T. - ERW - P.E. - CW
- 4.500" O.D. - API Grade B .188" W.T. - ERW - P.E. - CW
- 3.500" O.D. - API Grade B .188" W.T. - ERW - P.E. - CW
- 2.375" O.D. - API Grade B .154" W.T. - ERW - P.E. - CW
- 2.375" O.D. - API Grade B .188" W.T. - ERW - P.E. - CW

All pipe must be coated and wrapped to specifications. Special coating may be required per drawing or Engineering specification.

**PLASTIC PIPE**

Polyethylene pipe shall meet or exceed all requirements of ASTM D 2513, ANSI B 31, PE 3408 and DOT 192.121 & 192.123. The outside diameter and wall thickness shall conform as listed.

Pipe Dimensions

<u>Nominal Size</u>		<u>Outside Diameter</u>	<u>Minimum Nominal Wall Thickness</u>
3/4"	IPS	1.050"	.095"
1"	IPS	1.315"	.119"
1 1/2"	IPS	1.660"	.151"
2"	IPS	1.900"	.173"
2 1/2"	IPS	2.375"	.216"
3"	IPS	3.500"	.307"
4"	IPS	4.500"	.395"

Pipe shall be SDR11.

**VALVES**

All underground steel valves shall be installed in accordance with manufacturer's instructions and recommendations. Valves shall be non-rising stem gate valves with a 2" operating nut. Either flange or weld - ASA 300 lb.

All underground plastic valves shall be installed in accordance with manufacturer's instructions and recommendations. (Rockwell Polyvalve Ball Valve)

### **TRANSITION FITTINGS**

Where shown on the drawings or otherwise as may be required during construction, all joining of polyethylene pipe to steel shall be done using the pipe manufacturer's prefabricated transition fitting.

### **METER RISER**

Prefabricated meter risers shall be installed as shown on the drawings and shall be an anodeless service riser, 1" x 1" IPS, 30" Vert. X 30" Horiz., Wayne Manufacturing Inc., Shawnee, Oklahoma, or approved equal.

### **VALVE BOXES**

Valve boxes shall be installed at each line valve in the distribution system. Boxes shall be roadway screw type, 42@ shaft, with arch base, 22"-30" extension, with "GAS" marked on lid, per Drawing Detail. Contractor shall furnish two (2) valve operating wrenches, with socket to fit wrench nut.

### **SERVICE REGULATOR (LP & HP)**

A new service regulator shall be installed where the existing regulator is found to be defective per Drawing Detail.

### **SERVICE METER (LP & HP)**

The meter installation shall be by EMW Gas Association. The meter shall be as shown on the drawings.

### **SERVICE TEE**

All service lines shall be connected to the LP distribution system using polyethylene self-tapping punch valve services tees.

### **METER STOP**

A new meter stop shall be installed on each service as shown on the drawings. The stop shall be 125 or 300 psi maximum working pressure, iron body, Lock Wing tamper-proof, 2" x 2", black, per Drawing Detail.

### **LOCATOR WIRE**

A locator wire shall be laid along with all polyethylene pipe lines as indicated in the drawings. Locating wire shall be AWG #14 with vinyl insulation.

### **WARNING LOCATOR TAPE**

In addition to the locator wire, pipeline warning locator tape shall be laid along with all Polyethylene pipeline as indicated in the drawing. Warning locator tape shall be 4" wide and marked "Buried Gas Line Below" (Yellow)

### **PLASTIC FITTING**

All Elbows, tees, reducers, caps, tapping tees, transition fittings shall be of the same material as the pipe and will be butt-fusion fittings.

END OF SECTION

## Section 02730 - GRANULAR PAVING

### **PART 1 - GENERAL**

#### **1.01 SUMMARY**

- A. This Section includes crushed rock base and surface course.

#### **1.02 SUBMITTALS**

- A. Compliance submittals:
1. Submit as specified in Division 1.
  2. Includes, but not limited to, the following:
    - a. Test results from testing laboratory indicating compliance with the specifications.
    - b. Certification of conformance with the specifications.

#### **1.03 QUALITY ASSURANCE**

- A. Applicable Standards:
1. American Society for Testing and Materials (ASTM):
    - C117 - Material Finer than 76-um (No. 200) Sieve in Mineral Aggregates by Washing.
    - C131 - Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
    - C136 - Sieve or Screen Analysis of Fine and Coarse Aggregates.
    - D423 - Liquid Limit of Soils.
    - D424 - Plastic Limit and Plasticity Index of Soils.
  2. American Association of State Highway and Transportation Officials (AASHTO):
    - T99 - The Moisture Density Relations of Soils Using a 5.5-Pound (2.5 kg) Rammer and a 12-Inch (305 mm) Drop.

### **PART 2 - PRODUCTS**

- 2.01 GENERAL:** Crushed rock base and surface course shall consist of aggregate specified.

- A. Aggregate shall be crushed stone or crushed gravel, free from lumps or balls of clay or other objectionable matter, and reasonably free from thin and elongated pieces of dirt. Aggregates shall consist of angular fragments, durable and sound, and shall be reasonably uniform in density and quality.
- B. Percentage of wear shall not exceed 50 after 500 revolutions as determined by ASTM C131.
- C. Aggregate shall contain 75 percent by weight of pieces with two or more fractured surfaces if material is crushed gravel.
- D. Portion of aggregate passing No. 40 sieve shall be as follows:
  - 1. Liquid Limit: Not more than 25 determined by ASTM D423.
  - 2. Plastic Index: Not more than 6 determined by ASTM D424.
- E. Gradation shall not vary from low limit on one sieve to high limit on adjacent sieve or vice versa. Test by ASTM C136 and C117, and conform to the following table:

<i>Sieve Designation</i>	<i>Percent by Weight</i>	
	<u><i>Passing Square-Mesh Sieve</i></u>	
	<i>Surface Course</i>	<i>Base Course</i>
<i>1 -inch</i>	100	100
<i>1/2-inch</i>	--	60-90
<i>3/8-inch</i>	65*	--
<i>No. 4</i>	--	40-60
<i>No. 10</i>	5-25	--
<i>No. 40</i>	--	15-35

\*Indicates Maximum

### 2.03 EQUIPMENT

- A. General Requirements:
  - 1. Maintain all equipment, tools, machines used in the performance of the work required by this Section in a satisfactory working condition at all times.
  - 2. Equipment shall be subject to the approval of the Engineer.



B. Power Rollers:

1. Rollers shall be self-propelled, three wheel, or tandem-type with wheels equipped with adjustable scrapers.
2. Weight shall not be less than eight tons.

C. Tamping Rollers:

1. Rollers shall consist of one or more units arranged to adapt to uneven ground surfaces.
2. Rolling units of multiple type shall be pivoted on the main frame.
3. When fully loaded, rollers shall exert at least 300 psi on the combined areas of tamping feet in contact with the ground.
4. Each unit shall be equipped with a watertight cylindrical drum with length 48 inches or greater.
5. Tamping feet shall project not less than 7 inches from drum surface, with feet spaced not less than 10 inches, nor more than 10 inches measured diagonally from center to center.

D. Rubber-Tired Rollers:

1. Rollers shall consist of two axles on which are mounted not less than nine pneumatic-tired wheels, mounted so the rear group of tires do not follow in the tracks of the forward wheels but will be centered between the forward wheels.
2. The axles shall be mounted in a rigid frame provided with a loading platform or body suitable for ballast loading.
3. Inflate tires uniformly.
4. May be self-propelled.
5. Tow with pneumatic-tired tractors or other pneumatic-tired equipment.

E. Blade Graders shall be self-propelled with a wheelbase of not less than 15 feet, and a blade of not less than 10 feet.

F. Sprinkling equipment shall consist of tank trucks, pressure distributors, or other similar equipment designed to apply water uniformly and in controlled quantities to variable width of surface.

G. Hauling equipment shall consist of pneumatic-tired vehicles and dump bodies suitable for dumping materials in windows or layers on the subgrade.

- H. Tampers shall be mechanical (of an approved type) and hand-operated, weight not less than 50 pounds, and have a face area of not more than 100 square inches.
- I. Miscellaneous equipment shall consist of scarifiers, tractors, spring-tooth harrows, windrow equalizers, spreaders, and other equipment suitable for construction of select material.

## **PART 3 - EXECUTION**

### **3.01 GENERAL REQUIREMENTS**

- A. Stockpiles:
  - 1. Clear and level storage sites prior to stockpiling.
  - 2. Place in the manner and at locations designated by Engineer, providing separate stockpiles for materials from separate sources.
- B. Cold-Weather Limitations:
  - 1. Construction shall be prohibited when atmospheric temperature is below 35 degrees F.
  - 2. Do not place base course on frozen subgrade, or surface course on frozen base.
  - 3. Protect base course, surface course and subgrade in freezing weather and repair areas damaged by freezing by reshaping and recompacting.
- C. Preparation of Subgrade:
  - 1. Clear all vegetable matter such as trees, brush, down timber and other objectionable materials found on or above the surface.
  - 2. Scalp and dispose of all vegetable matter such as stumps, roots, buried trees and brush encountered below the surface of the ground or subgrade to a minimum depth of 6 inches.
  - 3. Grub and dispose of all vegetable matter such as stumps, roots, buried trees and brush encountered below the surface of the ground or subgrade to a minimum depth of 6 inches.
  - 4. When deleterious materials are encountered below ground line which may be detrimental to the proposed improvement, these shall be removed to a depth necessary to provide adequate support for the proposed improvement.
  - 5. The subgrade surface shall be brought to the specified lines, grades and cross-section by repeatedly adding or removing material and compacting to the specified density.
  - 6. The top 6 inches of subgrade for pavements shall be compacted to 95 percent of the maximum density of the material used as determined by ASTM D-698 and within a tolerance of plus 2 percent and minus 3 percent of the optimum moisture at maximum

density as determined by the moisture density curve obtained.

7. The newly finished subgrade shall be repaired from action of the elements or others. Any settlement or erosion that occurs prior to placing the pavement thereon, shall be repaired and the specific lines, grades and cross-section reestablished.

Any subgrade that has become unacceptable shall be reworked as necessary to restore the subgrade to shape, tolerance, density, and moisture content range for such density, immediately prior to the placing of the pavement.

- D. Grade Control: Establish and maintain by means of grade stakes placed in lanes parallel to the centerline of the area to be paved and spaced so string lines may be stretched between stakes.

### **3.02 MIXING AND PLACING OF MATERIALS**

- A. Deposit and spread material in a uniform layer and compact to the thickness indicated on the plans and as specified below. Spread material uniformly on the prepared subgrade from moving vehicles or spreader boxes.

1. Level material to the required contour and grades with blade graders.
2. Remove those portions of the layer which become segregated in spreading and replace with satisfactory mixture or remix as requested by Engineer.
3. Add water to the extent necessary to prevent segregation during mixing operations.
4. Add material to the mixture in such amounts and sizes as requested by the Engineer.

- B. Shaping and Compacting Mixed Materials:

1. Compact in layers no less than three nor more than seven inches thick.
2. Roll to specified compaction requirements throughout full depth of layer with tamping rollers, power rollers, rubber-tired rollers or combination.
3. Shape and smooth by blading and rolling with power roller or rubber-tired roller, or both.
4. Hand-tamp in places not accessible to rolling equipment.
5. Aerate by blade graders, harrows or other approved equipment when mixture is moistened by rain.

- C. Degree of Compaction:

1. Base compaction on weight per cubic foot of material passing 3/4-inch sieve and compact to at least 100 percent of density at optimum moisture.
2. Determine and control compaction in accordance with AASHTO T99.

D. Smoothness Test:

1. Surface shall show no deviation in excess of 3/8-inch in any 10 feet when tested with a 10-foot straightedge applied parallel with and at right angles to the centerlines of the paved area.
2. Correct any deviation in excess of this amount by loosening, adding or removing material, reshaping, watering, and compacting as requested by the Engineer.

**3.03 MAINTENANCE:** Maintain finished base course in a condition satisfactory to the Engineer until job completion or until surface is placed upon it.

**3.04 WAYBILLS AND DELIVERY TICKETS:** Submit daily to the Engineer during progress of work.

END OF SECTION

**SECTION 02830**  
**COMPOSITE FENCE**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Composite fencing.

**1.02 REFERENCE STANDARDS**

- A. ASTM D1037 – Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials.
- B. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. ASTM F1043 – Standard Specification for Strength and Protective Coatings on Steel Industrial Chain Link Fence Framework.
- D. ASTM F1083 – Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.
- E. AWPE E1 – Standard Method for Laboratory Evaluation to Determine Resistance to Subterranean Termites.
- F. AWPA E10 – Standard Method of Testing Wood Preservatives by Soil-Block Cultures.

**1.03 SUBMITTALS**

- A. Submittal Procedures.
- B. Product Data: Submit manufacturer's product data, including installation instructions.
- C. Samples: Submit manufacturer's samples:
  - 1. Composite fencing picket section.
  - 2. Standard color samples.
- D. Manufacturer's Certification: Submit manufacturer's certification that materials comply with specified requirements and are suitable for intended application.
- E. Material Certification: Submit recycled content material certification.
- F. Cleaning Instructions: Submit manufacturer's cleaning instructions.
- G. Warranty Documentation: Submit manufacturer's standard warranty.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing Products specified in this section with minimum five years documented experience.
- B. Installer Qualifications: Installers experienced with type of construction involved and materials and techniques specified.

- C. Single Source Entire fence system, and all associated accessories, fittings, and fasteners shall be obtained from single source.

## **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Delivery and Acceptance Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Storage and Handling Requirements:
  - 1. Store and handle materials in accordance with manufacturer's instructions.
  - 2. Keep materials in manufacturer's original unopened containers and packaging until installation.
  - 3. Store materials on flat, level surface.
  - 4. Protect materials during storage, handling, and installation to prevent damage.

## **1.06 WARRANTY**

- A. Warranty Period: 20 Years

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURER**

- A. Name of Manufacturer

### **2.02 COMPOSITE FENCES**

- A. Material: 100 percent, consisting of wood fibers, polyethylene, fillers and colorants.
- B. Certified: Scientific Certification Systems (SCS).
- C. Does not splinter or crack.
- D. Resists color fade.
- E. Does not yellow or fade to gray.
- F. Resists Insect Damage: AWPA E1.
- G. Resists Fungal and Moisture Damage. AWPA E10
- H. Temperature Range: Minus 20 degrees F to plus 130 degrees F.

### **2.03 FENCE MATERIAL**

- A. Privacy Fence: Pickets are installed side by side of the horizontal stringer.
  - 1. Top: Dog-eared (a picket with the corners cut off)
  - 2. Picket: 1" x 6" Fence x 6 feet or 8 feet. (Height per plan drawings)

3. Horizontal Stringer (runners, back rails): Stringers constructed of pressure treated 2" x 4" lumber. Six foot fence shall have three (3) stringers per section and Eight foot fence shall have four (4) stringers per section.
  - a. Installation spacing: 6 1/2" on top & bottom and 23" between stringers.
  - b. Install composite fencing plumb, level, straight, square, accurately aligned correctly located, to proper elevation and secure.
  - c. Attach pickets to rails with screws using three screws per picket/stringer.
  
4. Post: 4" x 6" Wood Post constructed using pressure treated wood set equally spaced between ends. Six foot fence shall not exceed post spacing of eight (8) feet on center and Eight foot fence shall not exceed post spacing of six (6) feet on center.
  - a. For 6 foot fence, post holes shall be 16 inch diameter by 40 inch minimum depth. For 8 foot fence, post holes shall be 16 inch diameter by 46 inch minimum depth. Add a minimum of 4" of gravel to bottom of hole.
  - b. For 6 foot fence, set posts in minimum of 36 inches of concrete. For 8 foot fence, set posts in a minimum of 42 inches of concrete. Posts should cure for a minimum of 72 hours.
  - c. Plumb and level all posts making sure to use a string to maintain alignment.
  - d. Attach post caps to top of posts in accordance with manufacturers supplied.
  
5. Accessories
  - a. Screws
    - i. Screws: Reference ICC ES AC 120 corrosion resistant or coated to match composite color.

## 2.04 GATES

1. Swing Gates: Gates shall be manufactured with a galvanized steel frame with attached pickets and designed to meet wind load and structural requirements for gate size and weight.
  - a. Gate sizes:
    - i. Height: Shall match fence height
    - ii. Width: Per Plan
  
2. Gate Posts:
  - a. Walk Gates:
    - i. 4" x 6" Treated Wood Post
    - ii. 4" Galvanized Square Steel Tube with welded cap
  - b. Drive Gates:
    - i. Galvanized Square Steel Tube with welded cap sized to meet performance requirements
  
3. Hardware:

- a. Hinges: Size and type as determined by manufacturer. Provide 2 hinges for each leaf up to 6 feet high and 1 additional hinge for each additional 24 inches in height or fraction thereof.
  - b. Latch: 3/4 inch diameter slide bolt to accommodate padlock.
  - c. For double gates provide 5/8 inch diameter center cane bolt assembly and strike with padlock provision.
  - d. Fasteners: Stainless steel bolts of type, size, and spacing as recommended by fence manufacturer for specific condition.
4. Footings: Cast concrete footings in accordance to drawing - Cast-in-Place Concrete as detailed on Drawings and approved shop drawings.
- a. Footing dimensions shall depend on gate height, post spacing, and other project conditions as determined by the gate manufacturer.
    - i. Footing Diameter: 12 inches minimum – 6' height  
16 inches minimum – 8' height
    - ii. Footing Depth: 36 inches minimum – 6' height  
42 inches minimum – 8' height
    - iii. Post Embedment: 4 inches minimum concrete around the sides and beneath post bottom.

END OF SECTION



## **Section 02950 - SURFACE RESTORATION**

### **1.01 GENERAL**

All work shall conform to the latest Highway Standard Specification. This section covers surface obstructions which Contractor removes and replaces such as pavement, drives, curbs, gutters, sidewalks, and similar surfaces as required to perform the work. The work of this section consists of furnishing all materials, labor, equipment and incidentals for the specified herein.

### **1.02 QUALITY ASSURANCE**

The words "Standard Specifications" as used herein refer to the State Department of Highways, Division of Highways, State of New Mexico "Standard Specifications for Highway and Bridge Construction".

### **1.03 PRODUCTS**

- A. Bedding. Bedding shall be as specified on the detail drawings.
- B. Backfill. Backfill shall not be placed in water or mud. Clean graded rock or frozen material shall not be used as backfill. Backfill material shall be as specified on the detail drawing.
- C. Bituminous Materials:
  - 1. Asphalt Cement: This material shall be homogenous and free from water, and shall not, on heating, foam below the specified minimum flash point. It shall be prepared by refining crude petroleum by suitable methods.
  - 2. Concrete: Reference Section, "Concrete Section 03300"

### **1.04 EXECUTION**

#### **ASPHALT CONCRETE INCLUDING BASE AND GRAVEL SURFACING**

- A. Remove, dispose of and restore to original or better condition asphalt concrete pavement, curbs, drives, sidewalks and gravel surfacing.
  - 1. Remove pavement, drive or sidewalk to clean straight lines.
  - 2. Saw cutting is required if a clean straight line cannot be obtained by other methods.
  - 3. As indicated on detail sheet, if the street cut is within 18 inches of an existing joint or cut, it shall be extended to that joint or cut. The asphalt surface shall be tack coated to the base.

## CONCRETE SURFACING

- A. Remove, dispose of and restore to original or better condition concrete drives, curbs, gutters, sidewalk and similar structures.
  1. Remove concrete to neatly sawed edges or the existing smooth joint lines.
  2. Saw concrete to a minimum depth of 2 inches.
  3. If saw cut would fall within 3 feet of construction joint, cold joint, expansion joint, or edge, remove concrete to the joint.
  4. Sub-grade compaction- refer to detail sheet.
  5. Restore to existing alignment, dimensions and grade.
  6. Match existing expansion joints and contraction joints.
  7. Restore all surface improvements to the same thickness as existing, but in no case less than the following:
    - a. Driveway and slab - 6" inches
    - b. Patio - 4" inches
      - i. Gutter - 6" inches measured a flow line.
      - ii. Sidewalk - 4" inches.
      - iii. Concrete shall be broom finished parallel to traffic flow and cured in accordance with Section 03300, Concrete. The surface shall be protected from damage or defacement.

## GRAVELED AREAS

All graveled areas, or areas otherwise surfaced for parking or for any other reason, which are cut or damaged in the construction, shall be returned to a condition equal or better to that which existed before the construction. All materials used shall be of equal or better quality to the materials used in the original construction of the surface.

END OF SECTION

## SECTION 03300

### REINFORCED CONCRETE

#### PART 1 GENERAL

##### 1.01 SUMMARY

The Contractor shall furnish the materials and labor for all reinforced concrete work as shown on the drawings or specified herein which are not specifically included in other divisions. The construction shall include the excavation and backfilling necessary to complete the work.

#### PART 2 PRODUCTS

##### 2.01 MATERIALS

###### A. Concrete.

The final in-place concrete shall be Class "A", 4000 psi (minimum) at 28 days, air entrained concrete. Either transit mix or job mixed concrete may be used.

The concrete mix shall contain not less than six (6) sacks of cement per cubic yard and not more than five (5) gallons of water per sack of cement.

###### B. Transit Mix Concrete

All transit mix or ready-mix concrete shall be prepared and delivered in conformance with ASTM C94-20.

All materials used in the preparation of transit mix concrete shall be as specified herein. The Contractor shall make all arrangements required to satisfy the Engineer that materials comply with these specifications. The Contractor shall arrange for the Engineer or his representative to have free access to the mix plant for sampling or testing materials at all times when work is being performed for this project.

All such concrete shall utilize air entraining Portland Cement to provide  $5\% \pm 1\%$  air entrainment. An additional admixture, "Pozzolith" or "P.D.A.", shall be used in accordance with the manufacturer's recommendations with no reduction in cement content.

The mixer shall be loaded in accordance with the manufacturer's capacity rating. The mixing speed of the revolving drum type mixer shall not be less than 4 rpm nor greater than a speed resulting in a peripheral velocity of the drum of 225 feet per minute when the drum is loaded at normal rated capacity, the number of revolutions of the drum at mixing speed shall not be less than 50 nor more than 100 after all materials and water have been charged into the drum. All revolutions after 100 shall be at agitating speed.

During the months of June, July, August and September, the concrete shall be delivered to the site of work and discharge shall be completed within one-half ( $\frac{1}{2}$ ) hour after loading the water into the mixer. The time may be increased to one hour during other months of the year.

Where transit mixers are required to travel over thirty (30) miles, the mixing water shall not be

added to the batch until reaching the job site. The batch shall be mixed at least eight (8) minutes prior to depositing. Water shall be accurately measured.

#### C. Portland Cement.

Portland cement for air entrainment shall be used for all transit mix and job mixed concrete. The cement shall conform to the "Standard Specifications for Portland Cement", ASTM C150-20, Type 1A.

Source. Cement produced by the same mill shall be used throughout the project unless otherwise approved by the Engineer. Cement from different mills shall not be used in the same footing under any circumstances.

Inspection and Tests. The Contractor shall furnish for each shipment of cement a copy of the Certified Mill Test Reports or a Certified Test Report conducted by an independent inspector showing that the cement has been tested and conforms to ASTM C150-20, Type 1A. The tests shall conform to applicable ASTM Standards. The costs of performing such tests are to be included in the price bid per cubic yard for concrete.

Acceptance or Rejection of Cement. The acceptance or rejection of cement shall rest with the Engineer, and any cement failing to meet the requirements specified herein may be rejected at his direction. All rejected cement shall be plainly marked for identification, shall be immediately removed from the work, and shall not again be offered for inspection. Cement kept in storage for several months may be subject to repeated tests if required.

Cement Packages. Cement for job mixed concrete shall be delivered in strong cloth or paper bags. No cement shall be used and no cement shall be inspected unless delivered in the original package with the brand and name of the manufacturer plainly marked thereon. Each bag of cement shall contain approximately ninety-four (94) pounds of cement, net weight.

Cement Storehouses. The Contractor shall provide at the site of the work a suitable weather-tight building, or buildings, having a tight floor properly blocked or raised from the ground, for the storage of cement. The building shall be large enough to permit keeping on hand a supply of cement in sufficient quantity to prevent delays or interruptions to the work which might be due to the lack of cement. The cement shall be stored in such manner as to permit easy access for the proper inspection and identification of each shipment. Cement in bags shall not be stacked to a height in excess of seven feet (7'). Suitable accurate scales shall be provided by the Contractor for weighing the cement. After the cement has been delivered to the job, the Contractor shall not remove any of the cement to any other job or dispose of any of this cement in any way without the prior approval of the Engineer.

#### D. Aggregates.

Aggregates for transit-mix or job mixed concrete shall utilize aggregates obtained from approved sources. The Contractor shall furnish a certificate stating: 1) that aggregates are from sources, 2) the characteristics of the fine and coarse aggregates, and 3) the gradation of each aggregate class to be used in this project.

If approved sources are unavailable, materials may be supplied from conditional sources which meet requirements of the applicable specifications. Such materials will be accepted on the basis of the requirements specified for sand, fine and coarse aggregates, and if cylinder made by experimental mixes develop a compressive strength of not less than four thousand (4,000) pounds per square inch for Class "A" concrete, as determined from test cylinders broken at 28 days which have been made, cured and broken in

conformance with the testing procedures specified herein.

The Contractor shall submit samples and certified test reports for aggregates from conditional sources. The sample shall weigh not less than ten (10) pounds. The certified test shall include: 1) the location of the source, 2) the characteristics of the fine and coarse aggregates, 3) the gradation of each aggregate class to be used in this project, and 4) the ability or deficiency of the aggregate to meet the applicable ASTM specifications. Aggregate from conditional sources shall not be used without the Engineer's written approval.

Fine Aggregate. Fine aggregate for the concrete shall be the best available natural sand and shall be composed of sharp, clean, hard, durable grains and shall be clean and free from lumps, clay balls, soft or flaky material, salt, alkali, organic matter, and loam.

Fine aggregates shall conform to all provisions and test methods of ASTM C33-18, latest revision.

Fine aggregates shall be graded from coarse to fine, approximately within the limits shown in the following table:

Screen Size	Percent Passing (By Weight)
3/8"	100
#4	95 - 100
#8	80 - 100
#16	50 - 85
#30	25 - 60
#50	10 - 30
#100	2 - 10

Fine aggregate shall not contain more than three percent (3%) by weight of material which can be removed by standard decantation test. The sum of the percentage of coal, clay lumps, soft fragments, and other deleterious substances shall not exceed five percent (5%) by weight.

All fine aggregate subjected to color tests for organic impurities and producing a color in sodium hydroxide solution darker than standard color shall be rejected.

Fine aggregate shall, when subjected to the mortar strength test, have a tensile or compressive strength equal to that developed by mortar of the same proportions and consistency made of the same cement and standard Ottawa sand.

Coarse Aggregate. Coarse aggregate shall consist of the best available crushed limestone, or other inert material approved by the Engineer.

Coarse aggregate shall be graded from coarse to fine, approximately within the limits shown in the following table:

Standard Square Mesh Screens - Size -	Percent Passing (By Weight)
1-1/2"	100
1"	95-100
3/4"	...
1/2"	25-60
#4	0-10

Finer aggregate than the above shall be used for special construction where specified or instructed by the Engineer.

Coarse aggregate shall conform to Standard Specifications, ASTM C33-18, except as to gradation.

If required, the Contractor shall furnish test certificates that the aggregates meet the above requirements.

In case the concrete resulting from the mixture of the aggregates is not of a workable character, or does not make the proper finished surface, the Engineer may require a different grading in order to secure the desired results.

E. Water.

All water used in mixing mortar or concrete shall be free from acid, alkali, oil, salt, vegetable or other matter in sufficient quantity to be injurious to the finished project, and shall be reasonably clear.

F. Admixtures.

All transit mix concrete shall include "Pozzolith" or "P.D.A." in accordance with the manufacturer's instructions and with no reduction in the cement proportion.

G. Steel Reinforcement.

Reinforcing steel shall be manufactured from new billet steel, Grade 60, and shall conform to ASTM A615. Wire mesh shall conform to ASTM A185. All reinforcement shall be unpainted, uncoated, clean and free of rust or scale before being placed.

This item includes anchor bolts with galvanized ends and nuts, as shown on a general plan. Anchor bolts shall conform to ASTM F1554, Grade 55.

H. Cushion Forms.

Cushion forms for the purpose of reducing forces on concrete due to soil expansion shall be provided as shown on the drawings. These forms shall be of sufficient strength to allow placement of the concrete and shall be installed in accordance with the manufacturer's instructions.

Cushion forms shall be equal to those constructed of asphalt-impregnated BLACBORD and

manufactured by the JAYHAWK FIBRE FORM COMPANY of Lawrence, Kansas, to the proper dimensions as shown on the drawings.

All surfaces in contact with concrete shall be coated with a factory applied polyethylene film, unless covers are to be left in place.

## **PART 3 EXECUTION**

### **3.01 CONSTRUCTION**

General. The Contractor shall exercise due care and utilize proper procedures to insure that final, in-place concrete is Class "A", 4000 psi minimum air entrained concrete.

Preliminary Mix Approval. The Contractor shall submit data and obtain the Engineer's approval of materials and mix prior to placing any concrete. Data on the cement, aggregate, admixture, proposed mix, design strength and a Certified Test Report showing the tested 7 day and 28 day compressive strength of proposed concrete shall be submitted at least 30 days prior to placement of any concrete. Additional tests may be ordered by the Engineer if the Certified Test Report shows low marginal strengths. The cost of these tests shall be borne by the Contractor.

Testing of Concrete. The Contractor shall take test samples from the concrete as it is being placed on the job. Test cylinders shall be prepared in conformance with ASTM C172 "Sampling Fresh Concrete" and ASTM C31 "Making and Curing Concrete Compressive.....Test Specimens in the Field." Unless directed otherwise by the Engineer, not less than three test cylinders shall be made for each concrete pour in this project. A minimum of one test cylinder for each transit mix truck or each ten cubic yards of job mixed concrete shall be made. Data regarding the source of concrete, placement location of the batch and other batch data shall be recorded on the cylinder. At least one cylinder for each day's pour shall be tested at seven (7) days to verify the initial strength prior to placement of structures or equipment upon the concrete. Other cylinders shall be tested at 28 days. The Contractor is advised that the results of backup cylinders tests may be submitted if the primary cylinder test results do not meet specifications.

The Contractor shall have the cylinders tested at a testing laboratory approved by the Engineer. Three copies of Certified Test Reports stating the compressive strength of the concrete and all cylinder data shall be furnished to the Engineer.

Excavation. Care shall be taken that all footings shall be placed on undisturbed soil at the elevation shown on the drawings, and any excavation made below these elevations shall be replaced with concrete at the Contractor's expense. Where excavations are unusually dry, they shall be wetted thoroughly before concrete is placed.

Mixing. Job mixed concrete shall be mixed in an approved batch machine or mixer. The ingredients shall be accurately measured before being placed in the mixer. Measuring boxes or other approved measuring before being placed in the mixer. Measuring boxes or other approved measuring apparatus shall be used so that the proportions can be accurately determined. The quantity of water to be added, which will vary with the degree of dryness of the material and with the weather conditions, shall be accurately measured for each batch of concrete. Means shall be provided by which a measured quantity of water can be introduced at any stage of the process. The mixing shall be done in a thorough and satisfactory manner and shall continue until every particle or aggregate is completely covered with mortar. The mixing time for each batch shall be not less than one (1) minute after the materials are in the mixer. The entire contents of the drum shall be discharged before recharging.

Retempering of concrete which has partly hardened will not be permitted.

Slump. The concrete at the time of placement shall have slump not greater than four (4") inches or less than two (2") inches when tested in accordance with ASTM C143, "Standard Method of Test for Slump of Portland Cement Concrete."

Air Entrainment. The concrete at the time of placement shall have air entrainment in the amount of  $5\% \pm 1\%$  when tested in accordance with ASTM C231-17a.

Consistency. All reinforced concrete which is required to be spaced or puddled in forms or around reinforcement steel shall be of such consistency that:

1. All aggregates will float uniformly throughout the mass, without settling or segregation.
2. When dropped directly from the discharge chute of the mixer, it will flatten out at the center of the pile but will stand up at the edges, the pile spreading from internal expansion and not by flowing.
3. It will slow sluggishly when tamped or spaded.
4. It can be readily puddled into the corners and angles of forms and around reinforcement steel.
5. It can be readily spaded to the bottom of the pour or to a depth of several feet at any time within thirty (30) minutes after placing.

A desirable consistency is one which results in a very slight accumulation of water at the top of a layer several feet in thickness, but with no segregation or accumulation of laitance.

If, in the opinion of the Engineer, the concrete contains excessive water or fails to meet the specified slump, such concrete shall not be used in this project and shall be discharged as waste material.

Cushion Forms. The top and side cover joints of all cushion forms shall be taped prior to pouring of concrete.

Prior to placement of cushion forms, materials shall be stored off the ground under a weather-proof covering, and thoroughly ventilated to prevent steaming.

The Contractor shall protect the cushion forms by providing necessary walkways to prevent point loading which may damage forms.

Just prior to placing of concrete, cushion forms shall be given a final inspection for damage and placement, and concrete shall not be placed until necessary corrections are made.

Forms. Forms shall be designed and constructed that they may be removed without injuring the concrete.

The material to be used in the forms for exposed surfaces shall be sized and dressed lumber or metal in which all bolt and rivet heads are countersunk.

Concrete Placement. Placement of concrete shall be accomplished as soon as possible for each



footing excavation to minimize (a) the chances of sloughing and (b) changes in the state of stress of the foundation soils. Concrete shall not be placed without the approval of the Engineer. Footing excavations shall not be left open overnight without concreting.

Drilled Footing Inspection. Each drilled footing excavation will be inspected by the Engineer prior to placing concrete. The inspection will be made to determine the following:

1. That the bell has been under reamed to the specified dimensions at the correct depth established by the drawing.
2. That the bell is concentric with the pier shaft.
3. That the pier shaft has been drilled plumb within specified tolerances along its total length.
4. To assure that excessive cuttings, buildup and soft, compressible material have been removed from the bottom of the excavation.

In either case, a plain smooth surface of the desired contour must be obtained. Undressed lumber may be used for backing or other unexposed surfaces, except inside faces of conduits.

The forms shall be built true to line and braced in a substantial and unyielding manner. They shall be mortar tight, and if necessary to close cracks due to shrinkage, shall be thoroughly soaked in water. Forms for re-entrant angles shall be filleted, and for corners shall be chamfered. Dimensions affecting the construction of subsequent portions of the work shall be carefully checked after the forms are erected and before any concrete is placed. The interior surfaces of the forms shall be adequately oiled with a non-staining mineral oil to insure the non-adhesion of mortar.

Form lumber which is to be used a second time shall be free from bulge or warp and shall be thoroughly cleaned. The forms shall be inspected immediately preceding the placing of concrete, any bulging or warping shall be remedied and all dirt, sawdust, shaving, or other debris within the form shall be removed.

No wooden device of any kind used to separate forms shall be permitted to remain in the finished work.

Temporary openings shall be placed at the bottom of the column and wall forms and at other points where necessary to facilitate cleaning and inspection immediately before depositing concrete.

Forms shall not be removed without the express approval of the Engineer.

Unformed Concrete. Unformed concrete shall be poured against undisturbed earth. Excavation for such concrete shall be made to neat lines as shown on the drawings. Any excess excavation shall be filled with concrete by and at the expense of the Contractor.

Placing Reinforcement. All reinforcement, when placed, shall be free from mill scale, loose or thick rust, dirt, paint, oil, or grease and shall present a clean surface.

When bending is required, it shall be accurately and neatly done.

All reinforcing shall be placed in the exact position shown on the plans and shall be held firmly in position by means of approved metal spacers and supports by wiring to the forms, and by wiring the bars

together at intersections with approved wire ties so that the reinforcement will not be displaced during the depositing and compacting of the concrete.

The placing and fastening of reinforcement in each section of the work shall be approved by the Engineer before any concrete is deposited in the section.

Care shall be taken not to disturb the reinforcement after the concrete has taken its initial set.

Placing Concrete. Before beginning a run of concrete, surfaces of the forms, reinforcing steel, and concrete previously placed, shall be thoroughly cleaned of hardened concrete or foreign materials. Forms shall be thoroughly wetted or oiled.

Concrete shall be placed in the forms immediately after mixing. It shall be so deposited that the aggregates are not separated. Dropping the concrete any considerable distance, depositing large quantities at any point and running or working it along the forms, or any other practice tending to cause segregation of the ingredients will not be allowed. The concrete shall be compacted by continuous tamping, spading, slicing, or vibrating. Care shall be taken to fill every part of the forms, to work the coarser aggregate back from the face, and to force the concrete under and around the reinforcement without displacing it. The concrete shall be deposited in continuous horizontal layers, and whenever practicable, concrete in footings shall be deposited continuously for each monolithic section of the work. Chutes used for conveying shall be mortar tight.

For inaccessible portions of the forms, a mechanical tamper or vibrator should be used.

Work shall be so arranged that each part of the work shall be poured as a unit if this is possible. Where necessary to stop pouring concrete, the work shall be brought up in level courses and against a vertical stop board.

The placing of concrete under water may be done only with the express approval of the Engineer and by special approved methods.

Placing in Cold Weather. No concrete shall be placed without the specific permission of the Engineer when the air temperature is at or below thirty-five (35°) degrees Fahrenheit.

If concreting in freezing weather is permitted by the Engineer, care shall be taken to prevent the use of any frozen material. In addition to adequate provision for protecting and concrete against chilling or freezing, the Contractor shall be required to heat the water and aggregate so that when deposited in the forms, the concrete will have a temperature of not less than fifty (50°) degrees Fahrenheit nor more than eighty degrees (80°) Fahrenheit. The concrete shall be adequately protected so as to maintain this temperature for a minimum of seventy-two (72) hours after it has been placed and a temperature above thirty-two (32°) degrees Fahrenheit for a period of two (2) additional days. The work shall be done entirely at the Contractor's risk.

No chemical or other foreign matter shall, without the approval of the Engineer, be added to the concrete for the purpose of preventing freezing.

Placing in Hot Weather. No exposed concreting shall be done in temperature greater than 100 degrees F and the concrete temperature shall not exceed 85 degrees F. Spray and/or shade the aggregate piles and cool mixing water as required to maintain proper concrete temperature. The placed concrete shall be covered, protected, and cooled so as to maintain a temperature below 100 degrees F.

The mixing time shall be held to a minimum as shall the time between mixing and placement. Forms, reinforcing, subgrade and the surrounding area shall be sprinkled with cold water. For slabs on ground, the Contractor shall dampen the subgrade the evening before concreting. During extremely hot periods, the Engineer may require pouring of concrete in evening hours or nighttime. Under extreme conditions, the Engineer may require that the mixing water be cooled and the aggregate sprayed with cold water.

During the curing period, exposed surfaces shall be carefully protected from drying. Water shall be applied to formed surfaces while forms are still in place.

Provision shall be made for maintaining concrete in a moist condition for a period of at least seven (7) consecutive days after the placement of the concrete.

Construction Joints. Construction joints shall be located as shown on the plans and at other points as may be necessary during construction, provided that the location and nature of additional joints shall be approved by the Engineer. In general, joints shall be located at points of minimum shear, shall be perpendicular to the principal lines of stress, and shall have suitable keys having areas of approximately one-third (1/3) of the area of the joints.

In resuming work, the surface of the concrete previously placed shall be thoroughly cleaned of dirt, scum, laitance, or other soft material, and shall be roughened. The surface shall then be thoroughly washed with clean water, after which concreting may proceed if approved by the Engineer.

Epoxy shall be applied to construction joints when specified and if required at other location designated by the Engineer.

Surfaces to receive epoxy shall be cleaned and prepared as outlined above. Mechanical abrasion, sandblasting or acid etching and thorough rinsing may be required to create rough surfaces.

The epoxy shall be mixed in strict accordance with the manufacturer's directions and all epoxy mixed shall be used within a maximum period of 30 minutes. The epoxy shall not be mixed prior to the time concrete is on hand for the finish pour.

Apply epoxy mixture by trowel. Undercut perimeter of patch when possible to avoid feathering.

Finish of Concrete Surfaces. All surfaces exposed to view shall be free from conspicuous lines, affects, or other irregularities caused by defects in the forms. If, for any reason, this requirement is not met, or if there are any conspicuous honey-combs, the Engineer may require the correction of the defects by rubbing with carborundum bricks and water until a satisfactory finish is obtained. Surfaces shall be finished to a smooth hard finish by float if not otherwise specified. All surfaces shall be sloped to allow for drainage.

Immediately after removing the forms, all wires or other exposed metal shall be cut back of the concrete surface, and the depressions thus made and all honey-comb and other defects shall be pointed with mortar and then rubbed smooth. If the Engineer deems any honey-comb or other defect to require such treatment, the defective concrete shall be cut out to a depth sufficient to expose the reinforcement and to afford a key for the concrete replacing that cut out.

All exposed concrete surfaces shall be finished to an elevation one foot (1') below finished grade, using a carborundum stone and clear water only.

The top surfaces of all foundations shall be accurately finished to grade. Special attention is to be

given the bearing plate areas. Each column footing is to be checked with a template of the four (4) bearing plates fastened to a rigid square frame to assure even bearings and accurate elevations.

Care shall be exercised to prevent depressions that will hold water on all level surfaces.

Curing Concrete. Exposed surfaces of concrete shall be moist cured by covering with polyethylene film.

The Engineer may require the frequent wetting of the concrete, and the use of additional means to protect it from the direct rays of the sun.

Removal of Forms. Forms shall remain undisturbed until the concrete has gained sufficient strength to retain its shape and avoid damage during removal. In no case shall forms be removed in less than three (3) days after placement.

Backfilling. Backfilling shall not begin without prior approval by the Engineer.

Backfill shall be carefully placed to avoid any damage to or movement of the footings and shall be thoroughly tamped with a mechanical tamper.

## **PART 4 MEASUREMENT AND PAYMENT**

### **4.01 MEASUREMENT**

Measurement for the Concrete installation will be made at the Contract unit price per Cubic Yard or Square Yard of coverage, complete in place, at each location installed and accepted by the Engineer.

### **4.02 PAYMENT**

All costs incurred by the Contractor by reason of compliance to satisfy the requirements under this section shall be considered incidental to and completely covered by the Contract unit price for the following bid items:

<u>Bid Items</u>	<u>Description</u>	<u>Unit(s)</u>
	Reinforced Concrete Canopy Footing & Conduit	Cubic Yard
	Reinforced Concrete Pad	Square Yard

END OF SECTION

## SECTION 04100

### CEMENT AND LIME MORTAR

#### PART 1 GENERAL

1.01 DESCRIPTION: The work shall consist of furnishing all labor, materials, equipment, and tools necessary for all cement and lime mortar work for masonry construction as shown on the plans or as necessary to complete the project. All mortars shall be cement lime mortar unless otherwise specified herein.

1.02 RELATED SECTIONS:

A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

1. Section 04200, Unit Masonry

#### PART 2 PRODUCTS

2.01 WATER: Only potable water is approved.

2.02 PORTLAND CEMENT: Portland cement shall conform to the Standard Specifications of the ASTM C150, Type 1, latest edition. White Portland cement shall be in conformity with U.S. Government Federal Specifications, SS-C-181, latest edition. Portland or White Portland cement shall be standard product, name of which shall be submitted to the Engineer for approval.

2.03 HYDRATED LIME: Hydrated lime shall conform to the Standard Specifications for the ASTM C6, latest edition. Quick lime shall conform to the Standard Specifications of the ASTM C5, latest edition.

2.04 SAND: Sand (or fine aggregate) shall conform to the following:

A. Sand for mortar work shall be capable of developing 95% of tensile strength of Ottawa sand. It shall not contain deleterious substances exceeding the following percentages:

- 1.) 0.25 of 1% coal and lignite,
- 2.) 1% of clay lumps
- 3.) 1% of shale, alkali, coated grains, or flaky particles.

B. Sand shall be graded from coarse to fine, with fine grains predominating as follows: For joints of average thickness, 100% of sand shall pass through #8 mesh sieve and no more than 15% to 35% through #50 mesh sieve.

C. Sand for pointing any cut stone work shall be as specified for masonry work except that for joints one-fourth (1/4) inch to three-eighths (3/8) inch sand shall pass a #12 mesh sieve and for finer joints shall pass a finer sieve.

### **PART 3 EXECUTION**

3.01 DELIVERY AND STORAGE: All materials shall be so delivered, stored, and handled as to prevent the inclusion of foreign materials and the damage of materials by water or breakage. Package materials shall be delivered and stored in original packages until ready for use. Package or materials showing evidence of water or other damage shall be rejected. All materials shall be of the respective qualities specified herein.

3.02 PROPORTIONS: Cement mortar shall be proportioned in the amount of one (1) part Portland cement to three (3) parts sand, tempered with lime putty not over twenty-five (25) percent of cement volume. All measurements are by volume. All mortars shall be highly plastic with high water retentivity.

3.03 MIXING: Mortar shall be thoroughly machine mixed for at least five (5) minutes after all material is in the mixer.

3.04 PLACEMENT: Mortar shall be used and placed in final position within two and one-half (2 1/2) hours after mixing when the air temperature is 80 degrees F., or higher. Mortar shall be used and placed in final position within three and one-half (3 1/2) hours when the air temperature is less than 80 degrees F. Mortar not used within these time limits shall be discarded.

3.05 RETEMPERING: Mortars that have stiffened within the time intervals as determined in paragraphs 3.02 and 3.03 above because of evaporation of moisture may be re-tempered to restore workability by adding water. Enough water may be added as is necessary to produce proper workability.

3.06 MORTAR FOR TUCK POINTING JOINTS: To reduce subsequent shrinkage in tuck pointed joints, the material shall be mixed with just enough water to make a damp mixture. This semi-dry mixture shall be left untouched for one to two hours, after which it shall be remixed and water added to obtain proper workability.

### **PART 4 MEASUREMENT AND PAYMENT**

#### **4.01 MEASUREMENT AND PAYMENT**

Mortar work shall be not be measured or paid for as a separate item but shall be included as part of the item listed below for which it is part of.

END OF SECTION

## **SECTION 04200**

### **UNIT MASONRY**

#### **PART 1 GENERAL**

##### **1.0 DESCRIPTION**

Provide, in place, all concrete masonry unit (CMU) or haydite concrete block work and all brick masonry as shown on the drawings, including:

- A. Exterior walls.
- B. Interior partitions.
- C. Exterior and interior decorative block walls.
- D. Masonry columns, piers, and pilasters.
- E. Cutting and patching of masonry to accommodate the work of all other trades.
- F. Cleaning and pointing of masonry work.

##### **1.02 OTHER ELEMENTS**

Securely build and bed into masonry the materials furnished by other trades, including:

- A. Through-wall flashing.
- B. Steel lintels.
- C. Sleeves and thimbles for piping of all trades.
- D. Louvers and grilles.
- E. Horizontal and vertical reinforcing rod where required.
- F. Relief angles for veneer material.
- G. Metal ties for veneer of other materials.

#### **PART 2 PRODUCTS**

##### **2.01 MASONRY BLOCKS**

Load-bearing concrete or haydite concrete masonry unit (CMU) blocks shall be used wherever loads are to be carried and shall conform to the Standard Specifications of ASTM C-90, latest edition. Blocks shall be molded accurately by machine, of uniform size, weight, strength, density, surface texture, and color. Small amount of sand shall be allowed in block composition to facilitate manufacturing units. Blocks shall be as manufactured by an approved block manufacturer. The average percentage of moisture in the units at the time of setting shall not exceed forty (40) percent of their total absorption. After the blocks

have been formed they shall be steam cured for not less than eight (8) hours at not less than one hundred twenty (12) pounds or more than one hundred fifty (150) pounds steam pressure at temperatures of 350 to 360 degrees. F. The blocks shall be sealed in the steaming cylinders for at least five (5) hours. Pressure curing requirements may be waived at the Engineer's discretion. Size of blocks shall be eight (8) inches in height by sixteen (16) inches in length by four (4) inch, six (6) inch, eight (8) inch, or twelve (12) inch widths, as required. Use special blocks for all corners, piers, jambs, sash, pilasters, caps, and other special conditions as shown on the drawings.

## 2.02 CONTROL JOINT MATERIAL

Rubber control joint material shall be installed in masonry walls where indicated on the plans. Control joint shall be DUR-O-WAL Regular "Rapid" control joint, HOHMANN & BARNARD Quadri-Seal, WILLIAMS PRODUCTS, INC. Block Seal, or approved equal.

## 2.03 REINFORCING

Masonry wall reinforcing shall be truss type joint reinforcing of proper size and shape as required for wall sizes and types as shown on the drawings, and as manufactured by DUR-O-WAL, CONTINENTAL STEEL, AA WIRE PRODUCTS COMPANY, or approved equal.

## 2.04 FLASHING

Through-wall flashing shall be copper fabric flashing, three (3) ounce electrolytic sheet copper bonded to asphalt saturated cotton fabric on both sides and shall be as manufactured by METROPOLITAN ROOFING SUPPLIES CO., INC., Bronx, New York; AFCO PRODUCTS, INC., Somerville, Massachusetts; ASCO PRODUCTS, INC., Sanford, Maine, or approved equal.

# **PART 3 EXECUTION**

## 3.01 WORKMANSHIP

Workmanship shall conform to the requirements of Local Building Code, Building Code Requirements for Masonry-American Standard A.41.1, the instructions from each material manufacturer, applicable published recommendations of the National Concrete Masonry Association, The Structural Clay Products Institute, and the requirements of these specifications.

## 3.02 ENVIRONMENTAL CONDITIONS

Do not lay masonry when the temperature of the outside air is below forty (40) degrees F. unless suitable means, approved by the Engineer, are provided to heat materials, protect work from cold and frost, and insure that mortar. Before laying, wet all brick, except those having absorption of less than five (5) percent.

## 3.03 DIMENSIONAL ACCURACY

All work shall be plumb and true and built accurately to the dimensions shown. All masonry shall be set in running bond, unless stacked bond is called for on the drawings. Cut masonry accurately to fit around all pipes, ducts, electrical boxes, and other openings, and slush all cut openings full. Care shall be taken to avoid filling void in masonry except where filled voids are called for on the drawings or below. Coordinate work with other trades. Cut all units exposed in finished work with an approved type of



power saw.

### 3.04 BLOCK CELL FILL

Fill cells of block from foundation to bearing point under all steel beam, bearings, or where noted. Add horizontal or vertical reinforcing rods where called for on the drawings.

### 3.05 SPECIALTY BLOCKS

Special block such as Bond Beams; Lintel Blocks; Bull Nose Corner; Jamb Block; Pattern Block; etc., shall be of the same material, density, surface texture, and color as standard block.

### 3.06 GENERAL PLACEMENT

Lay masonry and complete as follows:

A. Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells for general work in walls. Webs also shall be bedded in all courses of piers, columns and pilasters; in starting course on footings and solid foundation walls; and around cells that are to be reinforced or filled with grout. Lay solid units with full head and bed joints. Make joints approximately three-eighths (3/8) of an inch in uniform thickness unless indicated otherwise on the drawings. The thickness and uniformity of joints shall be subject to the Engineer's approval and any rejected work shall be taken down and re-laid promptly.

B. Provide continuous vertical expansion and control joints in masonry walls and partitions at locations indicated on drawings. Form and caulk the joints as detailed. Joint reinforcement shall not continue across the control joints unless it is indicated on the drawings.

C. Joints of units that will be exposed or painted shall be cut flush and tooled when thumbprint hard to form a concave joint. Joints in un-parged masonry below grade shall be pointed tight with a trowel. Joints in surfaces to be plastered, stuccoed, or covered with other masonry shall be cut flush.

D. The tops of exterior walls shall be adequately protected against moisture at night and during inclement weather or during delays in the work.

E. Projections, sills, steps, etc., shall at all times be adequately protected from damage and staining.

F. Corners of intersections shall be bonded.

G. Blocks shall be set tightly against bucks and all cut openings slushed full. Buck anchors shall be built into joints.

H. Provide concrete block lintels over openings where no timber or steel lintels have been provided, but lintel is required. They shall be formed in place with special bond-beam or lintel units and filled with 3000 psi concrete. Reinforce lintels with two (2) No. 4 bars, unless otherwise shown on drawings. Lintels shall have a minimum of eight (8) inch bearing at ends. Provide temporary support under lintels as necessary.

I. Provide lateral support at top of partitions by securing to structural system as required.

J. Before closing up any pipe, duct, or similar inaccessible spaces or shafts with masonry, remove all rubbish and sweep out the area to be enclosed.

K. After roofing work has been complete; heating system is operational; concrete walls are thoroughly dried; and PRIOR TO PAINTING, repair all cracks and defects appearing on concrete block walls. Work exposed to view shall be thoroughly cleaned and pointed with a concave or rodded joint unless otherwise called for on the plans.

**PART 4 MEASUREMENT AND PAYMENT**

4.01 MEASUREMENT

Measurement for the Unit Masonry will be measured to the nearest linear foot of unit masonry wall installed and accepted by the Engineer.

4.02 PAYMENT

All costs incurred by the Contractor by reason of compliance to satisfy the requirements under this section shall be considered incidental to and completely covered by the Contract unit price for the following bid items:

<u>Bid Item Number</u>	<u>Description</u>	<u>Unit(s)</u>
	Unit Masonry	Linear Foot (LF)

## SECTION 09900

### PAINTING

#### PART 1 GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. For gas pipe coating and wrapping, refer to Section 15230.

##### 1.02 SUMMARY

- A. This Section includes surface preparation, painting, and finishing of exposed interior and exterior items and surfaces.
  - 1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop-priming and surface treatment specified under other Sections.
- B. Paint exposed surfaces, whether or not colors are designated in schedules, except concrete or CMU block surfaces or where a surface or material is specifically indicated not to be painted or is to remain natural. Concrete or CMU block surfaces will only be painted if specifically required by the project's Plan Sheets. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces; verify with Engineer. If color or finish is not designated, the Owner will select from standard colors or finishes available.
  - 1. Painting includes field-painting air outlets and louvers exposed bare, and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment as specified in Division 15 and 16, respectively.
  - 2. Painting includes field-painting of roof flashing and roof mounted equipment, ductwork, and supports exposed to view, regardless of factory finish.
- C. Painting is not required on prefinished items, finished metal surfaces, concealed surfaces, operating parts and labels, unless specifically indicated.
  - 1. Prefinished items not to be painted include metal enclosures, acoustic materials, finished mechanical and electrical equipment, light fixtures, switchgear, and distribution cabinets.
  - 2. Concealed surfaces not to be painted include wall or ceiling surfaces in foundation spaces, furred areas, utility tunnels, pipe spaces, and duct shafts.
  - 3. Finished metal surfaces not to be painted include anodized aluminum, stainless steel, chromium plate, copper, bronze, brass, and Kynar/Hylar 500 finishes.
  - 4. Operating parts not to be painted include moving parts of operating equipment such as valve and damper operators, linkages, sensing devices, motor, and fan shafts.
  - 5. Labels: Do not paint over Underwriters Laboratories, Factory Mutual or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

### 1.03 SUBMITTALS

- A. Product data for all components of each paint system specified. Provide the manufacturer's technical information including label analysis and instructions for handling, storage, and application of each material proposed for use. List each material and cross-reference the specific coating, finish system, and application. Identify each material by the manufacturer's catalog number and general classification. Provide certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).
- B. Samples for Verification Purposes: Provide two 12" x 12" square samples of each color and material to be applied with texture to simulate actual conditions on representative samples of the actual substrate.
  - 1. Provide stepped samples defining each separate coat including block fillers and primers. Use representative colors when preparing samples for review. Resubmit until required sheen, color, and texture are achieved.
  - 2. Provide a list of material and application for each coat of each sample. Label each sample as to location and application.
  - 3. Submit samples on the following substrates for the Owner's review of color and texture only:
    - a. Stained or Natural Wood: Provide two 4-by-8-inch samples of natural and stained wood finish on actual wood surfaces.
    - b. Ferrous Metal: Provide two 4-inch-square samples of flat metal and two 8-inch-long samples of solid metal for each color and finish.

### 1.04 QUALITY ASSURANCE

- A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to those required for the Project, with a construction record of successful in service performance.
- B. Single-Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats.

### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the job-site in the manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
  - 1. Product name or title of material.
  - 2. Product description (generic classification or binder type).
  - 3. Manufacturer's stock number and date of manufacture.
  - 4. Contents by volume, for pigment and vehicle constituents.
  - 5. Thinning instructions.
  - 6. Application instructions.
  - 7. Color name and number.

- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg. F (7 deg. C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.
  - 1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

#### 1.06 JOB CONDITIONS

- A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 deg. F (10 deg. C) and 90 deg. F (32 deg. C).
- B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 deg. F (7 deg. C) and 95 deg. F (35 deg. C).
- C. Do not apply paint in rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg. F (3 deg. C) above the dew point; or to damp or wet surfaces.
  - 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer during application and drying periods.

## **PART 2 PRODUCTS**

#### 2.01 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
  - 1. Dunn-Edwards (D-E)
  - 2. Frazee Paints (F-P)
  - 3. Glidden Company (G-C)
  - 4. Benjamin Moore & Company (B-M)
  - 5. Pittsburgh Paints (PPG)
  - 6. Sherwin-Williams Company (S-W)
  - 7. Approved equivalent

#### 2.02 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, finish coat materials, and related materials that are compatible with one another and the substrates indicated under conditions of service and application as demonstrated by the manufacturer based on testing and field experience.
- B. Material Quality: Provide the manufacturer's best-quality trade sale paint material of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable.

- C. Colors: Provide color selections made by the Owner from the manufacturer's full range of standard colors.

## 2.03 MISCELLANEOUS WOOD-FINISHING MATERIALS

- A. Wood-Finishing Materials: Provide the manufacturer's recommended factory-formulated, wood-finishing materials that are compatible with the substrate and undercoats indicated.

## **PART 3 EXECUTION**

### 3.01 EXAMINATION

- A. Examine substrates and conditions under which painting will be performed for compliance with paint application requirements. Surfaces receiving paint must be thoroughly dry before paint is applied. Do not begin to apply paint until unsatisfactory conditions have been corrected. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

### 3.02 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted, or provide surface-applied protection prior to surface preparation and painting. Remove these items if necessary, to completely paint the items and adjacent surfaces. Following completion of painting operations in each space or area, have items reinstalled by workers skilled in the trades involved.
- B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease prior to cleaning. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to the manufacturer's instructions for each particular substrate condition and as specified. Provide barrier coats over incompatible primers or remove and reprime.
- D. Cementitious Materials: Prepare concrete, concrete masonry block, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required, to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
  - 1. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's printed directions.
- E. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.

- F. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
  - 1. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
  - 2. Prime, stain, or seal wood to be painted, immediately upon delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.
  - 3. When transparent finish is required, back prime with spar varnish.
  - 4. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately upon delivery.
- G. Ferrous Metals: Clean un-galvanized ferrous metal surfaces that have not been shop-coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with recommendations of the Steel Structures Painting Council (SSPC).
  - 1. Touch-up bare areas and shop-applied prime coats that have been damaged. Wire brush, clean with solvents recommended by the paint manufacturer and touch-up with the same primer as the shop coat.
- H. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so that the surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- I. Materials Preparation: Carefully mix and prepare paint materials according to manufacturer's directions. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue. Stir material before application to produce a mixture of uniform density; stir as required during application. Do not stir surface film into material. Remove film, and if necessary, strain material before using. Use only thinners approved by the paint manufacturer and only within recommended limits.
- J. Tinting: Tint each undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

### 3.03 APPLICATION

- A. General: Apply paint according to manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied. Paint colors, surface treatments, and finishes are indicated in the schedules.
- B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
  - 1. The number of coats and the film thickness required are the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. Sand between applications where sanding is required to produce a smooth even surface according to the manufacturer's directions.

2. Apply additional coats if 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 ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a dry film thickness equivalent to that of flat surfaces.
  3. The term exposed surfaces includes areas visible when permanent or built-in fixtures, grilles, and similar components are in place. Extend coatings in these areas as required, to maintain the system integrity and provide desired protection.
  4. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  5. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint.
  6. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
  7. Sand lightly between each succeeding enamel or varnish coat.
- C. Scheduling Painting: Apply first coat 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 coats to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.
- D. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to the manufacturer's directions.
1. Brushes: Use brushes best suited for the material applied.
  2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
  3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.
- E. Minimum Coating Thickness: Apply materials no thinner than the manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer unless otherwise indicated.
- F. Mechanical and Electrical Work: Painting mechanical and electrical work is limited to items exposed in mechanical equipment rooms and in occupied spaces.
1. Mechanical items to be painted include, but are not limited to, piping, pipe hangers and supports, heat exchangers, tanks, ductwork, insulation, supports, motors and mechanical equipment, and accessory items.
  2. Electrical items to be painted include, but are not limited to, conduit and fittings, and switchgear.
- G. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.



- H. Prime Coats: Before applying finish coats, apply a prime coat of material as recommended by the manufacturer, to material that is required to be painted or finished, and that has not been prime-coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
- I. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling such as laps, irregularity in texture, skid marks, or other surface imperfections.
- J. Pigmented (Opaque) Finishes: Completely cover to provide a smooth, opaque 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.
- K. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections.
  - 1. Provide satin finish for final coats.
- L. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with specified requirements.

#### 3.04 FIELD QUALITY CONTROL

- A. The Owner reserves the right to invoke the following test procedures at any time and as often as the Owner deems necessary during the period when paint is being applied:
  - 1. The Owner will engage the services of an independent testing agency to sample the paint material being used. Samples of material delivered to the Project will be taken, identified, sealed, and certified in the presence of the Contractor.
  - 2. The testing agency will perform appropriate tests for the following characteristics as required by the Owner:
    - a. Quantitative materials analysis.
    - b. Abrasion resistance.
    - c. Apparent reflectivity.
    - d. Flexibility.
    - e. Washability.
    - f. Absorption.
    - g. Accelerated weathering.
    - h. Dry opacity.
    - i. Accelerated yellowness.
    - j. Recoating.
    - k. Skinning.

- I. Color retention.
- m. Alkali and mildew resistance.
- 3. If test results show material being used does not comply with specified requirements, the Contractor may be directed to stop painting, remove noncomplying paint, pay for testing, repaint surfaces coated with rejected paint, and remove rejected paint from previously painted surfaces, if upon repainting with specified paint, the two coatings are incompatible.

### 3.05 CLEANING

- A. Cleanup: At the end of each work day, remove empty cans, rags, rubbish, and other discarded paint materials from the site.
  - 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

### 3.06 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting as acceptable to Engineer.
- B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
- C. At completion of construction activities of other trades, touch-up and restore damaged or defaced painted surfaces.

### 3.07 EXTERIOR PAINT SCHEDULE

- A. General: Provide the following paint systems for the various substrates indicated or as approved by the Engineer.
- B. Ferrous Metal: Primer is not required on shop-primed items. Touch-up all damaged shop-primed metal with appropriate metal primer.

- 1. Polyurethane System: Two coats over primer.

- a. First Coat Epoxy Primer: DFT = 4.0 mils.

D-E IP714 High Build

F-P Amerlock 400 High-Solids epoxy

G-C 5251/5252 Glid-Guard Epoxy Chromate Primer

B-M CM33/CM34 Polyamide Epoxy Primer

PPG Pitt-Guard DTR Epoxy 97-140 Series

S-W VOC System B67 Series H.D. Epoxy B60V30

- b. Second and Third Coats: Aliphatic Urethane Polyester;

DFT = 3.0 mils per coat.

D-E IP630 Ultrashield

F-P Amershield

G-C 5410 High Solids Urethane Coating, White

B-M CM74/CM75 Aliphatic Acrylic Urethane Gloss

PPG Pitthane Acrylic-Aliphatic Urethane 97-840 Series

S-W B65W301 Series/B60V30 Hi Solids Polyurethane

C. Galvanized and Aluminum:

1. Gloss Finish/Alkyd Enamel: Two finish coats over primer.

a. Pretreatment: Manufacturer's recommendations.

b. First Coat Primer: DFT = 3.0 mils.

D-E QD 43-7 White Anti-Corrosion Primer

F-P 661 Metal Primer

G-C 5229 All-Purpose Metal & Galvanized Primer, White

B-M 155 IronClad Galvanized Metal Latex Primer

PPG Pitt-Tech DTM Primer 90 Series

S-W Direct to Metal Primer Finish B66W1

c. Second Coat: Gloss Alkyd Enamel; DFT = 2.0 mils.

D-E 42-1 COMPO

F-P 381 SUPER BOND

G-C 4500 Alkyd Industrial Enamel

B-M 134 Impervo Alkyd Gloss Enamel

PPG Pitt-Tech DTM Acrylic

S-W Industrial Enamel, B54Z Series

d. Third Coat: Gloss Alkyd Enamel; DFT = 2.0 mils.

D-E 10 SYN-LUSTRO Gloss

F-P 352 CLASSIC

G-C 4500 Alkyd Industrial Enamel

B-M 134 Impervo Alkyd Gloss Enamel

PPG Pitt-Tech DTM Acrylic

S-W Industrial Enamel, B54Z Series

3.08 INTERIOR PAINT SCHEDULE

A. General: Provide the following paint systems for the various substrates as indicated.

B. Concrete Masonry Units:

1. Latex Emulsion Finish:

a. First Coat: Block Filler; DFT = 5-6 mils.

D-E	W 305 BLOCFIL
F-P	262 Acrylic Block Filler
G-C	5317 Ultra-Hide Acrylic Block Filler
B-M	153 Moorcraft Super-Hide Block Filler
PPG	6-12 Speedhide Hi-Fill Block Filler
S-W	ProMar Block Filler B25W25

b. Second and Third Coats: Semi-Gloss Finish/Latex Base; DFT = 1.3 mils.

D-E	W450 DECOGLO
F-P	021 SATIN GLIDE
G-C	7800 Spred 2000 No VOC Semi-Gloss Trim Enamel
B-M	281 Moorcraft 100% Acrylic Semi-Gloss
PPG	Speedhide 6-8510 Series Latex Semi-Gloss
S-W	ProMar 200 Latex Semi-Gloss Enamel B31W 200 Series

2. High-Performance, Polyamide-Epoxy Coating System: Provide two finish coats with total dry film thickness not less than 4 mils over concrete masonry block filler.

a. Filler Coat: Concrete masonry block filler.

Devoe	52901 Bloxfil Int/Ext Acrylic Latex Block Filler
Glidden	5317 Ultra-Hide Block Filler.
PPG	16-90 High Performance Acrylic Block Filler.
S-W	Heavy-Duty Block Filler, B42W46.
Tnemec	130-6601 Envirofill.

b. First and Second Coats: High-performance, polyamide-epoxy coating.

Devoe	124XX Tru-Glaze 4 Epoxy Gloss.
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Glidden	5240 Chemical-Resistant Epoxy
Moore	Ironclad Chemical and Water Resistant Epoxy Enamel 182.
PPG	97-1 Series Aquapon Polyamide-Epoxy.
S-W	Tile-Clad II Epoxy Enamel B62 Series/B60V70.
Tnemec	Series 69 Hi-Build Epoxoline II.

C. Gypsum Drywall Systems:

1. Latex Emulsion Finish: Two coats over prime coat.

a. First Coat Primer: Latex Base; DFT = 1.4 mils. Provide under the following finish coats.

D-E	W420 Walltone
F-P	061 Aqua Seal
G-C	5111 Latex Primer-Sealer
B-M	273 Moorcraft Primer Sealer
PPG	Speedhide 6-2 Latex Sealer
S-W	ProMar 200 Latex Flat Wall Paint, B30W 200 Series

b. Second and Third Coats: Eggshell Latex Emulsion Finish; DFT = 1.5 mils.

D-E	440 DECOSHEEN
F-P	022 LO-GLO
G-C	9300 No VOC Lifemaster 2000 Eggshell Enamel
B-M	286 Moorcraft Super-Hide Eggshell
PPG	Speedhide 6-411 Series Eggshell Latex Enamel
S-W	ProMar 200 Latex Eg-Shel B20W 200 Series

2. Epoxy Enamel Finish:

a. First Coat Primer: DFT = 1.5 mils.

D-E	W101 VINYLASTIC
F-P	562 ARO-GARD PRIMER
G-C	5111 Latex Primer-Sealer
B-M	273 Moorcraft Primer Sealer
PPG	Speedhide 6-2 Latex Wall Sealer
S-W	ProMar 200 Latex Wall Primer, B28 W200

- b. Second and Third Coats: Two coats over primer; DFT = 1.2 - 1.5 mils.

D-E	IT 755 CERAGLAZE
F-P	542 ARO-GARD
G-C	5277/5278 Glid-Guard Acrylic Epoxy Enamel
B-M	279 Moorcraft Waterborne Acrylic Epoxy Enamel
PPG	Aquapon WB Epoxy Waterborne 98 Series
S-W	Water Based Catalyzed Epoxy, B70/B60V15

D. Woodwork Painted:

1. Latex Based Finish Coats:

- a. First Coat Primer: Latex Based; DFT = 2.0 mils. Provide under the specified finish coats.

D-E	707 UNIKOTE
F-P	367 FRAGLO
G-C	5111 Latex Primer Sealer
B-M	345 Latex Enamel Underbody
PPG	Seal Grip 17-21 Latex Primer
S-W	Wall and Wood Primer B49WZ2

- b. Second and Third Coats: Semi-Gloss Latex Finish; DFT = 1.5 mils.

D-E	W450 DecoGlo
F-P	021 Satin Glide
G-C	7800 No VOC Spred 2000 Semi-Gloss Trim Enamel
B-M	281 Moorcraft 100% Acrylic Semi-Gloss
PPG	Speedhide 6-8510 Series Latex Semi-Gloss
S-W	ProMar 200 Latex Semi-Gloss Enamel B31W 200 Series

F. Ferrous Metal:

1. Latex Finish: Two finish coats over primer with minimum dry film thickness as indicated.

- a. Primer: Synthetic, quick-drying, rust-inhibiting primer. Omit when factory prime coated.

D-E	W711 VANPRIME
F-P	661 Metal Prime
G-C	5205 Tank & Structural Primer, Red

B-M	163 IronClad Retardo Rust Inhibitive Primer
PPG	Pitt-Tech DTM Acrylic Primer 90 Series
S-W	Kem Kromick Metal Primer B50N2/B50W1 Non-VOC

b. Undercoater: Interior, Latex-Based Paint.

D-E	--
F-P	367 FRAGLO
G-C	300 Latex Wood Undercoater
B-M	273 Moorcraft Primer Sealer
PPG	Pitt-Tech DTM Acrylic Primer 90 Series
S-W	ProMar 200 Primer, B28W200

c. Satin Gloss Finish Coat: Interior, Semi-Gloss, Acrylic:

D-E	W450 DECOGLO Acrylic Latex
F-P	021 SATIN GLIDE Acrylic
G-C	7800 No VOC Spred 2000 Semi-Gloss Trim Enamel
B-M	281 Moorcraft 100% Acrylic Semi-Gloss
PPG	Speedhide 6-8510 Series Semi-Gloss Latex
S-W	--

G. Metal-Galvanized and Aluminum:

1. Latex System: Two finish coats over primer.

a. Pretreatment: Properly cleaned and etched.

b. Primer: Latex-Base; DFT = 1.4 mils.

D-E	W711 VAN-PRIME
F-P	661 Metal Prime
G-C	5110 Ultra-Hide Latex Vapor Barrier
B-M	155 IronClad Galvanized Metal Latex Primer
PPG	Pitt-Tech DTM Acrylic Primer 90-Series
S-W	B66W1, DTM Primer Finish

c. Semi-Gloss: Two coats over primer; DFT = 1.3 mils/coat.

D-E	W450 DECOGLO Acrylic Latex
-----	----------------------------

F-P	2nd Coat 367 FRAFLO; 3rd Coat - 021 SATIN GLIDE
G-C	7800 No VOC Spred 2000 Semi-Gloss Trim Enamel
B-M	281 Moorcraft 100% Acrylic Semi-Gloss
PPG	Pitt-Tech DTM Satin Acrylic 90-Series
S-W	ProMar 200 Latex Semi-Gloss B31W 200 Series

#### **PART 4 MEASUREMENT AND PAYMENT**

##### 4.01 MEASUREMENT AND PAYMENT

Paint work shall be not be measured or paid for as a separate item but shall be included as part of the item listed below for which it is part of.

END OF SECTION



**SECTION 10430**  
**EXTERIOR SIGNAGE**

**PART 1 - GENERAL**

1.1 SUMMARY

- A. Section Includes:
  - 1. Non-illuminated Panel signs.
  - 2. Illuminated Pylon sign.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For panel/pylon signage.
  - 1. Include fabrication and installation details and attachments to other work.
  - 2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
  - 3. Show message list, typestyles, graphic elements, and layout for each sign at least quarter sized.
  - 4. Show locations of electrical service connections.
  - 5. Include diagrams for power, signal, and control wiring.
- C. Samples: For each exposed product and for each color and texture specified.
- D. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.
- E. Delegated-Design Submittal:
  - 1. Include structural analysis calculations for signs indicated to comply with design loads; signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

- A. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

## 1.5 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Five (5) years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer to design sign structure and anchorage of pylon type Site Ground Sign to withstand design loads for this site.
- B. Thermal Movements: For exterior signs, allow for thermal movements from ambient and surface temperature changes.
  - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- 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.

### 2.2 PANEL SIGNS

- A. Standard/Warning Panel Signs: Designs per drawing; with smooth, uniform surfaces and support assembly; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
  - 1. Solid-Sheet Sign Panels: Aluminum sheet with finish specified in "Sign-Panel-Face Finish and Applied Graphics" Subparagraph below and as follows:
    - a. Surface-Applied Graphics: Applied vinyl film. Graphics per drawing Sign Details and Layout sheets.
- B. Pylon "Ground" Sign: Hollow Box, Double Sided sign with smooth, uniform surfaces and support assembly; with graphics and LED pricing message board as follows. Graphics characters having uniform faces, sharp corners, and precisely formed lines and profiles:
  - 1. Illuminated Sign: LED lighting including transformers, insulators, and other accessories for operability, with provision for servicing and concealing connections to the site electrical system. Use tight or sealed joint construction to prevent unintentional light leakage. Space lamps apart from each other and away from sign surfaces as needed to illuminate evenly.
    - a. Power: 120 V, 60 Hz, single phase, 15 A maximum.

2. Solid-Sheet Sign Panels: Aluminum sheet with finish specified in "Sign-Panel-Face Finish and Applied Graphics" Subparagraph below and as follows:
  - a. Surface-Applied Graphics: Applied vinyl film. Graphics will be as noted on the drawings and shall be approved by the OWNER.
3. Hollow-Box Sign Frame: Entire perimeter framed with formed-aluminum sheet or extruded-aluminum, hollow-box-type frame with vertical edges attached to supports with aluminum fittings. Close top and bottom edges of panels with manufacturer's standard welded seams or extrusions.
  - a. Hollow-Box Depth: 12 inches.
  - b. Profile: Rectangular.
  - c. Corner Condition in Elevation: Square and/or Rounded. Refer to drawings. Owner will approve final corner condition.
  - d. Finish and Color: As selected by Owner from manufacturer's full range.
4. Sign-Panel-Face Finish and Applied Graphics:
  - a. Integral Aluminum Finish: Clear anodized
  - b. Painted Finish and Graphics: Manufacturer's standard, factory-applied. Color White.
  - c. Photo-Image Graphics: Manufacturer's standard multicolor, 600-dpi minimum halftone or dot-screen image.

### 2.3 MATERIALS – SIGN PANELS

- A. Aluminum Sheet: 0.040 gage, 3003-H14 Aluminum Sheet per ASTM B209 or Federal Standard QQ-A-250/2.
- B. Vinyl Film: UV-resistant vinyl film of nominal thickness indicated, with pressure-sensitive, permanent acrylic adhesive on back; die cut to form characters or images as indicated and suitable for exterior applications.

### 2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:
  1. Use concealed fasteners and anchors unless indicated to be exposed.
  2. For exterior exposure, furnish stainless-steel or hot-dip galvanized devices unless otherwise indicated.
  3. Exposed Metal-Fastener Components, General:
    - a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
- B. Anchoring Materials:

1. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
2. Anchoring Cement: Factory-packaged, non-shrink, non-staining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
  - a. Water-Resistant Product: At exterior locations, provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

## 2.5 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
  1. Mill joints to tight, hairline fit. Form joints exposed to weather to resist water penetration and retention.
  2. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed joints of flux, and dress exposed and contact surfaces.
  3. Conceal fasteners and anchors unless indicated to be exposed; locate exposed fasteners where they will be inconspicuous.
  4. Internally brace signs for stability and for securing fasteners.
- B. Pylon Sign Box Fabrication: Fabricate pylon sign with integral base consisting of channels, angles, plates, or other fittings. Design and fabricate pylon and anchorage to withstand wind pressure indicated for Project location. Detail anchorage so that water can drain out of assembly without obstruction. Drill holes in members for anchor-bolt connection. Provide anchor bolts of size required for connecting base to concrete foundations.
  1. Internal Frames: Manufacturer's standard internal steel framing system and anchorage, modified as required for Project requirements. Provide welded construction. Cut, drill, and tap units to receive hardware, bolts, and similar items.
    - a. Hot-dip galvanize steel framing system after fabrication according to ASTM A 123/A 123M.
  2. External Frames: Manufacturer's standard steel framing system and anchorage for direct attachment of sign message panels, modified as required for Project requirements. Provide welded construction using mitered joints. Cut, drill, and tap units to receive hardware, bolts, and similar items.
    - a. Hot-dip galvanized steel framing system after fabrication according to ASTM A 123/A 123M.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General: Install signs using installation methods indicated and according to manufacturer's written instructions.
  - 1. Install signs level, plumb, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
  - 2. Install signs so they do not protrude or obstruct according to accessibility standard.
  - 3. Before installation, verify that sign components are clean and free of materials or debris that would impair installation.
  - 4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

### 3.2 INSTALLING PYLONS

- A. Attachment with Preset Anchor Bolts: Set pylon base in position over anchor bolts projecting from concrete foundation, shim and support pylon to prevent movement, place washers and nuts, and tighten. Fill shim space with non-shrink, nonmetallic grout, mixed and placed to comply with manufacturer's written instructions.
- B. Attachment with Drilled-in-Place Anchor Bolts: Set pylon base in position over concrete foundation, locate and drill anchor holes, shim and support pylon to prevent movement, place washers and anchor bolts, and tighten. Fill shim space with non-shrink, nonmetallic grout, mixed and placed to comply with manufacturer's written instructions.

## PART 4 MEASUREMENT AND PAYMENT

### 4.1 MEASUREMENT

Measurement for the Exterior Signage installation will be made at the Contract unit price per each, complete in place, at each location installed and accepted by the Engineer.

### 4.2 PAYMENT

All costs incurred by the Contractor by reason of compliance to satisfy the requirements under this section shall be considered incidental to and completely covered by the Contract unit price for the following bid items:

<u>Description</u>	<u>Unit(s)</u>
Non-Illuminated Panel Sign	Each
Illuminated Pylon Sign	Each

END OF SECTION

**SECTION 10520  
FIRE PROTECTION SPECIALTIES**

**PART 1 GENERAL**

1.01 SUMMARY

- A. This Section includes the requirements for the following:
  - 1. Portable fire extinguishers.
  - 2. Fire-protection cabinets and mounting accessories.

1.02 RELATED DOCUMENTS

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

1.03 SUBMITTALS

- A. Product Data: Include construction details, material descriptions dimensions of individual components and profiles, and finishes for fire-protection specialties.
  - 1. Fire Extinguishers: Include rating, classification and covers.

1.04 QUALITY ASSURANCE

- A. Source Limitations: Obtain fire extinguishers through one source from a single manufacturer.
- B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, “Standard for Portable Fire Extinguishers.”
- C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
  - 1. Provide extinguishers listed and labeled and approved by the Fire Marshall or other authority having jurisdiction.

**PART 2 PRODUCTS**

2.01 MANUFACTURERS

- A. Subject to compliances with requirements, provide products by Supplier.
  - 1. Portable Fire Extinguishers:
    - a. General Accessory Manufacturing Company.
    - b. Or approved equal.

2.02 MATERIALS

- A. Cold-Rolled Steel Sheet: Carbon steel, complying with ASTM A366/A 366M, commercial quality. Stretcher leveled, temper rolled.

2.03 PORTABLE FIRE EXTINGUISHERS

- A. General: Provide fire extinguisher of type, size, and capacity for each location per drawing.
- B. All Locations: Regular Dry Chemical.
  - 1. 20# (CO2) for Class B and Class C fires.
  - 2. Brackets: Provide brackets for wall mounting of extinguishers at the locations shown on the drawing.

2.04 ACCESSORIES

- A. Mounting Brackets: Manufacturer's standard steel, designed to secure extinguisher, of sizes required for types and capacities of extinguishers indicated, with plated or baked-enamel finish.
  - 1. Provide brackets for extinguishers located in cabinets.

**PART 3 EXECUTION**

3.01 INSTALLATION

- A. Install fire extinguishers and cabinets as noted per drawing.

**PART 4 MEASUREMENT AND PAYMENT**

4.01 MEASUREMENT

Measurement for the Fire Protection equipment installation will be made at the Contract unit price per each, complete in place, at each location installed and accepted by the Engineer.

4.02 PAYMENT

All costs incurred by the Contractor by reason of compliance to satisfy the requirements under this section shall be considered incidental to and completely covered by the Contract unit price for the following items:

<u>Description</u>	<u>Unit(s)</u>
Fire Extinguisher and Cabinet	Each

END OF SECTION

## SECTION 11500

### CNG VEHICLE FUELING EQUIPMENT

#### MORIARTY, NEW MEXICO CNG FUELING STATION

#### PART 1 DESCRIPTION

##### 1.01 SUMMARY OF WORK

- A. The Contractor shall furnish equipment and materials to provide for integration of a Compressed Natural Gas (CNG) public access fueling station that meet all Local, State, and Federal standards for safety and operation. For the equipment integration requirements for this Project, refer to Section 13550, which combined with this section, define the CNG equipment and installation specifications for the Project.
- B. In addition to the above, the work scope includes:
  - 1. Freight charges to deliver all equipment and materials under this Specification shall be part of the pricing.

##### 1.02 CODES AND STANDARDS

- A. All equipment and each packaged system shall a) comply with the following codes and standards that are enforced by the local authorities having jurisdiction and b) if not specifically enforced by the local authorities, comply with the latest edition of the following codes and standards at the time of fabrication.
  - 1. American National Standards Institute (ANSI)
    - a. ANSI/NGV 1, Standard for Compressed Natural Gas Vehicle Fueling Connection Devices
    - b. ANSI/NGV 4.1, NGV Dispensing Systems
    - c. ANSI/NGV 4.2, Hoses for Natural Gas Vehicles and Dispensing Systems
    - d. ANSI/NGV 4.4, Breakaway Devices for Natural Gas Dispensing Hoses and Systems
    - e. ANSI/NGV 4.6, Manually Operated Valves for Natural Gas Dispensing Systems
    - f. ANSI/NGV 4.7, Automatic Pressure Operated Valves for Natural Gas Dispensing Systems
    - g. ANSI/NGV 4.8, NGV Fueling Station Reciprocating Compressor Guidelines
    - h. ANSI Z535.2, Environmental and Facility Signs
    - i. ANSI/IEC 60529, Degrees of Protection provided by Enclosures (IP Code)
    - j. ANSI/NEMA MG-1, Motors and Generators
    - k. ANSI/NEMA 250, Enclosures for Electrical Equipment (1000 V Maximum)
  - 2. American Petroleum Institute (API)



- a. API Recommended Practice 520 – Sizing, Selection, and Installation of Pressure Relieving Devices in Refineries
3. American Society of Mechanical Engineers (ASME)
    - a. Boiler and Pressure Vessel (B&PV) Code
      - i. Section V - Nondestructive Examination
      - ii. Section VIII, Division I - Pressure Vessels
      - iii. Section IX - Welding and Brazing Qualifications
    - b. ASME A13.1, Scheme for the Identification of Piping Systems
    - c. ASME B16.25, Butt welding Ends
    - d. ASME B31.3, Process Piping Code
  4. American Society for Nondestructive Testing (ASNT)
    - a. SNT-TC-1A Recommended Practice
  5. American Welding Society (AWS)
    - a. A5.1 Covered Carbon Steel Arc Welding Electrodes
    - b. A5.5 Low Alloy Steel Covered Arc Welding Electrodes
  6. International Code Council (ICC)
    - a. International Building Code (2009)
    - b. International Fire Code (2009)
    - c. International Fuel Gas Code
    - d. International Mechanical Code
    - e. International Plumbing Code
  7. National Fire Protection Association (NFPA)
    - a. NFPA 52 Vehicular Gaseous Fuel Systems Code
    - b. NFPA 70 National Electrical Code
    - c. NFPA 496 Purged and Pressurized Enclosures for Electrical Equipment
  8. Society of Automotive Engineers (SAE)
    - a. J1616 Recommended Practice for CNG Vehicle Fuel
  9. Underwriters Laboratories Inc. (UL)
    - a. UL 508A Industrial Control Panels
    - b. UL 1604 Electrical Equipment for Use in Class I and II, Division 2, and Class III Hazardous (Classified) Locations
  10. U.S. Department of Labor (OSHA)
    - a. Title 29 CFR Part 1910 - Occupational Health and Safety Standards

### 1.03 QUALITY ASSURANCE

- A. All materials shall be new (i.e., not previously used and manufactured no more than 2 years prior to receipt of Notice to Proceed unless authorized and provided by the Owner). All equipment shall be permanently affixed and accessible for maintenance and operation in accordance with all code requirements.
- B. The Contractor shall notify the Owner's Representative no later than 10 working days prior to factory testing of the CNG compressor systems to allow the Owner's Representative the opportunity to witness the test prior to shipment. Owner's witnessing of the testing does not relieve the Contractor of the responsibility to comply with the specifications.
- C. All paint and priming products, whether shop or field applied shall be lead, chromium, and cadmium free. In addition, these products and all other materials used shall comply with local, regional, state and federal air quality rules and regulations, especially those of the local air quality management district.
- D. All materials and surfaces exposed to the exterior, unless otherwise pre-finished or otherwise treated with a corrosion-resistant finish, shall receive a shop-applied paint system.
- E. The CNG compressors including control system and drive, dryer, and dispenser shall be factory-inspected and comply with NFPA 52, NFPA 70, NFPA 496, UL508, UL508A and UL1604 or equal.

### 1.04 SUBMITTALS

- A. ATTACHED TO CONTRACTOR'S BID TO FURNISH EQUIPMENT, submit a detailed Scope of Supply of all equipment offered including characteristics and quantity.
- B. Within four (4) weeks of Notice to Proceed, submit four copies of the following drawings and data for review. Submittal drawings and data shall be certified by the respective equipment manufacturer that the drawing(s) and data accurately represent the final product/system in all respects.
  - 1. For each equipment system or assembly: General arrangement drawing, process and instrumentation diagram, mechanical fabrication/assembly drawing, electrical elementary diagram, wiring diagram, electrical control assembly drawing, and installation instructions. Equipment arrangement drawings shall clearly identify the precise location, number, type, and size of customer connections, weight of equipment, and anchor bolt size and pattern for attachment of equipment to foundation.
  - 2. Mechanical and electrical bills of material.
  - 3. No fabrication or material purchase shall start until drawings are reviewed and accepted by the Owner's Representative. Individual equipment systems may be released for fabrication upon Owner's acceptance of the corresponding, certified

shop drawings.

C. Submit calculations or evidence that certifies the:

1. Structural integrity of the storage assembly for additional loadings applied by wind and/or seismic events that can occur on site (as required ASCE 7-16/IBC 2018).

## 1.05 PROJECT CONDITIONS

A. Natural Gas

1. Specific Gravity : 0.60
2. Heating Value (LHV) : 998 BTU/SCF
3. Moisture Content : 7 lb/MMSCF max.
4. Gas Composition : 94.9% C<sub>1</sub>  
: 2.3% C<sub>2</sub>  
: 0.4% C<sub>3</sub> +  
: 1.8% N<sub>2</sub>  
: 0.6% CO<sub>2</sub>

(Note: Actual gas composition may vary)

5. Gas Pressure at Station Inlet : 130psig  
(Gas pressure shall be regulated by E.M.W Gas)

B. Design Conditions

1. Site Conditions:
  - a. Elevation : 6220 ft amsl
  - b. Ambient Temperatures : -10 to 90 °F
  - c. Climate : Cold Semi-Arid (Koppen BSk)
  - d. Installation Area : Outdoors
2. Compressor:
  - a. Suction Pressure : 125psig
  - b. Discharge Pressure : 4,500 psig
  - c. Minimum Unit Flow Rate : 250scfm
3. Dryer:
  - a. Inlet Gas Moisture Content : 7 lb/MMSCF (max)
  - b. Outlet Gas Moisture Content : 0.25 lb/MMSCF or less
  - c. Minimum Throughput : 500scfm
  - d. Design Pressure : 150 psig
  - e. Inlet Pressure : 130psig

f. Maximum Pressure Drop : 3psig

4. The equipment provided under this Specification shall be installed outdoors. All equipment shall be designed to operate in the climate in Moriarty, New Mexico.

## **PART 2 MATERIALS & EQUIPMENT**

All materials and equipment provided for the Project shall conform to the latest edition of NFPA 52, IFC 2018 and ANSI NGV as noted in Article 1.02. Major component specifications of the CNG fueling station equipment to be provided are summarized in this section.

### **2.01 GENERAL CNG EQUIPMENT REQUIREMENTS**

- A. The fueling equipment shall be designed for continuous operation and shall meet vehicle fueling needs upon user demand around the clock. The operation of the fueling system shall be automatic (shall start-up and stop automatically) with provisions for manual operation/intervention. In the event of an alarm or emergency shutdown, on-site manual intervention shall be required to reset the compressor.
- B. Sufficient access shall be provided to perform major work on the compressor, including the removal of driver. All electric panels shall have the necessary clearances in front of openings as required by code.
- C. Equipment skids and mounts shall be of welded steel construction and shall have lifting lugs. Skids and equipment mounts shall accommodate anchoring to a concrete foundation.
- D. All gas containing components shall be protected by pressure relief valves set at or below each component's maximum allowable working pressure.
- E. All electrical controls shall be pre-wired to a single terminal strip in a junction box. The terminal strip shall be clearly labeled, ready for field termination. The junction box shall have skid edge conduit connections.
- F. All drain connections shall be piped to the skid edge and plugged.
- G. Gas inlet and outlet lines shall be terminated at the skid edge.
- H. All non-stainless steel components shall be primed and painted.

### **2.02 HIGH PRESSURE NATURAL GAS PACKAGED COMPRESSOR UNIT**

- A. The Packaged Compressor Unit (Skid) shall include carefully matched components that are pre-piped, pre-wired, tested and proven reliable and shall meet all Federal and State of New Mexico Codes for a natural gas compression unit located at this site. The compressor package shall be Owner supplied.

Compressor Package Site Design Criteria:

- 1. Inlet gas pressure: 125psig (suction pressure)

2. Flow Capacity: 300scfm
3. Design Pressure: 4,500 psig (delivery pressure)
4. Centurion PLC based Control Panel with IP addressable SCADA System
5. Electric Drive 480VAC, 3 phase, 60 Hertz
6. Class 1, Division 2 area
7. 100 Rated Horsepower
8. Oil Heater Controlled by ambient temperature sensor
9. Three Stage Compression with Pre-lube Pump & Controls
10. Inter-Stage Coalescing Filters
11. Day Tank
12. Standard of Custom Engineered Designs (submittal Package)
13. Package meets NFPA 52, NEC and ASME Standards
14. Skid design shall include for Full Enclosure of the Compressor Package

B. Packaged Compressor Unit (Skid) and Enclosure

1. The CNG system shall be designed for continuous operation and shall meet vehicle fueling needs upon 24 hour user demand. Operation of fueling system shall be automatic (shall start-up and stop automatically) with provisions for manual operation/intervention. In event of an alarm or emergency shutdown, on-site manual intervention shall be required to reset the compressor.
2. Sufficient access shall be provided to perform major work on the compressor. Electrical panels shall have necessary clearances in front of openings as required by code.
3. Equipment skid shall be of an enclosed design and shall be of welded steel construction and shall have lifting lugs. Skids shall accommodate anchoring to a concrete foundation using an epoxy-filled, drilled anchor bolt system. Additional requirements are summarized as follows:
  - a. Enclosure shall be weatherproof, rain-tight, and coated with manufacturer's recommended coating system.
  - b. All materials shall be non-combustible or limited combustibility materials.
  - c. Enclosure shall be of welded steel construction.
  - d. Enclosure shall be designed to limit equipment noise levels to maximum of 75dBA at 10 feet outside of enclosure.
  - e. One (1) 150W minimum light fixture suitable for Class 1, Division 2, Group D location shall be provided complete with explosion-proof wall mounted manual switch.
  - f. All doors shall be either swing out, sliding, and/or roll-up type; shall be lockable; and shall have hold-open devices with means to open at least one door from inside.
  - g. ESD Push-button shall be located inside system enclosure near primary access door and outside skid enclosure.
4. The inlet and outlet skid natural gas pipe connections rated ASME/ANSI Class150 flanges, size as noted on Plans.

B. Natural Gas Compressor

1. The system shall be a self-contained electric motor-driven package, consisting of one electric motor driven compressor, controls, auxiliary systems, and safety devices. The compressor shall be designed specifically to compress natural gas. No converted gas engine or air compressor shall be used.
2. Compressor shall be of multi-stage, reciprocating design. Compressor shall be of a cross head design.
3. Each compressor system shall be sized to handle quoted capacity with gas analysis and conditions specified in Article 1.05.
4. Compressor cylinders shall be pressure lubricated with pressure lubricated crankcase running gear. Compressor lubrication shall be synthetic oil or as approved by compressor manufacturer.
5. A thermostatically controlled crankcase heater shall maintain the correct oil viscosity.
6. Air cooled finned tube intercoolers and aftercooler shall be provided. Refer to Article 2.02E.
7. Compressor system shall include a closed loop gas recovery system. Refer to Article 2.02F.
8. Compressor system shall have an automatic condensate drain system collected by separators. Refer to Article 2.02G.
9. Electric shutdown controls shall be provided for the following: low/high inlet pressure, high discharge pressure, discharge control pressure, high first through fifth stage discharge temperatures, excessive motor starts, low crankcase oil level, main motor/starter overload, and emergency shutdown switch.
10. Compressor package shall include a Murphy (Enovation Controls) Centurion™ manufactured CNG Level II compressor PLC logic control panel (or approved equal) with remote IP addressable SCADA System communications capability. The compressor control panel shall be weather-tight and suitable for use in Class 1, Division 2, Group D locations. The compressor control panel shall include an LCD or touchscreen annunciator panel.
11. Additional termination points shall be provided for remote emergency shutdown button stations (stations shall be provided by Contractor).
12. Each compressor system shall be equipped with following:
  - a. Direct compressor drive.
  - b. Interstage gas coolers, gauges, separators, coalescing filters and relief valves.
  - c. Piston rings shall have an expected life of 4,000 hours.
  - d. Compressor valves shall have an expected life of 3,000 hours.

- e. Compressor shall have a guaranteed maximum oil carryover after final discharge filtration system of no more than 0.5 lb/MMscf of natural gas.
- f. Fan belts if required shall be V-belt, cogged type.
- g. Guards for drive belts and hot surfaces that provide protection in conformance with OSHA and other safety regulations.
- h. Inlet line assembly including a particulate filter, check valve, fail-closed actuated valve, isolation valve, flexible hose, and relief valve.
- i. Automatic condensate drain system per Article 2.02G.
- j. Discharge line assembly including pre-coalescing and coalescing filters, relief valve, check valve, and isolation valve per Article 2.02H.
- k. Parker-type zero tolerance O-ring face seal fittings for all tubing sized 1/2 in. to 1-1/2 in.

13. Service vent valves to depressurize lines for servicing.

14. CNG Compressor approved Manufacturers:

- a. Ariel/JW Power
- b. ANGI
- b. or approved equal.

C. Compressor Electric Motor

- 1. Motor shall be constant speed, NEMA Premium®, TEFC motor.
- 2. Motor shall be 480VAC, 3 phase, 60 Hz, HP rating per Article 7.05.
- 3. Motor shall be rated for continuous duty with minimum of 1.15 service factor.
- 4. Motor shall be a totally enclosed fan cooled type, and suitable for use in Class 1, Division 2, Group D locations.
- 5. Motor shall be direct drive to the compressor and balanced after shipment and installation on the skid pad.
- 6. Approved Manufacturers:
  - a. A. O. Smith
  - b. Baldor
  - c. GE
  - d. Regal Beloit
  - e. WEG Electric Motors
  - f. TECO Westinghouse Motor Company
  - g. or approved equal that meets Buy America requirements.

D. Motor Starter Panel

- 1. Shipped separately for location off compressor skid in a non-hazardous area.
- 2. NEMA 4R type (outdoor use) enclosure.
- 3. Lockable main breaker sized to adequately handle compressor horsepower.

4. SCR solid-state type reduced voltage starter.
5. Over-current protection on all circuits.
6. Minimum "Interrupting Rating" rating of 10 KAIC.
7. Exterior indicating lights shall include "Power On" and "Compressor Running."
8. Elapsed Time Meters for the compressor to record cumulative hours of operation.
9. Provision for 480VAC supply.
10. Motor soft starter(s) and/or contactor(s) sized for the required motor horsepower rating.
11. Transformer(s) for control circuit power, inputs, and outputs.
12. Acceptable Manufacturers for AC motor starter panel, motor controller and soft starter products:
  - a) Square D.
  - b) Cutler Hammer / Westinghouse.
  - c) Allen Bradley Co.
  - d) WEG
  - e) or approved equal

E. CNG Cooling System

1. Gas coolers suitable for service in ambient temperatures of between -20°F and 120°F and designed to deliver gas at a maximum temperature of ambient plus 20°F.
2. Forced draft air circulation shall be used to cool CNG from effects of compression. Fan drive may be either derived from prime mover or separate electric motor.
3. Tubing material shall be seamless bright annealed per ASME SA213/ASTM A213, Type 316 or Type 304.
4. Cooler intake and exhaust sections shall be oriented so as to minimize introduction of exhaust air into enclosure.

F. Gas Recovery System

1. Gas recovery system shall recover any gas that is vented during compressor shutdown.
2. Upon compressor shutdown, gas within compressor system shall be routed to recovery system to allow unloaded compressor starting.
3. All oil separators shall drain to a single manual drain.
4. Gas recovery vessel shall be ASME rated and have necessary capacity and pressure rating to accumulate blowdown gas without relieving gas to atmosphere or to station inlet line.
5. Gas recovery vessel shall have a relief valve and manual service vent valve.

G. Automatic Condensate Drain System

1. Provide actuated drain valve for each coalescing filter piped to system blowdown tank and controlled by programmable controller adjustable at controller user interface.



2. Provide ASME-rated condensate blowdown tank(s) with sufficient volume for maximum system condensate flow, tank relief valve, and tank drain piped to edge of skid with manual isolation ball valve.

#### H. Filters

1. Inlet Gas Suction Filter:
  - a. Sized to filter particulate of 50 micron diameter or greater at maximum compressor flow rate.
  - b. Provide manual drain valve with differential pressure gauge.
2. Interstage Coalescing Filters:
  - a. Provide coalescer filter downstream of each cylinder between interstage cooler and next-stage compressor inlet.
  - b. Size coalescer filter to eliminate 95% entrained liquids and liquid accumulation from up to 8 hours of continuous operation.
3. Discharge Coalescing Filters:
  - a. Provide two filters (pre-coalescer and coalescer) for each compressor.
  - b. Install coalescing filters (in-series) as far as possible downstream of final stage aftercooler but before priority/direct fill valve panel.
  - c. Size filters for discharge not to exceed 50 ppm liquid hydrocarbon or oil.
  - d. Pressure drop shall not exceed 2% at compressor's maximum flow rate over gas pressures ranging from 2,000 to 4,500 psig.
4. Acceptable Manufacturers for filter products:
  - a. Parker/Finite
  - b. Nowata
  - c. or approved equal.

#### I. Vibration Monitoring

1. Provide a vibration and shock switching system (switches and associated signal wiring) with output to the Compressor PLC control panel for following applications on each compressor package:
  - a. Compressor frame vibration (shaft imbalance) for each compressor.
  - b. Cooler assembly.
2. Vibration Switch Specifications:
  - a. Switch shall consist of a vibration and shock sensitive mechanism used for shutdown of electric motor powered equipment.
  - b. Switches shall use a magnetic latch.
  - c. Case shall be base mounted, explosion-proof aluminum alloy housing meeting NEMA 7/IP54 specifications; rated Class I, Division 1, Groups C & D

- d. UL and CSA listed.
  - e. Normal temperature operating range of -40°F to 185°F (-40°C to 85°C)
  - f. Switch shall be fully adjustable.
  - g. Switch shall be capable of 3-plane of motion detection.
3. Installed switches shall be pre-wired to connect to Compressor PLC control system. Switching system shall provide for compressor shutdown and alarm annunciation.
  4. Adjust and test vibration switching system during factory acceptance test and log data.
  5. Acceptable Manufacturers for Vibration Switch products:
    - a. FW Murphy (Enovation Controls) (VS-2-EX)
    - b. or approved equal.
- J. Additional Requirements
1. Refer to Articles 2.09 and 2.10 for additional requirements for instrumentation/controls and piping/tubing, respectively.
- K. The Package shall be provided with an Operations and Maintenance manual and shall show (at a minimum) the operation of the following systems:
1. Inlet (suction) System
  2. Isolation Valves
  3. Automatic Condensate Drain System
  4. Gas Recovery system
  5. Discharge System
  6. Control Panel with PLC
  7. Safety Controls
  8. Design-Construction Drawings of installed Package
- L. Provide start-up spare parts for the compressor as recommended by the manufacturer to include a minimum of (but not limited to):
1. Twenty (20) gallons compressor oil\*
  2. First stage valve
  3. Second stage valve
  4. Third stage valve
  5. Fourth stage valve
  6. Fifth stage valve
  7. Discharge filter element(s)
  8. Valve/Gasket Kit
  9. Ring/Gasket Kit
  10. O-rings

\*Approved for use by the Compressor Manufacturer and approved by the Owner (Synthetic Based NOT Mineral Oil Based)

M. Approved CNG System Packagers

1. J-W Power Company
2. ANGI Energy Systems, Inc.
3. Or approved equal that meets Buy America requirements.

2.03 SINGLE TOWER NATURAL GAS DRYER

- A. The Single Tower Inlet Natural Gas Dryer Unit (Skid) shall include carefully matched components that are pre-piped, pre-wired, tested and proven reliable and shall meet all Federal and State of New Mexico Codes for natural gas processing. The Single Tower Natural Gas Dryer shall be Owner supplied.

Design Criteria:

1. Inlet Gas Moisture Content: 7 lb/MMSCF(max)
2. Outlet Gas Moisture Content: 0.25 lb/MMSCF or less
3. Minimum thru-put: 500scfm
4. Design Pressure: 150 psig
5. Inlet Pressure: 130psig
6. Maximum Pressure Drop: 3 psig
7. Adsorber vessel designed, manufactured and stamped per ASME code.
8. Piping designed per ASME B31.3
9. NEMA/NEC electrical construction standard.
10. 480 volt, 3 Phase, 60 hertz power input
11. Closed-loop regeneration of the molecular sieve absorbent
12. Three valve block and bypass piping arrangement for isolation of the dryer
13. Pre-filter and after filter complete with differential pressure indicators
14. Insulated adsorber vessel and electric heater for heat conservation
15. Incoloy sheath low watt density flanged immersion type electric heater
16. Stainless steel desiccant screens and diffusers
17. Desiccant drain and fill port on vessel. The tower shall be loaded with a minimum of 750 pounds of desiccant.
18. Air cooled gas cooler with non-sparking fan and TEFC motor

Dryer Instrument and Control Features:

1. Electrical enclosures for operation in Class 1, Division 2, Group D areas
2. Fully programmed PLC based dryer control system
3. Panel mounted regen start, regen stop, and alarm reset push buttons. Status lights and remote ESD and alarm customer contacts
4. Heater element and over-temperature shutdowns and blower/heater interlocks
5. Local temperature and pressure gauges for monitoring process and regeneration

- B. The natural gas dryer shall be a skid-mounted single-tower dryer with a manual regenerative system. Dryer shall be sized for the quoted capacity with the gas analysis and process conditions specified in Article 1.02.

- C. Molecular Sieve

1. Adsorbent shall be molecular sieve 3A with a minimum life of 5 years.
2. The sieve shall minimize adsorption or desorption of odorants, CO<sub>2</sub>, H<sub>2</sub>S, and other components or trace elements from natural gas.

D. Adsorption Tower and Filters

1. The dryer shall consist of a single tower with a regenerator. Dryer shall be located on the suction side of the compressor. Pressure drop across the dryer skid (between the skid inlet and outlet flange connections) shall not exceed the values specified in Article 2.03A. Skid isolation and bypass valves shall be provided and shall be butterfly type valves. The inlet and outlet skid connections rated ASME/ANSI Class150 flanges, size as noted on Plans. Piping system including welding shall be in accordance with ASME B31.3, Process Piping.
2. The adsorption tower shall be rated at 150 psig and 500°F. The tower shall have a safety relief valve with appurtenances to allow for testing. The tower shall be fitted with desiccant fill and drain ports to allow desiccant transfer without disassembling piping. Locally-mounted adsorption tower pressure and differential pressure gauges shall be provided.
3. A coalescing filter shall be provided for the adsorption tower inlet. The filter shall be sized to capture liquid slugs and capture aerosol and solid particles greater than 0.01 micron (Grade XP). The filter shall be equipped with a differential pressure indicator and manual liquid drain to a common drain. A particulate filter rated for 1 micron (Grade ZHTNX) shall be provided for the adsorption tower outlet. A differential pressure indicator shall be provided. Filters shall possess ASME rating or Canadian Registration Number approval. Both filters shall allow replacement of the filter element without removing the filter from the piping.

E. Regeneration System

1. Operator-attended regeneration shall be manually initiated by a panel-mounted push button after the manually operated isolation valves are correctly positioned. The regeneration time shall be approximately ten (10) hours. Regeneration gas flow shall be in a downward direction through the desiccant bed. The regeneration system shall comprise a blower, low-Watt regeneration heater, cooler, separator and accumulator tank as well as related piping, wiring and controls.
2. The gas blower shall be a vane- or lobe-type with an electric motor rated in accordance with NFPA 70. Blower/motor shall be installed in an ASME "U" or "UM" stamped carbon steel pressure vessel with the same pressure rating as the dryer vessel. The horizontal blower bell housing shall be fitted with stainless steel glides mating stainless steel runners fitted to the support skid to permit removal from the blind flange with minimal effort by one person. Suitable anchoring of the blower housing shall be provided to support the blower housing once installed.

3. The gas heater shall use incoloy sheathed, low-Watt-density electric heating elements mounted inside an insulated heating chamber. The heater bundle shall be furnished with a thermocouple and temperature switch for heater sheath over-temperature alarm and shutdown. A heater high outlet temperature switch shall be furnished at the heater outlet. The heater vessel shall be an ASME "U" or "UM" stamped carbon steel pressure vessel with the same pressure and temperature rating as the desiccant chamber.
4. An air-to-gas fin tube aftercooler complete with electric motor and non-sparking fan blades with motor in compliance to Class 1, Div. 2, Group D electrical class shall be provided. A high-efficiency coalescing-separator with two-piece aluminum bowl and head construction shall be provided. It shall include a carbon steel condensate reservoir and a manual drain valve piped to the skid edge. The reservoir shall have a liquid capacity for at least two regeneration cycles.

F. Dewpoint Monitoring

1. The dewpoint monitoring system shall generate alarm signals when the dew point at the dryer outlet begins to deteriorate. The first alarm set point shall indicate the dryer outlet dew point has started to deteriorate. The second alarm set point shall indicate the need for regeneration of the system. The dryer outlet dewpoint shall be presented on the NEMA 4 panel text display.

G. Additional Requirements

1. System shall be pressure and functionally tested at the factory.
2. Refer to articles 2.09 and 2.10 for additional requirements related to instrumentation/controls and piping/tubing, respectively.

H. Acceptable Manufacturers:

1. PSB Industries
2. Xebec
2. Or approved equal that meets Buy America requirements.

2.04 ASME COMPRESSED NATURAL GAS STORAGE ASSEMBLY

- A. The CNG storage assembly shall include carefully matched components that are pre-piped, tested and proven reliable and shall meet all Federal and State of New Mexico Codes for natural gas storage.

The storage assembly shall be Owner supplied and will consist of Three (3) storage assemblies, plumbed to provide a three (3) bank cascade system with a total minimum capacity of 90,000scf at 5,000psig.

Storage Assembly Summary:

Each Storage Assembly shall consist of three (6) ASME-rated CNG spherical storage vessels. Each vessel shall have a minimum capacity of 12,360 SCF at a maximum operating pressure of 5000 PSIG:

1. (6 each) 48" diameter Spheres
2. 5500 pounds per square inch maximum allowable working pressure (MAWP)
3. Fabricated to ASME Code Section VIII, Division 2

Other optional configurations may be used with the approval of the Engineer as long as the storage capacity requirements are met.

B. Cylindrical CNG storage pressure vessel assembly specifications:

1. Vessels shall be designed to be oriented vertically. The vessel assemblies shall include all materials (e.g. valves, fittings, anchor brackets) for a complete and operable system. The assemblies shall comply with the following specifications:
2. The forged, seamless pressure vessels shall be manufactured in accordance with the ASME BPV Code Section VIII, Division 2, with a safety factor of 3:1 for CNG service. Vessels shall have a maximum allowable working pressure of at least 5,500 psig @ 120°F (S.F. = 3). A hydrostatic test of the completed assembly at the maximum operating pressure shall be performed prior to shipment.
3. The minimum design metal temperature (MDMT) shall be -40°F. The maximum design metal temperature shall not exceed +200°F.
4. All vessels shall be new and must be stamped with the ASME U symbol applied by a National Board Commissioned Inspector employed by an authorized inspection agency.
5. The maximum ultimate tensile strength (UTS) of the heat treated vessel shall not exceed 135,000 psi (approximate hardness of Rockwell C30). Vessel which exhibits an average hardness of Rockwell C22 with no individual reading greater than C24, as specified in Part 3 of the Canadian Standards Association (CSA) B51-97 shall be subjected to design qualification sulfide stress cracking tests made in accordance with Clause 14.3 of CSA B51-97, Part 2.
6. In addition to the mandatory ASME code non-destructive testing in accordance with Clause 4.2.4 of CSA B51-97, Part 3, the vessel shall, after heat treatment, be subject to ultrasonic inspection using the angle beam technique as described in ASTM A388 with a rejection notch criterion of 5% of the vessel minimum design wall thickness.
7. End plugs used to reduce vessel, center, and end openings to the required system piping connection size shall utilize material which has been tested in accordance with ASTM A350 and which meets, as a minimum, the same toughness requirements as the ASME pressure vessel. The maximum UTS of the plug material shall not exceed 135,000 psi.

8. Each vessel shall include 3/4 inch NPT outlet and a drain valve located at a low point, which may be used to remove effluents (compressor oil, moisture, etc.), which may collect inside the vessel.
9. Each vessel in the assembly shall be furnished with a 3/4 inch full port stainless steel (SS) Nutron or approved equal ball valve with lockable handle on the inlet/outlet end. It shall also be furnished with a spring-loaded Anderson Greenwood or approved equal, pressure relief valve (PRV) and 3/4 inch full port SS ball valve (PRV isolation) with lockable handle on the opposite end of the vessel.
10. All ball and hand valves shall have a safety factor design of 4:1 based on the vessel design pressure in accordance with NFPA 52.
11. Each PRV shall be adequately sized to protect each vessel against a fire condition in accordance with API RP 520 and shall be set at 5,500 psig. Wherever possible, all fittings used to connect shut-off valves, PRVs etc., to each vessel shall be of SS construction and shall have, as a minimum, a pressure rating equal to the vessel design pressure.
12. Structural steel I-beams at each end (end racks) shall be used to support each vessel. The bottom flange of the I-beam located on the PRV end of the assembly shall be provided with slotted holes to permit thermal expansion of the complete assembly due to ambient temperature changes. The complete structural assembly shall be designed to support the weight of the vessels and their contents. Support structure design incorporates strength requirements for maximum wind and seismic load resistance.
13. Exterior surfaces of the vessels and the surface of all structural supports shall be abrasive cleaned in accordance with Steel Structures Painting Council (SSPC) SP-6 or higher and cleaned with approved solvents prior to painting. As a minimum, all surfaces shall be painted with one coat of epoxy primer selected to match the topcoat with a minimum dry film thickness (DFT) of 2 to 5 mils. Whenever possible, the primer shall be applied within 24 hours of blasting and cleaning. A high solids, two component, white urethane enamel or an aliphatic polyurethane topcoat shall be applied over the dry primer with a DFT of a minimum of 4 to 6 mils unless otherwise specified by the manufacturer. The DFT of the primer and paint shall be measured using a suitable electronic paint thickness gauge.
14. The interior surface of each vessel shall be steam-cleaned after the hydrostatic test is completed. The interior shall be vacuum-cleaned to remove all loose particles and inspected by ultra violet light ("Black Light" 3,200 to 4,000 angstrom units) to determine that no oil (hydrocarbons) is present.
15. After all leak-testing is completed; each vessel shall be depressurized to a pressure of 10 to 20 psig and sealed for shipment. The retained, dry test medium shall insure that a positive pressure is maintained to prevent ingress of dirt and corrosion of internal surfaces during storage and shipment prior to use.

- C. Acceptable Manufacturers:
  - 1. CP Industries
  - 2. Fiba Tech
  - 3. Wilco.
  - 4. Or approved equal that meets Buy America requirements

## 2.05 PRIORITY FILL AND ESD VALVE PANEL

- A. The 1/2-inch Priority Control Logic (PLC) controlled priority fill and ESD valve system panel shall direct compressor discharge to either dispenser or storage.
- B. The priority control valve system shall accommodate two (2) single compressor packages, two (2) each two hose fast-fill dispensers, one cascade ASME storage assembly of nine (9) vessels, with future capacity for three (3) additional ASME vessels. A single (common) emergency shutdown (ESD) valve system shall, when actuated, shutoff flow to the dispensers.
- C. The PLC priority for compressor flow is summarized as follows:
  - 1. First priority: Direct flow to fast-fill dispensers.
  - 2. Second priority: Replenish the three (3) bank cascade storage assembly (high, mid and low). The high-bank shall be refilled first, followed by the mid-bank and then the low-bank.
- D. All valves, actuators, fittings, tubing, etc., shall be provided and will allow a simple connection at the panel enclosure (via bulkhead connection). Provisions shall also be included for any future equipment specified on the Plans (i.e. additional compressor, fast-fill dispensers or storage assemblies). Bulkhead connections to future equipment shall be plugged.
- E. Priority Control Logic: Cascade storage shall be accessed first, in the event of a demand for vehicle fast filling. If storage cannot complete the fill, then the station control system shall start the compressor and direct compressor discharge gas to the dispenser. The compressor shall continue to run to meet any additional fast filling demands. If there are no further fast fill demands, the compressor shall replenish the storage.
- F. All components including control valves, emergency shutdown valves, PLC, transmitters/transducers, etc. shall be mounted within a NEMA 4X rated enclosure. The enclosure shall be equipped with legs suitable for anchoring the panel to a concrete foundation.
- G. All electrical components shall be suitable for Class 1, Division 2, Group D locations.
- H. Acceptable Manufacturers:
  - 1. JW Power
  - 2. TGT
  - 2. ANGI



3. Or approved equal that meets Buy America requirements.

## 2.06 QUICK FILL DISPENSER

A. The Owner shall provide CNG Quick Fill Fuel Dispensers as follows:

1. Provide the quantity of dispenser(s) specified in on the Plans.
2. The dispenser(s) shall be manufactured under the guidelines of NFPA 52, NFPA 70 (NEC), CSA ANSI/IAS NGV4.1-1999/CSA 12.5-M99, and ANSI/ASME B31.3.
3. The fast-fill dispenser(s) shall have hose assemblies designed to independently fill vehicles up to 3,600 psig referenced to 70 degrees F.
4. The fast-fill dispenser shall be controlled by the Fuel Management (control) System (FMS) terminal. The FMS terminal authorizes the dispenser to independently meter the compressed gas and dispense gas from each hose. The dispenser shall be controlled by internal logic controller with interface to Fuel Management System (s), so that FMS can authorize the dispensing of fuel and so that CNG fuel consumption mass can be recorded by the FMS. Dispenser shall generate 1000 pulse count per mass of CNG dispensed. Actual mass-calibration rate is to be coordinated with Owner. As the gas is dispensed, the mass is to be measured by a mass flow meter, converted to equivalent gallons, and displayed by the dispenser display head.
5. Interface with Fuel Management System terminal(s). Furnish interface connections between each dispenser and the fuel management terminal(s) for the following signals: Handle switch, low-voltage meter pulsar and authorize signal. Conductors of different voltage shall be routed in Separate conduits.
6. The dispenser shall comply with the Americans with Disabilities Act (ADA) and the National Conference of Weights and Specifications (NCWM). The dispenser shall have received National Type Evaluation Program listing and comply with applicable codes and standards listed in Specification Article 1.02.
7. The dispenser shall be complete with all equipment piped and wired. All accessories necessary for testing and routine maintenance shall be included. A pit frame shall be provided for dispenser mounting on the fuel island.
8. The dispenser shall be designed and qualified for 4,500 psig. The vehicle delivery pressure shall 3,600 psig referenced to 70 degrees F. The dispenser shall provide hose assemblies, quantity and type as specified in Article 2.05L. Each hose shall be labeled with a sign on the dispenser enclosure indicating the delivery pressure from that hose.
9. The flow of gas to the vehicle shall continue until the electronic control system signals a complete fill or is manually stopped. The shut-off fill pressure shall be electronically ambient-temperature and heat-of-compression compensated at a fixed reference temperature of 70°F. The system shall allow unrestricted CNG

flow until the shutoff pressure is reached (i.e., CNG flow shall not be throttled as the shut-off pressure is approached.)

B. Dispenser Enclosure

1. The dispenser enclosure shall be self-supporting and weatherproof. The dispenser enclosure shall enclose meters, displays, and appropriate valving and controls. Instructions for dispenser operation shall be located on the front and back of the dispenser. Enclosure material and finish are specified in Article 2.05L.

C. Hoses

1. The twin-hose assemblies shall be ANSI/IAS NGV 4.2-1999 approved Parker Parflex or approved equal rated at 5,000 psig MAWP and shall be electrically conductive. Each twin-hose assembly shall consist of a supply hose and a vent hose. Each hose assembly shall be 12 feet long minimum and sized per Article 2.05L. CNG fill hoses will be provided with inline break away protection with a check valve on each hose assembly in the event of a vehicle pull away while it is still connected to the hose.
2. Hoses shall be distinctly marked, either by the manufacturer's permanently attached tag or by distinct markings, indicating the manufacturer's name or trademark, natural gas service and working pressure.

D. Fueling Connection and Venting

1. Fueling nozzles shall be NGV-1 or NGV-2, Type 1 or 2 couplings as noted in Article 2.05L. A holster shall be provided to protect nozzle when not in use. Venting of the gas, during hose disconnect at the dispenser, shall occur via a vent line inside the side panel of the dispenser. A 1/2 inch vent line connection at the dispenser shall be provided to allow Contractor to route the vented gas away from the dispenser to a common vent stack located within the site enclosure.

E. Metering

1. Dispenser fuel metering shall be accomplished through the use of a Coriolis mass flow meter consisting of a sensor and an electronic control module that measures the mass of the gas flow independent of density, pressure or temperature. Minimum design features shall include:
  - a. An independent Coriolis metering system, Micro Motion CNG50 or approved equal, for each fueling hose of the dispenser.
  - b. Certified metering accuracy of  $\pm 1.5\%$ .
  - c. Meter mounted and wired within the dispenser housing.
  - d. Factory installed and calibrated before shipment

F. Dispenser Displays and Registers

1. The display heads shall display the equivalent gallons dispensed, cost per gallon,

and total sale amount. The displays shall be readable from the front and rear of the dispenser. Gauges measuring the pressure delivered to the vehicle shall be mounted in the dispenser visible from the front and back. The gauges shall be liquid-filled. The display shall be capable of being re-set after each use.

2. The dispenser registers shall be man equal.

G. Dispenser Inlet Filters

1. One coalescing filter, Parker J type or approved equal, with isolation and drain valves shall be connected to each of the three dispenser inlet lines and shall capture aerosol particles greater than 0.6 microns. The filters shall have a design pressure not less than 5,000 psig. Filter element replacement shall be performed without removing the connection piping or tubing.

H. Vehicle Fill System

1. Dispensers shall incorporate only electronically controlled temperature compensated fuel control systems, which shall include the following:
  - a. Algorithm based software to provide vehicle filling control that calculates the vehicle's required fuel capacity compensating for ambient temperature, heat of compression, gas temperature variations and vehicle cylinder temperature rise so as to provide accurate fills to within 93-98% of vehicle rated capacity.
  - b. Computer based adjustable control of sequential set points for low, mid and high banks of storage with full low flow cut off.

I. Sequencing Control

1. Sequential control valves shall be located in the dispenser housing to access each of the banks of storage.

J. Isolation Valves

1. Butterfly type isolation valves shall be provided and located in each dispenser housing to allow isolation of the dispenser from each storage bank inlet line.

K. Relief Valves

1. Pressure relief valves shall be provided and located in each dispenser housing for each storage bank inlet line. Discharge from the relief valves shall be routed through the top of the dispenser enclosure.

L. The Compressed Natural Gas quick fill fuel dispenser supplied shall be designed per the following specific design criteria:

1. Non X-Purge Type
2. Display panel on each side of the dispenser

3. Powder Coated Stainless Steel Enclosure Body
4. Class 1, Division 1, Group D, NON-PURGE electronics
5. Provisions for a 4-20mA signal output to a remote controller.
6. Provided with one (1) each 3/8 inch (min) nominal diameter hose with NGV-1, Type 1 (Quick Connect) standard flow nozzle for the light duty vehicles. Minimum design flow rate: 1500 scfm.
7. Provided with one (1) each 1/2 inch (min) nominal diameter hose with NGV-2, Type 1 (Quick Connect) high flow nozzle for heavy duty vehicles. Minimum design flow rate: 2500 scfm.
8. Shall be compatible with FuelMaster Fuel Island Terminal.

M. Acceptable Manufacturers:

1. Tulsa Gas Technologies (TGT)
2. Wayne
3. Kraus
4. ANGI
3. Or approved equal that meets Buy America requirements.

## 2.07 FUEL MANAGEMENT SYSTEM (FMS)/ACCESS TERMINAL

A. For the E.M.W Gas Association CNG transactions, provide one (1) each FuelMaster compatible Fuel Island Terminal or equal for access to the CNG Fill Dispenser with the following features:

1. Dispenser shall be controlled by internal logic controller with interface to the Fuel Control System Terminal, so that the terminal can authorize the dispensing of fuel, and so that CNG fuel consumption mass can be recorded by the terminal.
3. Interface with Fuel Management Control System Terminal. Furnish connections between the dispenser and its Fuel Control System Terminal for the following signals: Handle switch, low-voltage meter pulsar and authorize signal. Conductors of different voltage shall be routed in separate conduits.
4. Fueling shall be initiated fueling by keyboard code, optical or magnetic stripe cards or ChipKey®.

B. Acceptable Manufacturers:

1. OPW Petro Vend™
2. Fuel Master
3. Or approved equal

## 2.08 SITE CONTROL PANEL

- A. The Contractor shall supply a Site Control Panel used to control the CNG station site operations.
- B. A Frank W. Murphy manufactured CNG Level II site control panel with Allen Bradley Micrologix™ 1400 PLC system (or approved equal) with IP addressable SCADA

communications capability shall be provided for automatic compressor start/stop operation with alternating lead/lag control. The site control panel shall be weather-tight and suitable for use in Class 1, Division 2, Group D locations. The site control panel shall include a Red Lion HMI operator panel (or approved equal). Site controller shall be a stand-alone unit and be capable of operating up to 2 compressors. Site controller shall operate independently and shall not be dependent on the operational status of any one compressor.

## 2.09 INSTRUMENTATION AND CONTROLS FOR EQUIPMENT SYSTEMS

- A. All pressure gauges shall conform to the following requirements:
  - 1. All gauges shall read at least 1.2 times the system design pressure (NFPA 52).
  - 2. Accuracy, including hysteresis, shall  $\pm 0.5\%$  of full scale or better.
  - 3. Rear blowout protection shall be provided.
  - 4. All gauges shall be waterproof and oil-filled.
  - 5. The dial shall have a minimum diameter of 2-1/2 inches.
- B. All temperature gauges shall conform to the following requirements:
  - 1. Accuracy shall be within  $\pm 1\%$  of the full scale or better.
  - 2. The dial shall have a minimum diameter of 2-1/2 inches.
- C. All instrument components interfacing with natural gas shall be made of material compatible with odorized natural gas. No copper metal or alloys containing more than 70% copper shall be used in natural gas service.
- D. All gauges and manually-operated valves shall be located no higher than five (5) feet above grade except as allowed in writing by the Owner.
- E. All devices shown on the Contractor's Piping and Instrumentation Diagram shall be identified with a metallic device label/tag affixed to the device.

## 2.10 PIPING/TUBING FOR EQUIPMENT SYSTEMS

- A. Piping and tubing systems shall be rated for the maximum pressure and temperature to which they will be subjected under normal operating conditions and be properly supported and protected to prevent damage from vibration during shipment, operation, and maintenance. Piping and tubing systems shall be installed in a neat and orderly arrangement, adapting to the contours of the skid package. Piping and tubing systems shall not obstruct access openings. Where practical, piping and tubing shall be installed to avoid physical damage. Supports shall not be welded directly to piping or tubing.
- B. Piping design, inspection, and testing shall be in accordance with ASME B31.3 with a

minimum factor of safety of at least three (3) based on the system design pressure. Steel piping shall be seamless and conforming to ASTM A106, Grade B. Cast iron or semi-steel piping shall not be used. Testing shall be pneumatic.

- C. Spacing for piping, tubing, and conduit supports shall be as recommended by ASME B31.3.
- D. High pressure CNG process stainless steel tubing and tube fittings shall be stainless steel. All CNG tubing and tube fittings shall be rated for at least 5,000 psig working pressure. All tubing fittings used (compressor skids, dispensers, storage, and inter-skid connections) shall be Swagelok Type 316 stainless steel (small than 1/2" diameter tubing), Parker Seal-Lok (1/2" diameter tubing or larger) or approved equal. Mixing brands of tubing and fittings of the same nominal tubing size for high pressure CNG process tubing shall not be allowed.
- E. Stainless steel tubing shall be seamless and bright annealed per ASME SA213/ASTM A213, Type 316 or Type 304. Tubing wall thickness shall be selected to meet or exceed the MAWP for the applicable process tubing section IAW the requirements of ASME B31.3.
- F. Piping shall be prepared and painted in accordance with manufacturer's standards.
- G. Personnel installing tubing and tube fittings shall be trained and certified by the tube-fitting manufacturer. All tubing shall be installed neatly and in a workmanlike manner. All tubing shall be properly anchored, supported, and/or pitched. All tubing shall run true to the vertical and horizontal axes of the skid.
- H. All drain lines shall be brought to skid edge with a drain valve.
- J. All valves shall be accessible for easy operation and maintenance

## 2.11 CNG COMPRESSOR DISCHARGE FILTRATION

- A. The Contractor shall provide filtration equipment for the CNG compressor discharge as follows:
  - 1. Provide a discharge coalescing filtration system that is completely piped with all valves and fittings. The filtration system shall consist of two Parker J series or approved equal coalescing filters in series. Filtration system shall be located upstream and adjacent to the priority valve panel.
  - 2. Filter system shall include 3/4 inch Hoke Series 72 or approved equal inlet and outlet isolation valves and a Hoke or approved equal 1/4 inch drain (needle) valve for each filter. Filter bodies shall be rated for 5,000 psig minimum.
  - 3. The first filter in series shall have Grade 10 pre-coalescing media. The second filter shall have Grade 4 media.
  - 4. The filtration system shall be mounted on a steel bracket stand, which can be anchored to a concrete foundation using four anchors. Each filter shall be

mounted in a manner to enable the filter bowl to be removed without removing the filter from the mounting bracket.

- B. Acceptable Manufacturers:
  - 1. Parker Finite.
  - 2. Or approved equal.

### **PART 3 EXECUTION**

#### **3.01 CNG EQUIPMENT**

- A. The Contractor shall design, fabricate, shop test and deliver the required equipment and materials to provide for a Compressed Natural Gas (CNG) public access fueling station that meet all Local, State, and Federal standards for safety and operation.

#### **3.02 SHOP EQUIPMENT TESTING**

- A. All ASME pressure vessels shall be hydrostatically pressure tested per ASME BPV Code Section VIII (applicable Division).
- B. Process piping for equipment systems shall be hydrostatically and pneumatically leak tested per ASME B31.3.
- C. A factory test of the completed equipment system(s) shall be performed to demonstrate that all requirements of this specification are met. This test shall include but not be limited to:
  - 1. Check of motor(s) operation.
  - 2. Calibration check of instruments.
  - 3. Functional test including operation of control systems, safety alarms, and shutdowns.
- D. The Contractor shall notify the Owner's Representative no later than 10 working days prior to factory testing of the CNG Packaged Unit compressor systems to allow the Owner's Representative the opportunity to witness the test prior to shipment. Owner's witnessing of the testing does not relieve the Contractor of the responsibility to comply with the specifications.
- E. Written records documenting the results of the shop testing shall be provided as part of the equipment operating and maintenance manual.

#### **3.03 DELIVERY**

- A. The Contractor shall provide for the delivery of the CNG Equipment to the Project site. Securely package and protect equipment and materials during shipment. Packages, containers, and boxes shall be clearly labeled with manufacturer's name, brand or model number.

- B. For each shipment, a list of all equipment and materials shipped including shipper contact information shall be provided to Owner prior to shipment.
- C. Owner's Representative shall only review the condition of the exterior packaging for the equipment and materials as received onsite. Contractor shall be responsible for any damage to equipment and materials during shipment not visible from the exterior of the package, container, and box.

**PART 4 MEASUREMENT AND PAYMENT**

4.01 MEASUREMENT

Measurement for the CNG Equipment will be made at the Contract unit price per each as accepted by the Engineer.

4.02 PAYMENT

All costs incurred by the Contractor by reason of compliance to satisfy the requirements under this section shall be considered incidental to and completely covered by the Contract unit price for the full integration of the following supplied items.

<u>Description</u>	<u>Unit(s)</u>
CNG Station Inlet Gas Dryer	Each
CNG Station CNG Dispenser w/Hoses	Each
CNG Station Fuel Island Terminal (Fuel Master)	Each
CNG Station 1/2" Priority Fill and ESD Valve Panel	Each
CNG Station Custom Valve Distribution Panel	Each
CNG Station Coalescing Filter Assembly	Each
CNG Station 100 HP 3 Stage Compressor Skid Package	Each
CNG Station Site Control Panel	Each
CNG Station 12,369 SCF Storage Sphere (48")	Each

END OF SECTION



## SECTION 13100

### ENGINEERED CANOPY SYSTEMS

#### PART 1 GENERAL

##### 1.1 QUALITY ASSURANCE

- A. Engineered Canopy System manufacturer shall have a minimum of 15 years of experience.
- B. Canopy Manufacturer shall have a current American Institute of Steel Construction (AISC) SBR Certification.
- C. All materials shall be delivered to the job site on trucks that are directly owned and operated by the Canopy System manufacturer

##### 1.2 SYSTEM DESCRIPTION

Engineered Canopy System shall be pre-engineered and pre-fabricated using only the highest quality materials available. Recycled or salvaged steel, decking and fascia are not acceptable. Engineered Canopy System shall be completely flat decked. The Engineered Canopy System shall have a complete perimeter guttering system designed to drain back to a centralized gutter that carries roof water to the columns for collection and dispersal via an external downspout or internal PVC drain system.

##### 1.3 PERFORMANCE REQUIREMENTS

Design, fabricate, and erect the canopy system to withstand loads from winds, gravity, and structural movement, and resist in-service use without failure. Design members to withstand stresses resulting from combinations of loads that produce maximum allowable stresses prescribed Metal Building Manufacturers Association (MBMA) Design Practices Manual and International Building Code (IBC) 2018, American Society of Civil Engineers (ASCE) 7-16 or as specified.

- A. Design Loads: Basic design loads to be withstood are indicated below:  
(These are minimum requirements)

Governing Building Code:	Per IBC 2018 or as specified
Roof Dead:	Self weight unless additional specified
Roof Live:	Per ASCE 7-16 or as specified
Snow Drift:	Per IBC 2018 or as specified
Seismic:	As required by local code
Wind Loads:	Per ASCE 7-16 or as specified
Uplift:	Per ASCE 7-16 or as specified

##### 1.4 STRUCTURAL FRAMING AND ROOF PANELS

Design structural members and exterior coverings for applicable loads and combinations of loads in accordance with latest edition of Metal Building Manufacturers Association (MBMA) Design Practices Manual and IBC 2018 or Local Code.

- A. Structural Steel: Comply with the latest edition of AISC Specification for Design, Fabrication and Erection of Structural Steel for Buildings for design requirements and allowable stresses.
- B. Light Gauge Steel: For design requirements and allowable stresses, comply with latest edition of AISC Specification for the Design of Cold-Formed Steel Structural Members and Design of Light Gauge Steel Diaphragms.

## **1.5 SUBMITTALS**

Submit the following in accordance with the Conditions of the Contract:

- A. Product Data: Include manufacturer's product information for building components and accessories.
- B. Shop Drawings: Provide shop drawings for structural framing system, roofing, and fascia panels, and accessories not fully detailed or dimensioned in manufacturers product data.
  - 1. Structural Framing: Furnish erection drawings for submittal to secure permits. Include fabrication and assembly details. Show anchor bolt details and roof framing.
  - 2. Roofing and Fascia Panels: Provide panel layouts and details of edge conditions, joints, corners, custom profiles, support bracing, anchorages, trim, flashing, closures, and special conditions.

## **1.6 PRODUCT CERTIFICATION**

Certification must be prepared and signed by a Professional Engineer with 5 years of continuous experience in canopy design and registered in the state for which the project is being built verifying that structural framing and covering panels meet local loading requirements and codes.

## **1.7 SYSTEM SPECIFICATIONS**

The Engineered Canopy System submittal from the canopy system manufacturer will be reviewed for approval by the Engineer.

## **PART 2 PRODUCTS**

### **2.1 METALS**

Metal products shall be as specified by the ASTM International standards listed or as otherwise specified. Provide the following as required:

- A. Structural Steel Tubing: ASTM A500, Grade B, with a minimum yield stress of 46,000 psi.
- B. Steel Members Fabricated from Plate or Bar Stock: ASTM A529, A570, or ASTM A572. Provide 36,000-psi minimum yield strength.

- C. Steel Members Fabricated by Cold Forming: ASTM A607, Grade 50.
- D. Structural Quality Zinc-Coated (Galvanized) Steel Sheet: Roof deck shall be a minimum thickness of 20 gauge and a minimum yield of 40,000 PSI to meet ASTM A653, with a G60 coating complying with ASTM A924.
- E. Fascia Materials: Aluminum Composite Material Panel to be constructed with a 3mm thick pre-finished ACM substrate. Finish color shall be factory applied. Color shall be any stock color.
- F. Structural Bolts: ASTM A325 minimum.
- G. Beams: ASTM A572, 50,000 PSI

## **2.2 PAINT MATERIALS**

Comply with performance requirements of federal specifications indicated.

- A. Shop primer for ferrous metals: Fast-curing, lead free universal primer per Federal Specification TT-P-645B or TT-P-645C. The primer thickness shall be a minimum of 2 mils.
- B. Deck Materials have a coil coated polyester finish.

## **2.3 STRUCTURAL FRAMING**

- A. Rigid Frames: Crossbeams and purlins shall be factory welded, shop primed, wide flange shapes with structural attaching plates and or splice members to suit project conditions. All attachments shall be factory drilled for field bolted connections. Field welding and fabrication is unacceptable.
- B. Columns: Structural Steel Tubing ASTM A500, Grade B, minimum yield stress of 46,000 psi.
  - 1. Provide means for tank vent piping and electrical conduit as required or as specified on drawings.
  - 2. Provide 14 gauge external collector boxes or 7 gauge internal drain boxes at each column to collect drain water from the guttering system. Collector boxes used as required.

## **PART 3 EXECUTION**

### **3.1 ERECTION**

Erect framing true to line, plumb, level, rigid and secure. Level baseplates are to be true even plane with bearing to supporting structures, set with double-nutted anchor bolts. Anchor bolts shall be a minimum of 1 1/4" in diameter, 30" long with a 5" hook. Contractor shall use non-shrinking grout under the baseplate to obtain uniform bearing and maintain level baseline elevation. Moisture cure the grout for 7 days after its placement.

### **3.2 ROOF PANELS**

Fasten panels to purlins with galvanized steel clip fasteners. Avoid panel creep or application not true to line. Protect factory finishes from damage. Field cutting of panels by torch is not permitted.

### **3.3 SHEET METAL ACCESSORIES**

Install gutters, downspouts, and other accessories for positive anchorage to structure and weather tight mounting. Use only high quality sealant designed for outdoor use on sheet metal.

### **3.4 FACIA SECTIONS**

Install fascia sections, trim and related accessories per manufactures specifications for the style of fascia used on this project.

Install screw fasteners with power tools having controlled torque as to not strip screw threads and or damage fascia material.

### **3.5 CLEANING AND TOUCH-UP**

Clean component surfaces. Touch up abrasions, marks or minor defects to shop primed surfaces. Stack all waste materials and packaging in appropriate facility. If appropriate facility is not provided, stack material neatly out of the way.

END OF SECTION

## SECTION 13120

### PRE-ENGINEERED AND FABRICATED STRUCTURES (CANOPY / CARPORT SYSTEMS)

#### PART 1 GENERAL

##### 1.01 SYSTEM DESCRIPTION

Engineered Canopy/Carport Systems shall be pre-engineered and pre-fabricated using only the highest quality materials available. Recycled or salvaged steel, decking and fascia are not acceptable. Engineered Canopy Systems over refueling dispensers shall be completely flat decked. The Engineered Canopy System over refueling dispensers shall have a complete perimeter guttering system designed to drain back to a centralized gutter that carries roof water to the columns for collection and dispersal via an external downspout or internal PVC drain system.

##### 1.02 PERFORMANCE REQUIREMENTS

Design, fabricate, and erect the canopy system(s) to withstand loads from winds, gravity, and structural movement, and resist in-service use without failure. Design members to withstand stresses resulting from combinations of loads that produce maximum allowable stresses prescribed Metal Building Manufacturers Association (MBMA) Design Practices Manual, International Building Code (IBC) 2018, and the American Society of Civil Engineers (ASCE) Chapter 7-16.

A. Design Loads: Basic design loads to be withstood are indicated below:  
(These are minimum requirements)

Governing Building Code:	IBC 2018
Roof Dead:	Self weight
Roof Live:	IBC 2018 Section 1607: 20 PSF Uniform; 300 LB Concentrated
Snow Loads:	IBC 2018 Section 1608: 20 PSF Uniform
Seismic:	Per ASCE 7-16, Chapter 11: Design Category: B $I_e = 1.00$
Wind Loads:	IBC 2018 Section 1609 and per ASCE 7-16, Chapter 26: Basic Wind Speed 105 mph Exposure Category: B Surface Roughness Category: B

##### 1.03 STRUCTURAL FRAMING AND ROOF PANELS

Design structural members and exterior coverings for applicable loads and combinations of loads in accordance with latest edition of Metal Building Manufacturers Association (MBMA) Design Practices Manual and IBC 2018 or Local Code.

A. Structural Steel: Comply with the latest edition of AISC Specification for Design, Fabrication and Erection of Structural Steel for Buildings for design requirements and allowable stresses.

- B. Light Gauge Steel: For design requirements and allowable stresses, comply with latest edition of AISC Specification for the Design of Cold-Formed Steel Structural Members and Design of Light Gauge Steel Diaphragms.

#### 1.04 SUBMITTALS

Submit the following in accordance with the Conditions of the Contract:

- A. Product Data: Include manufacturer's product information for building components and accessories.
- B. Shop Drawings: Provide shop drawings for structural framing system, roofing, and fascia panels, and accessories not fully detailed or dimensioned in manufacturers product data.
  - 1. Structural Framing: Furnish erection drawings for submittal to secure permits. Include fabrication and assembly details. Show anchor bolt details and roof framing.
  - 2. Roofing and Fascia Panels: Provide panel layouts and details of edge conditions, joints, corners, custom profiles, support bracing, anchorages, trim, flashing, closures, and special conditions.

#### 1.05 PRODUCT CERTIFICATION

Certification must be prepared and signed by a Professional Engineer with 5 years of continuous experience in canopy design and registered in the state for which the project is being built verifying that structural framing and covering panels meet local loading requirements and codes.

#### 1.06 SYSTEM SPECIFICATIONS

The Engineered Canopy System submittal from the canopy system manufacturer will be reviewed for approval by the Engineer.

#### 1.07 QUALITY ASSURANCE

- A. Engineered Canopy System manufacturer shall have a minimum of 15 years of experience.
- B. Canopy Manufacturer shall have a current American Institute of Steel Construction (AISC) SBR Certification.
- C. All materials shall be delivered to the job site on trucks that are directly owned and operated by the Canopy System manufacturer

## **PART 2 PRODUCTS**

#### 2.01 METALS

Metal products shall be as specified by the ASTM International standards listed or as otherwise specified. Provide the following as required:

- A. Hot Rolled Structural wide flange steel: ASTM A992 or ASTM A572, with a minimum yield stress of 50,000psi.
- B. Other Hot Rolled Structural Steel: ASTM A36, with a minimum yield stress of 36,000psi.
- C. Structural Steel Tubing: ASTM A500, Grade B, with a minimum yield stress of 46,000 psi.
- D. Steel Members Fabricated by Cold Forming: ASTM A607, Grade 50.
- E. Structural Quality Zinc-Coated (Galvanized) Steel Sheet: Roof decking shall be a minimum thickness of 20 gauge (unless otherwise noted on the drawings) and a minimum yield of 40,000 PSI to meet ASTM A653, with a G60 coating complying with ASTM A924.
- F. Fascia Materials: Aluminum Composite Material Panel to be constructed with a 3mm thick pre-finished ACM substrate. Finish color shall be factory applied. Color shall be any stock color.
- G. Structural Bolts: ASTM A325 minimum. Light Gage steel connection bolts: ASTM A307.

## 2.02 PAINT MATERIALS

Comply with performance requirements of federal specifications indicated.

- A. Shop primer for ferrous metals: Fast-curing, lead free universal primer per Federal Specification TT-P-645B or TT-P-645C. The primer thickness shall be a minimum of 2 mils.
- B. Deck Materials have a coil coated polyester finish.

## 2.03 STRUCTURAL FRAMING

- A. Rigid Frames: Crossbeams and purlins shall be factory welded, shop primed, wide flange shapes with structural attaching plates and or splice members to suit project conditions. All attachments shall be factory drilled for field bolted connections. Field welding and fabrication is unacceptable.
- B. Columns: (for canopy over refueling dispensers, compressors or ASME vessels)
  - 1. Provide means for tank vent piping and electrical conduit as specified on drawings.
  - 2. Provide 14 gauge external collector boxes or 7 gauge internal drain boxes at each column to collect drain water from the guttering system. Collector boxes used as required.

# **PART 3 EXECUTION**

## 3.01 ERECTION

A. Dispenser / Compressor / ASME Vessel Canopy: Erect framing true to line, plumb, level, rigid and secure. Level baseplates are to be true even plane with bearing to supporting structures, set with double-nutted anchor bolts. Anchor bolts shall be a minimum of 1 1/4" in diameter, 30" long with a 5" hook. Contractor shall use non-shrinking grout under the baseplate to obtain uniform bearing and maintain level baseline elevation. Moisture cure the grout for 7 days after its placement.

## 3.02 ROOF PANELS

Fasten panels to purlins with galvanized steel clip fasteners. Avoid panel creep or application not true to line. Protect factory finishes from damage. Field cutting of panels by torch is not permitted.

3.03 SHEET METAL ACCESSORIES

Install gutters, downspouts, and other accessories for positive anchorage to structure and weather tight mounting. Use only high quality sealant designed for outdoor use on sheet metal.

3.04 FACIA SECTIONS

Install fascia sections, trim and related accessories per manufactures specifications for the style of fascia used on this project.

Install screw fasteners with power tools having controlled torque as to not strip screw threads and or damage fascia material.

3.05 CLEANING AND TOUCH-UP

Clean component surfaces. Touch up abrasions, marks or minor defects to shop primed surfaces. Stack all waste materials and packaging in appropriate facility. If appropriate facility is not provided, stack material neatly out of the way.

**PART 4 MEASUREMENT AND PAYMENT**

4.01 MEASUREMENT

Measurement for the Pre-Engineered and Fabricated Structures installation will be made at the Contract unit price per each, complete in place, at each location installed and accepted by the Engineer.

4.02 PAYMENT

All costs incurred by the Contractor by reason of compliance to satisfy the requirements under this section shall be considered incidental to and completely covered by the Contract unit price for the following bid items:

<u>Description</u>	<u>Unit(s)</u>
Pre-Engineered and Fabricated Structure (Canopy)	Each

END OF SECTION



## SECTION 13550

### CNG VEHICLE FUELING EQUIPMENT INTEGRATION

#### PART 1 GENERAL

##### 1.01 SUMMARY OF WORK INCLUDED

- A. This specification covers the general requirements for the equipment setup and integration, onsite testing, commissioning, and onsite training for compressed natural gas (CNG) vehicle fueling equipment station. The fueling equipment as packaged per Section 11500, shall be located as shown on the Plans. The installed CNG fueling system when completed shall consist of, but not be limited to, the following:
1. Two (2) CNG Compressor Packaged Units with electric motor drive.
  2. One (1) single tower inlet gas dryer package with manual regeneration system.
  3. Three (3) CNG storage assemblies rated at 5,500psig minimum.
  4. One (1) CNG compressor discharge coalescing filtration system to filter all CNG sent to the fueling dispenser(s).
  5. One (1) 1/2-inch Priority Logic Control Valve, ESD Valve and Custom Valve Distribution Panel.
  6. Two (2) dual-hose, fast-fill dispensers.
  7. One automated Fuel Island Terminal (FIT) (4 hose Card reader).
- B. In addition to the above, the work scope includes:
1. Connection of Owner provided equipment and Controls / ESD systems / Security system and pressure testing of all Stainless-Steel components. Assist Owner with operation of merchant ID from new Card Reader for Public Access transactions.
  2. Successful completion of onsite equipment commissioning, performance testing, and training for E.M.W. (Owner) personnel.
- C. For the equipment requirements for this Project, refer to Section 11500, which combined with this Section, define all of the CNG equipment specifications for the Project.

##### 1.02 CODES AND STANDARDS

- A. All equipment installations shall a) comply with the following codes and standards that are enforced by the local authorities having jurisdiction, including the New Mexico State Fire Marshal, and b) if not specifically enforced by the local authorities, comply with the latest edition of the following codes and standards at the time of Installation.

1. American National Standards Institute (ANSI)
  - a. ANSI/NGV 1, Standard for Compressed Natural Gas Vehicle Fueling Connection Devices
  - b. ANSI/NGV 4.1, NGV Dispensing Systems
  - c. ANSI/NGV 4.2, Hoses for Natural Gas Vehicles and Dispensing Systems
  - d. ANSI/NGV 4.4, Breakaway Devices for Natural Gas Dispensing Hoses and Systems
  - e. ANSI/NGV 4.6, Manually Operated Valves for Natural Gas Dispensing Systems
  - f. ANSI/NGV 4.7, Automatic Pressure Operated Valves for Natural Gas Dispensing Systems
  - g. ANSI/NGV 4.8, NGV Fueling Station Reciprocating Compressor Guidelines
  - h. ANSI Z535.2, Environmental and Facility Signs
  - i. ANSI/IEC 60529, Degrees of Protection provided by Enclosures (IP Code)
  - j. ANSI/NEMA MG-1, Motors and Generators
  - k. ANSI/NEMA 250, Enclosures for Electrical Equipment (1000 V Maximum)
  
2. American Petroleum Institute (API)
  - a. API Recommended Practice 520 – Sizing, Selection, and Installation of Pressure Relieving Devices in Refineries
  
3. American Society of Mechanical Engineers (ASME)
  - a. Boiler and Pressure Vessel (B&PV) Code
    - i. Section V - Nondestructive Examination
    - ii. Section VIII, Division I - Pressure Vessels
    - iii. Section IX - Welding and Brazing Qualifications
  - b. ASME A13.1, Scheme for the Identification of Piping Systems
  - c. ASME B16.25, Butt welding Ends
  - d. ASME B31.3, Process Piping Code
  
4. American Society for Nondestructive Testing (ASNT)
  - a. SNT-TC-1A Recommended Practice
  
5. American Welding Society (AWS)
  - a. A5.1 Covered Carbon Steel Arc Welding Electrodes
  - b. A5.5 Low Alloy Steel Covered Arc Welding Electrodes
  
6. International Code Council (ICC)
  - a. International Building Code (2018)
  - b. International Fire Code (2018)
  - c. International Fuel Gas Code

- d. International Mechanical Code
  - e. International Plumbing Code
7. National Fire Protection Association (NFPA)
- a. NFPA 52 Vehicular Gaseous Fuel Systems Code
  - b. NFPA 70 National Electrical Code
  - c. NFPA 496 Purged and Pressurized Enclosures for Electrical Equipment
8. Society of Automotive Engineers (SAE)
- a. J1616 Recommended Practice for CNG Vehicle Fuel
9. Underwriters Laboratories Inc. (UL)
- a. UL 508A Industrial Control Panels
  - b. UL 1604 Electrical Equipment for Use in Class I and II, Division 2, and Class III Hazardous (Classified) Locations
10. U.S. Department of Labor (OSHA)
- a. Title 29 CFR Part 1910 - Occupational Health and Safety Standards

### 1.03 QUALITY ASSURANCE

- A. All installed materials shall be new (i.e., not previously used and manufactured no more than 2 years prior to receipt of Notice to Proceed.) unless equipment is provided by the Owner. Owner provided used equipment has been refurbished to meet the specifications herein unless otherwise authorized by the Owner or Owner's Engineer. All installed equipment shall be permanently affixed and accessible for maintenance and operation in accordance with all code requirements.
- B. All installed items shall be inspected for finish damage and finishes shall be repaired if damaged. Paint and priming products, whether shop or field applied shall be lead, chromium, and cadmium free. In addition, these products and all other materials used shall comply with local, regional, state and federal air quality rules and regulations, especially those of the local air quality management district.

### 1.04 SUBMITTALS

- A. Submit equipment record drawings as described in Article 2.03.
- B. Submit operating and maintenance manuals as described in Article 2.04.
- C. Submit Warranty documentation for equipment warranty(s) described in Article 2.06.

## **PART 2 PRODUCTS**

### 2.01 EQUIPMENT SET UP AND INTEGRATION

- A. The Contractor shall provide the setup, installation and integration tasks in order to provide a complete and functional installation of the CNG Fueling Equipment provided under Section 11500. The fueling equipment, as installed, shall be provide for continuous operation and shall meet vehicle fueling needs upon the Owner’s user demand around the clock. The operation of the CNG fueling system shall be automatic (shall start-up and stop automatically) with provisions for manual operation/intervention. In the event of an alarm or emergency shutdown, on-site manual intervention shall be required to reset the compressor.

## 2.02 ONSITE EQUIPMENT TESTING, COMMISSIONING, AND TRAINING

- A. The Contractor shall provide the necessary equipment and labor required to complete onsite equipment testing, commissioning and personnel training required to provide a complete and functional installation of the CNG Fueling Equipment.

## 2.03 EQUIPMENT RECORD DRAWINGS

- A. The Contractor shall update the certified shop drawings to reflect any Engineer approved field modifications subsequent to delivery from the factory. The latest revision of the shop drawings shall be incorporated into the equipment operating and maintenance manuals. Drawings shall be provided in both hard copy and electronic PDF compatible formats.

## 2.04 OPERATING AND MAINTENANCE MANUALS

- A. All product data and related information appropriate for Owner’s maintenance and operation of all products and systems provided under this Contract shall be compiled into an integrated operating and maintenance manual. The manual shall include written test reports documenting performance and operational data. The Priority Logic Control program listing shall be included in the manual. Submit one copy of the draft manual for review by the Owner’s Representative. Submit three copies of the final manual after acceptance by the Owner’s Representative.

## 2.05 RECOMMENDED SPARE PARTS LISTING

- A. The Contractor shall provide listings of recommended equipment spare parts required for start-up, one, and three (3) years after equipment startup. Owner shall provide an approximate annual equipment run time which shall be the basis for the spare parts list.

## 2.06 EQUIPMENT WARRANTY & RESPONSE TIME

- A. Contractor shall provide a minimum one-year (1 year) warranty covering equipment parts and labor. The warranty period shall begin at Substantial Completion. Contractor shall be onsite within 12 hours of notification from Owner of a warranty service request.

# **PART 3 EXECUTION**

## 3.01 EQUIPMENT SET UP AND INTEGRATION

- A. GENERAL

1. The Contractor shall provide all necessary equipment, materials, and construction labor to set up and integrate all the CNG equipment provided by Section 11500 in order to provide a fully operational Quick Fill CNG station. Assure related Work by section is completed (as noted below) to assure the proper integration of the CNG system.
2. The Construction of the CNG Station shall comply with the drawings, specifications, procedures and standards for establishment of a compressor and refueling station.
3. The current NFPA-52 Vehicular Gaseous Fuel Systems Code applies to all the design and installation requirement of a CNG refueling facility. The Code specified requirements for the construction, location and installation of compressors, cylinders, regulation equipment, pressure relief devices, CNG transfer, pressure relief devices, CNG transfer, pressure gauges, high pressure piping system, vehicle refueling operation, and electrical both of the compressor system as well as the dispenser/filling posts.

**B. MECHANICAL CONSTRUCTION PER SPECIFICATIONS AND DRAWING**

1. Related in this section includes the following:
  - a. Placement of CNG equipment including compressor skids, dryer and storage units as shown on the Drawings. Included are providing loading and lifting equipment necessary for placement.
  - b. Anchoring down to the concrete pads of the CNG equipment including compressor skid, dryer and storage units.
  - c. Pipe, Pipe Fittings, and Pipe installations.
  - d. Stainless Steel Piping and Polyethylene Conduit installations.
  - e. Valves and Accessories installations.
  - f. Welding and Fusion of Pipe Work.
  - g. Coating & Wrapping or Epoxy Coating.
  - h. Testing of Installed Piping Systems.

**C. ELECTRICAL CONSTRUCTION PER SPECIFICATION AND DRAWING**

1. Related in this section includes the following:
  - a. High and Low Voltage Wiring.
  - b. Cable Raceways, Underground Conduit and Polyethylene Conduit.
  - c. Wire Coating, Size, Number, Type of Material.
  - d. Pull Boxes.
  - e. Conduit & Fittings in A Class One location.

**D. SECURITY SYSTEM PER SPECIFICATION AND DRAWING**

1. Related in this section includes the following:

- a. Installation of Security System including lighting, cameras, junction boxes, connections.

E. FUEL MANAGEMENT SYSTEM PER SPECIFICATION AND DRAWING

- 1. Related in this section includes the following:
  - a. Integration of the Fuel Management Systems (FMS) Terminal (card reader). This includes the integration of the one TGT compatible Fuel Island Terminal.

F. SIGNS AND DECALS PER SPECIFICATION AND DRAWING

- 1. Related in this section includes placement of the Signs and Decals per sign specification as noted on Signs Details.
  - a. Correct Type of material.
  - b. Correct Height and location.
  - c. Direction the Sign or Decal is facing.

G. INTEGRATION OF THE EQUIPMENT

- 1. Communications: Related in this section includes verification of initial CNG station system communications.
  - a. Wiring must be wired properly and check for proper communication between systems.
  - b. Stainless Steel Tubing should be connected properly so that the communication to the Check Valves operates properly.
  - c. Communication between the CNG Dispenser(s) and Fuel Management System(s) must be established and checked.
  - d. Proper communications must be established and checked between the Fuel Island Terminals and Owner's existing Fuel Management information system.
- 2. ESD Operation: Related to this section includes of all connections for the communication required for proper operation of the CNG Station Emergency Shutdown Devices (ESD).
  - a. Proper ESD/emergency shutdown, including proper connection and communications required for valve closures including proper connection and operation of all ESC shutdown buttons.
- 3. General Station Operation: Related to this section includes general station work required for proper operation of the CNG Station.
  - a. Correct operation of Fuel Management System(s) at the dispensers, including authorization of transaction, energizing of dispenser, and recording of transaction data.
  - b. Observe compressor operation, including stage pressures and temperatures and verifying function of controller.

### 3.02 ONSITE EQUIPMENT TESTING, COMMISSIONING, AND TRAINING

- A. The installed fueling equipment shall undergo a witnessed onsite system test of the installed equipment. At least two (2) weeks prior to the system test, the Contractor shall submit to the Owner's Representative draft Maintenance and Operating Manuals.
- B. During the startup/testing of the mechanical, instrumentation and electrical equipment by the Contractor, the Contractor shall make available representatives of the manufacturers of all of the major equipment or other qualified persons who shall conduct the test with the assistance of the Owner's Installation Contractor. Natural gas shall be used for the system test. Piping and tubing shall be purged with nitrogen prior to introducing natural gas.
- C. The scope of onsite testing shall include, but not be limited to, the following:
  - 1. Functionally test all equipment for proper operation of all operating modes/cycles. This includes calibrating all instrumentation and checking calibration of the CNG dispenser meters.
  - 2. Verify proper operation of equipment alarms and shutdowns.
  - 3. Verify proper operation and integration of the equipment systems.
  - 4. Any discrepancies found as a result of these inspections and tests shall be corrected by the Contractor at no cost to the Owner (including the cost for making all the corrections and repeating the tests within two (2) weeks).
- D. Acceptance by the Owner's Representative of the equipment and associated items furnished by Contractor under this specification shall occur only after the following requirements have been met:
  - 1. It has been demonstrated to the satisfaction of the Owner Representative that the equipment as a whole, meet and conform to the requirements of the Specification and drawings.
  - 2. All testing required by this Specification have been successfully completed and have been accepted by the Owner's Representative.
  - 3. The date of acceptance of the equipment shall be the date of the written notice of its acceptance by the Owner's Representative to Contractor. All warranties and/or guarantees referred to or implied in this Specification shall commence on that acceptance date.
  - 4. Acceptance by the Owner's Representative of the witnessed test shall not release Contractor from any of its warranty obligations, or any other obligation, under this Specification.
- E. Contractor shall provide two (2) formal training classes in equipment operation, service, and maintenance. Training shall be conducted onsite on the Owner's premises. Factory service representatives shall instruct the Owner's designated operating and maintenance

personnel in the operation, adjustment, and maintenance of all equipment and systems. Training shall include classroom and “hands-on” activities. The basis of instruction shall be the equipment operating and maintenance manual. The duration of the training classes shall be at the discretion of the Owner.

### 3.03 SUBSTANTIAL COMPLETION

- A. The contractor shall make all CNG equipment fully operational and maintain such equipment for a period of time until the station equipment properly operates for 20 continuous working days without system faults, completion of this activity to be defined as Substantial Completion.

## **PART 4 MEASUREMENT AND PAYMENT**

### 4.01 MEASUREMENT

Measurement for the integration of the CNG Equipment will be made at the Contract unit price per each as installed and accepted by the Engineer.

### 4.02 PAYMENT

All costs incurred by the Contractor by reason of compliance to satisfy the requirements under this section shall be considered incidental to and completely covered by the Contract unit price for the following bid items.

<u>Description</u>	<u>Unit(s)</u>
CNG Station Integration	Each

END OF SECTION



## SECTION 15060

### PIPE HANGERS AND SUPPORTS

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. The work covered under this section consists of the furnishing of all necessary labor, supervision, materials, equipment, and services to completely execute the pipe hanger and supports as described in this specification and Division 15.

##### 1.02 RELATED SECTIONS:

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

1. Section 15160, Pipe Installation
2. Section 15160B, Stainless Steel Piping and Tubing

##### 1.03 REFERENCES

- A. ASTM B633 - Specification for Electrodeposited Coatings of Zinc on Iron and Steel
- B. ASTM A123 - Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip
- C. ASTM A653 - Specification for Steel Sheet, Zinc-Coated by the Hot-Dip Process
- D. ASTM A1011 – Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability (Formerly ASTM A570)
- E. MSS SP58 - Manufacturers Standardization Society: Pipe Hangers and Supports- Materials, Design, and Manufacture
- F. MSS SP69 - Manufacturers Standardization Society: Pipe Hangers and Supports- Selection and Application
- G. NFPA 13 - Standard for the Installation of Sprinkler Systems

##### 1.04 QUALITY ASSURANCE

- A. Hangers and supports used in fire protection piping systems shall be listed and labeled by Underwriters Laboratories.
- B. Steel pipe hangers and supports shall have the manufacturer's name, part number, and

applicable size stamped in the part itself for identification.

- C. Hangers and supports shall be designed and manufactured in conformance with MSS SP 58.
- D. Supports for sprinkler piping shall be in conformance with NFPA 13.

#### 1.05 SUBMITTALS

- A. Submit product data on all hanger and support devices, including shields and attachment methods. Product data is to include, but not limited to materials, finishes, approvals, load ratings, and dimensional information.

## **PART 2 PRODUCTS**

### 2.01 ACCEPTABLE MANUFACTURERS

- A. Manufacturer: Subject to compliance with these specifications, pipe hanger and support systems shall be as manufactured by Cooper B-Line, Inc. (or Engineer approved/specified equal).

### 2.02 PIPE HANGERS AND SUPPORTS

#### A. Hangers

1. Uninsulated pipes 2 inches and smaller:
  - a. Adjustable steel swivel ring (band type) hanger, B-Line B3170.
  - b. Adjustable steel swivel J-hanger, B-Line B3690.
  - c. Malleable iron ring hanger, B-Line B3198R or hinged ring hanger, B3198H.
  - d. Malleable iron split-ring hanger with eye socket, B-Line B3173 with B3222.
  - e. Adjustable steel clevis hanger, B-Line B3104 or B3100.
2. Uninsulated pipes 2-1/2 inch and larger:
  - a. Adjustable steel clevis hanger, B-Line B3100.
  - b. Pipe roll with sockets, B-Line B3114.
  - c. Adjustable steel yoke pipe roll, B-Line B3110.
3. Insulated pipe - Hot or steam piping:
  - a. 2 inch and smaller pipes: use adjustable steel clevis with galvanized sheet metal shield. B-Line B3100 with B3151 series.

- b. 2-1/2 inch and larger pipes:
  - 1) Adjustable steel yoke pipe roll with pipe covering protection saddle. B-Line B3110 with B3160-B3165 series.
  - 2) Pipe roll with sockets with pipe covering protection saddle, B-Line B3114 with B3160-B3165 series.
- 4. Insulated pipe - Cold or chilled water piping:
  - a. 5 inch and smaller pipes: use adjustable steel clevis with galvanized sheet metal shield. B-Line B3100 with B3151 series.
  - b. 6 inch and larger pipes:
    - 1) Pipe roll with sockets with pipe covering protection saddle, B-Line B3114 with B3160-B3165 series.
    - 2) Adjustable steel yoke pipe roll with pipe covering protection saddle. B-Line B3110 with B3160-B3165 series.

#### B. Pipe Clamps

- 1. When flexibility in the hanger assembly is required due to horizontal movement, use pipe clamps with weldless eye nuts, B-Line B3140 or B3142 with B3200. For insulated lines use double bolted pipe clamps, B-Line B3144 or B3146 with B3200.

#### C. Multiple or Trapeze Hanger

- 1. Trapeze hangers shall be constructed from 12 gauge roll formed ASTM A1011 SS Grade 33 structural steel channel, 1-5/8 inch by 1-5/8 inch minimum, B-Line B22 strut or stronger as required.
- 2. Mount pipes to trapeze with 2 piece pipe straps sized for outside diameter of pipe, B-Line B2000 Series.
- 3. For pipes subjected to axial movement:
  - a. Strut mounted roller support, B-Line B3126. Use pipe protection shield or saddles on insulated lines.
  - b. Strut mounted pipe guide, B-Line B2417.

#### D. Wall Supports

- 1. Pipes 4 inches and smaller:
  - a. Carbon steel hook, B-Line B3191.

- b. Carbon steel J-hanger, B-Line B3690.
- 2. Pipes larger than 4 inch:
  - a. Welded strut bracket and pipe straps, B-Line B3064 and B2000 series.
  - b. Welded steel brackets, B-Line B3066 or B3067, with roller chair or adjustable steel yoke pipe roll. B-Line B3120 or B3110. Use pipe protection shield or saddles on insulated lines.

#### E. Floor Supports

- 1. Hot piping under 6 inch and all cold piping:
  - a. Carbon steel adjustable pipe saddle and nipple attached to steel base stand sized for pipe elevation. B-Line B3093 and B3088T or B3090 and B3088. Pipe saddle shall be screwed or welded to appropriate base stand.
- 2. Hot piping 6 inch and larger:
  - a. (Adjustable) Roller stand with base plate, B-Line B3117SL (or B3118SL)
  - b. Adjustable roller support and steel support sized for elevation, B-Line B3124

#### F. Vertical Supports

- 1. Steel riser clamp sized to fit outside diameter of pipe, B-Line B3373.

#### G. Copper Tubing Supports

- 1. Hangers shall be sized to fit copper tubing outside diameters.
  - a. Adjustable steel swivel ring (band type) hanger, B-Line B3170CT.
  - b. Malleable iron ring hanger, B-Line B3198RCT or hinged ring hanger B3198HCT.
  - c. Malleable iron split-ring hanger with eye socket, B-Line B3173CT with B3222.
  - d. Adjustable steel clevis hanger, B-Line B3104CT.
- 2. For supporting vertical runs use epoxy painted or plastic coated riser clamps, B-Line B3373CT or B3373CTC.
- 3. For supporting copper tube to strut use epoxy painted pipe straps sized for copper tubing, B-Line B2000 series, or plastic inserted vibration isolation clamps, B-Line BVT series.

#### H. Plastic Pipe Supports

1. V-Bottom clevis hanger with galvanized 18-gauge continuous support channel, B-Line B3106 and B3106V, to form a continuous support system for plastic pipe or flexible tubing.

#### I. Supplementary Structural Supports

1. Design and fabricate supports using structural quality steel bolted framing materials as manufactured by Cooper B-Line. Channels shall be roll formed, 12 gauge ASTM A1011 SS Grade 33 steel, 1-5/8 inch by 1-5/8 inch or greater as required by loading conditions. Submit designs for pipe tunnels, pipe galleries, etc., to engineer for approval. Use clamps and fittings designed for use with the strut system.

### 2.04 UPPER ATTACHMENTS

#### A. Beam Clamps

1. Beam clamps shall be used where piping is to be suspended from building steel. Clamp type shall be selected on the basis of load to be supported, and load configuration.
2. C-Clamps shall have locknuts and cup point set screws, B-Line B351L, or B3036L. Top flange c-clamps shall be used when attaching a hanger rod to the top flange of structural shapes, B-Line B3034 or B3033. Refer to manufacturer's recommendation for setscrew torque. Retaining straps shall be used to maintain the clamps position on the beam where required.
3. Center loaded beam clamps shall be used where specified. Steel clamps shall be B-Line B3050, or B3055. Malleable iron or forged steel beam clamps with cross bolt shall be B-Line B3054 or B3291-B3297 Series as required to fit beams.

#### B. Concrete Inserts

1. Cast in place spot concrete inserts shall be used where applicable; either steel or malleable iron body, B-Line B2500, 109AF (B2501) or B3014. Spot inserts shall allow for lateral adjustment and have means for attachment to forms. Select inserts to suit threaded hanger rod sizes, B-Line N2500 or B3014N series.
2. Continuous concrete inserts shall be used where applicable. Channels shall be 12 gauge, ASTM A1011 SS Grade 33 structural quality carbon steel, complete with styrofoam inserts and end caps with nail holes for attachment to forms. The continuous concrete insert shall have a load rating of 2,000 lbs/ft. in concrete, B-Line B22I, 32I, or 52I. Select channel nuts suitable for strut and rod sizes.

### 2.05 VIBRATION ISOLATION AND SUPPORTS

- A. For refrigeration, air conditioning, hydraulic, pneumatic, or other vibrating system applications, use a clamp that has a vibration dampening insert and a nylon inserted locknut. For copper and steel tubing use B-Line BVT series Vibraclamps, for pipe sizes use BVP

series.

- B. For larger tubing or piping subjected to vibration, use neoprene or spring hangers as required.
- C. For base mounted equipment use vibration pads, molded neoprene mounts, or spring mounts as required.
- D. Vibration isolation products as manufactured by B-Line, Vibratrol systems.

## 2.06 ACCESSORIES

- A. Hanger Rods shall be threaded on both ends or made as continuous threaded rods of circular cross section. Use adjusting locknuts at upper attachments and hangers. No wire, chain, or perforated straps are allowed.
- B. Shields shall be 180 degree galvanized sheet metal, 12 inch minimum length, 18 gauge minimum thickness, designed to match outside diameter of the insulated pipe, B-Line B3151.
- C. Pipe protection saddles shall be formed from carbon steel, 1/8 inch minimum thickness, sized for insulation thickness. Saddles for pipe sizes greater than 12 inch shall have a center support rib.

## 2.07 FINISHES

### A. Indoor Finishes

- 1. Hangers and clamps for support of bare copper piping shall be coated with copper colored epoxy paint, B-Line Dura-Copper®. Additional PVC coating of the epoxy painted hanger shall be used where necessary.
- 2. Hangers for other than bare copper pipe shall be zinc plated in accordance with ASTM B633 OR shall have an electro-deposited green epoxy finish, B-Line Dura-Green®.
- 3. Strut channels shall be pre-galvanized in accordance with ASTM A653 SS Grade 33 G90 OR have an electro-deposited green epoxy finish, B-Line Dura-Green®.

### B. Outdoor and Corrosive Area Finishes

- 1. Hangers and strut located outdoors shall be hot dip galvanized after fabrication in accordance with ASTM A123. All hanger hardware shall be hot dip galvanized or stainless steel. Zinc plated hardware is not acceptable for outdoor or corrosive use.
- 2. Hangers and strut located in corrosive areas shall be type 304 (316) stainless steel with stainless steel hardware.

**PART 3 EXECUTION**

**3.01 PIPE HANGERS AND SUPPORTS**

- A. Pipe shall be adequately supported by pipe hanger and supports specified in PART 2 PRODUCTS. Hangers for insulated pipes shall be sized to accommodate insulation thickness.
- B. Unless otherwise noted on the Project Plans, horizontal steel piping shall be supported in accordance with MSS SP-69 Tables 3 and 4, excerpts of which follow below:

NOMINAL PIPE SIZE (INCHES)	ROD DIAMETER (INCHES)	MAXIMUM SPACING (FEET)
1/2 to 1-1/4	3/8	7
1-1/2	3/8	9
2	3/8	10
2-1/2	1/2	11
3	1/2	12
3-1/2	1/2	13
4	5/8	14
5	5/8	16
6	3/4	17
8	3/4	19
10	7/8	22
12	7/8	23
14	1	25
16	1	27

- C. Horizontal copper tubing shall be supported in accordance with MSS SP-69 Tables 3 and 4, excerpts of which follow below:

NOMINAL PIPE SIZE (INCHES)	ROD DIAMETER (INCHES)	MAXIMUM SPACING (FEET)
1/2 to 3/4	3/8	5
1	3/8	6
1-1/4	3/8	7
1-1/2	3/8	8
2	3/8	8
2-1/2	1/2	9
3	1/2	10
3-1/2	1/2	11
4	1/2	12
5	1/2	13
6	5/8	14
8	3/4	16

- D. Provide a means of preventing dissimilar metal contact such as plastic coated hangers, copper

colored epoxy paint, or non adhesive isolation tape- B-Line Iso-pipe. Galvanized felt isolators sized for copper tubing may also be used, B-Line B3195CT.

- E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.
- F. Install hangers to provide a minimum of 1/2 inch space between finished covering and adjacent work.
- G. Place a hanger within 12 inches of each horizontal elbow.
- H. Support vertical piping independently of connected horizontal piping. Support vertical pipes at every (other) floor. Wherever possible, locate riser clamps directly below pipe couplings or shear lugs.
- I. Where several pipes can be installed in parallel and at the same elevation, provide trapeze hangers as specified in section 2.02 C. Trapeze hangers shall be spaced according to the smallest pipe size, or install intermediate supports according to schedule in section 3.01B.
- J. Do not support piping from other pipes, ductwork or other equipment that is not building structure.

### 3.02 CONCRETE INSERTS

- A. Provide inserts for placement in formwork before concrete is poured.
- B. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- C. Where concrete slabs form finished ceilings, provide inserts to be flush with slab surface.
- D. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inch.

## **PART 4 MEASUREMENT AND PAYMENT**

This work shall not be measured or paid separately, but will be included in the bid item for which it is a part.

END OF SECTION



**SECTION 15110  
PIPE AND PIPE FITTINGS**

**PART 1        GENERAL**

1.01    SUMMARY

- A. The purpose and intent of this Section are to require that all necessary piping and related material be furnished to provide complete and workable piping systems.
- B. Provide all pipe and fittings required to install all new piping systems specified in Division 15 and as indicated on the drawings.

1.02    RELATED SECTIONS:

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
  - 1. Section 15160, Pipe Installation
- B. For unique specifications pertaining to CNG and compressed air application stainless steel piping, refer to Division 15, Section 15160B.

1.03    REFERENCES

- A. Pipe and fittings shall be designed and tested in accordance with manufacturers' recommended procedures and the following codes and applicable standards:
  - 1. American Petroleum Institute (API)
    - 5L        - Specification for Line Pipe
  - 2. American Society of Mechanical Engineers (ASME):
    - B16.3    - Malleable Iron Threaded Fittings, Classes 150 and 300
    - B16.5    - Pipe Flanges and Flanged Fittings
    - B16.9    - Factory-Made Wrought Steel Butt Welding Fittings
    - B16.11   - Forged Fittings, Socket-Welding and Threaded
    - B16.21   - Nonmetallic Flat Gaskets for Pipe Flanges
    - B16.22   - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings
    - B16.25   - Butt Welding Ends
    - B31.3    - Process Piping
    - B36.10   - Welded and Seamless Wrought Steel Pipe
  - 3. ASTM International:
    - A53       - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
    - A106     - Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service

- A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength
- D2513 - Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings
- D3261 - Standard Specification for Heat Fusion Joining of Polyethylene Pipe and Fittings
- D3350 - Standard Specification for Polyethylene Plastic Pipe and Fittings Materials
- F1973 - Standard Specification for Factory Assembled Anodeless Risers and Transition Fittings in Polyethylene (PE) and Polyamide 11 (PA11) and Polyamide 12 (PA12) Fuel Gas Distribution Systems

#### 1.04 COMPLIANCE SUBMITTALS

- A. Submit as specified in Division 1.
- B. Submit the following for acceptance:
  1. Color code for random length pipe shipped to job site.
  2. Affidavits of compliance with applicable standards.
  3. Test certificates.
  4. Special fitting detail.
  5. Joint details.
  6. Butt welding end preparation details.
  7. Laying schedule for mechanical thrust restraint for buried piping.

#### 1.05 DELIVERY, STORAGE AND HANDLING

- A. Ship all random-length pipe to the job site marked with a continuous color stripe indicating material and schedule number.
- B. Handle all pipe and fittings in a manner to ensure that pipe and fittings will not be damaged.
- C. Do not drop or bump pipe or fittings.
- D. Use slings, lifting lugs, hooks or other devices designed to handle pipe.
- E. Store pipe and fittings with provisions to prevent movement or slipping into adjacent units.
- F. Ship all gaskets to the job site tagged with size, material and pressure rating.
- G. Ship spare gaskets separately packaged and tagged as spare parts.

## **PART 2 PRODUCTS**

#### 2.01 MATERIALS

- A. Fittings:
  1. Fittings shall conform to AWWA C110 or C153 and shall be ductile iron.
  2. Provide all specials, taps and plugs as specified or indicated.
  3. Flanged fittings shall be provided for flanged pipe.
  4. Flange faces shall be coated with a rust-preventive compound.

B. Coatings:

1. Pipe: All buried steel or iron pipe shall be mill coated with manufacturer's exterior liquid epoxy coating conforming to NAPCA Bulletin 1-65-94 for coating and wrapping of steel pipe, designation TGF-3. Coating mills are to be approved by the Engineer. For above ground steel or iron pipe, a Liquid Epoxy Coating may be applied in accordance with manufacturer's recommendation.
2. Fittings/Valves: For weld and threaded fittings and irregular shapes, a Liquid Epoxy Coating may be applied in accordance with manufacturer's recommendation.

C. Gaskets and Bolting Material:

1. Provide all gaskets, bolts, lubricants, and other accessories required to install pipe and fittings complete and ready for service.
2. Bolts for flanged joints shall conform to ASTM A307 Grade B.
3. Gaskets for flanged joints shall be 1/8" thick, full faced synthetic rubber.
4. Gaskets for flanged joints on air service shall be rated for 22° F minimum.

D. Flanged Coupling Adapters:

1. Shall be Ford 193, Smith-Blair 913, Rockwell 913. Equivalent substitutions may be used if acceptable to the Engineer.
2. Couplings shall be coated per Section 15230 of Division 15.
3. Flanged coupling adapters shall have anchor studs and/or harnesses designed for a 150 psi minimum operating pressure.
4. Where flexible couplings are used underground, Type 316 stainless steel bolts shall be used.
5. Gaskets, except for those used in air piping, shall be neoprene rubber. Gaskets for air piping shall be suitable for operation at temperatures up to 250° F.

E. Carbon Steel Pipe:

1. Carbon steel pipe shall conform to:
  - a. ASTM A53, Grade B.
  - b. ASTM A106, Grade B.
  - c. API 5L, Grade B.
2. Pipe Rating:
  - a. 2½" diameter and larger shall be standard weight.
  - b. 2" diameter and smaller shall be Schedule 80.
3. Pipe Joints:
  - a. 2½" diameter and larger shall be butt-weld except where flanges are required.

b. 2" diameter and smaller shall be butt-weld.

4. Fittings:

- a. Fittings 2½" diameter and larger shall be butt-weld forged or wrought steel and shall conform to ASME B16.9.
- b. Fittings 2" diameter and smaller shall be butt-weld conforming to ASME B16.11.
- c. Fittings shall be of the same schedule and material as the pipe to which they attach.
- d. Screwed fittings 2" diameter and smaller shall be ANSI/ASME Class 300 malleable iron conforming to ASME B16.3 or Class 2000 forged steel threaded fittings conforming to ASME B16.11.
- e. Malleable iron unions 2" diameter and smaller shall be ANSI/ASME Class 300 conforming to ASME B16.3 with a ground joint of bronze to iron; screwed fitting shall be used only on systems where threaded joints are indicated.

5. Flanges:

- a. Steel pipe flanges shall conform to ASME B16.5 and shall be of the same material as the pipe to which they attach. Slip-on or weld neck flanges may be used for ANSI/ASME Class 150 and 300. Only weld neck flanges shall be used for 400 pound class and greater.
- b. Steel flanges connecting to 125-pound cast iron flanged valve or fitting shall have a flat face. All others shall have raised face. The flange surface finish shall be in accordance with MSS SP-6

6. Flange Bolts:

- a. Bolting materials for use in temperatures less than 400°F will be ASTM A307 Grade B bolts and hexagon nuts.

7. Gaskets:

- a. Heavy-duty Buna-N shall be 1/16" thick full faced for pipe sizes 10" and smaller, and smaller, and 1/8" thick full faced for pipe sizes 12" and larger.
- b. One complete set of spare gaskets shall be provided consisting of at least one gasket of each size, material and pressure rating used for this installation.

F. Plastic Pressure Pipe and Fittings (HDPE & MDPE)

- 1. The High Density Polyethylene Pipe (HDPE) and Medium Density Polyethylene Pipe (MDPE) shall be made from polyethylene resin compound manufactured and tested to ASTM D2513.
  - a. The pipe resin material grading shall conform to ASTM D3350 as summarized below:

- HDPE: PE3408/PE3608, minimum cell classification shall be 345464C
- MDPE: PE2406/PE2708, minimum cell classification shall be 234373E

b. The pipe material shall have a Long Term Hydrostatic Strength of the following when tested and analyzed by ASTM D2837:

- HDPE: 1600 psi
- MDPE: 1250 psi

c. The HDPE raw materials shall contain a minimum of 2-3%, well dispersed, carbon black to shield the pipe against UV light degradation. MDPE raw material (non-black) shall contain sacrificial UV additives/stabilizers that protect the pipe against deterioration by absorbing UV energy.

d. The Pipe shall contain no recycled compound except that generated in the manufacturer's own plant from resin of the same specification and from the same raw material supplier.

e. The pipe supplier, upon request, shall certify compliance with the requirements of the paragraph in writing.

## 2. Pipe Design

a. The pipe shall be designed in accordance with the following formula:

$$P = 2S / [(D_o/\tau)-1]$$

Where:

- S = Hydrostatic Design Stress (psi)
- P = Design Pressure Rating (psi)
- D<sub>o</sub> = Pipe Outside Diameter (inches)
- τ = Minimum Wall Thickness
- D<sub>o</sub>/τ = Dimension Ratio

b. The design pressure rating P shall be derived using the formula above, and shall be its normal working pressure in pounds per square inch at temperatures up to 73°F.

c. The Hydrostatic Design Stress shall be 800 psi for PE 3408/PE3608 materials and shall be 630 psi for PE2406/PE2708 materials.

d. The pipe dimensions shall be as specified in manufacturer's literature.

## 3. Marking

a. The PE pipe shall be marked in accordance with ASTM A3350. The following shall be continuously indent printed on the pipe, or spaced at intervals not exceeding 5 feet.

- i. Name and/or trademark of the pipe manufacturer.
- ii. Nominal pipe size.
- ii. Dimension Ratio
- iv. The letters PE followed by the polyethylene grade per ASTM D3350, e.g. PE 3608, followed by the hydrostatic design basis in 100's of psi.

- v. Manufacturing Standard Reference, e.g. ASTM D2513.
- vi. A production code from which the date and place of manufacture can be determined.

#### 4. Joining Methods

- a. Wherever possible the polyethylene pipe should be joined by the method of thermal butt-fusion, as outlined in ASTM D3261, Heat Joining Polyethylene Pipe and Fittings. Butt-fusion joining of pipe and fittings shall be performed in accordance with the procedures recommended by the manufacturer. The temperature of the heater plate MDPE connections should not exceed  $210^{\circ}\text{C} \pm 5^{\circ}\text{C}$  ( $410^{\circ}\text{F} \pm 10^{\circ}\text{F}$ ) and the fusion joining pressure should not exceed 24 pounds per square inch of projected end area, excluding an allowance for friction.
- b. The polyethylene pipe may be adapted to fittings or other systems by means of an assembly consisting of a polyethylene stub-end, butt-fused to the pipe, a backup flange of ductile iron, made to Class 150, ASME B16.5 dimensional standards with exceptions, bolts of compatible material and a Gasket of suitable red rubber or asbestos-rubber compound cut to fit the joint. In all cases, the bolts shall be drawn up evenly and in line.
- c. Polyethylene pipes of the same outside diameter but different wall thicknesses shall be joined by means of flange assembly as designated above.
  - i. The pipe supplier shall be consulted to obtain machinery and expertise for the joining by butt-fusion of polyethylene pipe and fittings. No pipe or fittings shall be joined by fusion by any contractor unless he is adequately trained and qualified in the techniques involved. The Contractor shall provide a certification for all personnel who will conduct fusion activities.

#### G. Anodeless Risers and Transition Fittings

- 1. Anodeless Risers and transition Fittings shall conform to ASTM F1973.

### 2.02 ACCEPTABLE MANUFACTURER

#### A. Polyethylene Pipe (HDPE & MDPE)

- 1. JM Manufacturing
- 2. Sclairpipe
- 2. Ameriduct/Lamson & Sessions
- 3. Or approved equal

#### B. Carbon Steel Pipe:

- 1. Ameron
- 2. L.B. Foster
- 3. Thompson Pipe and Steel Co.
- 4. Or approved equal

#### C. Anodeless Risers:

- 1. Elster Perfection
- 2. Lyall

- 3. Or approved equal

**PART 3 EXECUTION**

3.01 INSTALLATION

- A. Install pipe in accordance with Section 15160 or 15160B of Division 15.

3.02 INSPECTION

- A. Inspection for acceptance of pipe will be conducted by the Engineer as soon as practical after arrival of pipe and fittings at the job site.
- B. Job site inspection takes precedence over any prior inspection.

3.03 ACCEPTANCE

- A. Pipe will be inspected by Engineer for acceptance by owner at the construction site. Acceptance at the job site shall be paramount. Prior approval or payment for pipe rejected at the job site shall be null and void. Acceptance by Engineer at a point in the sequence of manufacture, delivery and installation will not relieve the Contractor of his responsibilities as set forth in the Contract Documents. Manufacturing defects that prohibit installed pipe from successfully passing leakage tests shall constitute rejection of the defective pipe.

**PART 4 MEASUREMENT AND PAYMENT**

4.01 MEASUREMENT

Measurement for the piping will be made at the Contract unit price per foot at each location installed and accepted by the Engineer.

4.02 PAYMENT

All costs incurred by the Contractor by reason of compliance to satisfy the requirements under this section shall be considered incidental to and completely covered by the Contract unit price for the following bid items. Other piping costs are to be covered in the applicable section. Refer to Sections 15160 and 15160B.

<u>Bid Item Number</u>	<u>Description</u>	<u>Unit(s)</u>
	1" MDPE Pipe	Linear Foot
	1-1/4" MDPE Pipe	Linear Foot
	2" MDPE Pipe	Linear Foot

END OF SECTION

## **SECTION 15160 PIPE INSTALLATION**

### **PART 1        GENERAL**

#### **1.01    SUMMARY**

- A.     This section includes the work for fabrication, handling, and installation and testing of buried and interior pipe, fittings, valves, specials and appurtenances as indicated on the drawings and as specified herein.
  
- B.     For unique specifications pertaining to the installation of stainless steel piping, refer to Division 15, Section 15160B.
  
- C.     For specifications pertaining to the valves to be installed in the piping installation, refer to Division 14, Section 15180A.
  
- D.     This section does not include installation of storm and sanitary drains or plumbing.
  
- E.     Install all small piping to cooling or sealing water connections, vents, drains, control tubing, etc., required to complete the installation of each unit of mechanical equipment.

#### **1.02    REFERENCES**

- A.     American Society of Mechanical Engineers (ASME):
  - 1.    A13.1 - Scheme for the Identification of Piping Systems
  - 2.    B31    - ASME Code for Pressure Piping
  - 3.    B31.3 - Process Piping Guide
  - 4.    Boiler and Pressure Vessel Code, Section 1.
  
- B.     American Welding Society (AS):
  - 1.    B3.0-77 - Welding Procedure and Performance Qualification

#### **1.03    DELIVERY, STORAGE AND HANDLING**

- A.     Handle pipe, valves, and fittings in a manner to insure installation in an undamaged condition.
  - 1.     Do not drop or bump.
  
  - 2.     Use slings, hooks and other devices designed to protect pipe, fittings, joint elements and coating when moving sections of pipe from storage area to installation location.
  
- B.     Handle pipe and fittings with equipment having an adequate factor of safety against overturning.

#### **1.04    RELATED SECTIONS**



A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

1. Section 15160B, Stainless Steel Piping
2. Section 15180A, Compressed Gas Valves

## **PART 2 PRODUCTS**

2.01 As specified in Divisions 15.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION - BELOW GROUND PIPING**

A. Below ground Piping:

1. Install pipe of size, materials, strength class, and joint type with embedment indicated for plan location.
2. Clean interior of all pipe, fittings, and joints prior to installation. Exclude entrance of foreign matter if work is suspended or stopped.
  - a. Close open ends of pipe with snug-fitting closures.
  - b. Do not let water fill trench. Include provisions to prevent flotation should water control measures prove inadequate.
  - c. Remove water, sand, mud and other undesirable material from trench before removal of end cap.
3. Brace or anchor as required to prevent displacement after establishing final position.
4. Perform only when weather and trench conditions are suitable. Do not lay in water.
5. Excavating and Preparing the Trench: Excavate and prepare the gas line trenches per NMDOT Standard Specification 660 and as follows:
  - a. The trench bottom should be smooth and free from large stones, large dirt clods, and any frozen material.
  - b. The Contractor shall not open more trench in advance of pipe laying than is necessary to expedite the work. One block or 500 feet (whichever is the shorter) shall be the maximum length of open trench permitted on any line under construction.
  - c. On rocky trenches place a minimum 6-inch layer of selected bedding material to provide a cushion for the pipe.
  - d. The width of the trench at the top of the pipe should be held to the minimum required for efficient and proper installation.

6. Fill and Pipe Embedment Material:

- a. Bedding Rock - Material shall be clean river gravel or sound crushed limestone, free of cementitious, shaley or flat and flaky particles in an amount, which would cause the material to cake or pack or otherwise form an unyielding support for the pipe. Gradation shall be:

1" square mesh sieve	-	100% passing
½" square mesh sieve	-	55% to 90% passing
No. 4 square mesh sieve	-	8% to 40% passing
No. 10 square mesh sieve	-	0% to 15% passing
No. 200 square mesh sieve	-	0% to 4% passing

- b. Where Bedding Rock is not required, bedding material shall be the same as fill material. Insitu excavated material may be allowed by the Engineer as bedding material, if the Engineer believes adequate pipe support will be maintained. The purpose of the bedding is to provide a firm, stable and uniform support of the pipe.
- c. Fill Material - Backfill material shall be selected earth or granular fill material, free from sod, sticks and roots over ½ inch in diameter, and free from hard lumps, clods or rock in such quantity or concentration as to interfere with the specified compaction. Material shall be of proper moisture content for specified compaction.

7. Blasting:

- a. Blasting will not be allowed unless approved by the Owner.
- b. The Contractor shall comply with all laws, ordinances, applicable safety code requirements, and regulations relative to the handling, storage, and use of explosive material and the protection of life and property. He shall be responsible for all damage caused by his blasting operations.
- c. If blasting is allowed, the Contractor shall conduct a pre-blast and post-blast survey of each structure located within the blast area. Documentation such as photos, videotape, and inspection logs shall be produced and maintained by the Contractor.
- d. A seismograph reading of each blast charge shall be recorded by the Contractor, as necessary.

8. Depth of Cover:

- a. Gas line trenches shall be excavated so that the minimum cover over the top of pipe will be 30 inches to existing street or ground surface, or to future surface when indicated.

9. Locator Wire:

- a. For all plastic sanitary sewer force mains, gas mains, and water mains, No. 12, single strand, insulated copper wire is to be installed in the trench with the main, and looped around all valves. Reference the project plans for a detail of a typical

locator wire steel riser post.

- b. The locator wire shall be placed within 12" of the top pipe. In addition to the locator wire, the Contractor shall install a detectable magnetic warning tape within 4" to 6" of the top of the finished surface. The warning tape shall be printed "Caution - Buried Gas Line", accordingly.

B. Cutting Pipe:

1. Cut in neat manner without damage to pipe.

C. Closure Pieces:

1. Connect two segments of pipeline or a pipeline segment and structure with short sections of pipe fabricated for the purpose.
2. Location of joints, types of joints, and pipe materials and strength classifications shall comply with specifications.

D. Plug Removal:

1. Remove plugs from existing pipe as indicated in order to complete connections to existing pipe. Removed plugs shall become the property of the Contractor.

E. Test Plugs:

1. Furnish and install test plugs where necessary to properly complete required testing.
2. Test plugs shall be as manufactured by pipe supplier.
3. Plugs shall be push-on, flanged, mechanical joint or restrained as required for ductile iron pipe and shall be watertight against heads equal to the specified test pressure.
4. Secure plugs in place to facilitate removal when required to connect pipe.
5. Restrain plugs to fittings where indicated.

### 3.02 INSTALLATION - INTERIOR AND ABOVE GROUND EXTERIOR PIPING

A. Interior and above ground piping installation includes:

1. Field welds.
2. Makeup of flanged, mechanical joints, grooved, screwed and solder joints.
3. Connection to existing pipe.
4. Connection to equipment.
5. Installation of miscellaneous valves.

6. Testing of piping systems: Pneumatically test carbon steel natural gas and compressed air systems per ASME B31.3 and per Section 15160B, Paragraph 3.02
- B. Install pipe, fittings and valves in accordance with recognized industry standards, which will achieve permanently leak proof piping systems, capable of performing indicated service without failure.
- C. Install piping systems with a minimum of joints and couplings, but with adequate and accessible unions, flanged couplings adapters or sleeved couplings for disassembly and maintenance or replacement of valves and equipment.
- D. Welded pipe 2½” and larger shall be fabricated such that a minimum of field welds are required.
- E. All flanges shall be installed so that bolt holes straddle center lines.
- F. Install vents at all high points and drains at all low points. Vents and drains to be ¾” unless noted otherwise.
- G. All piping runs shall be parallel with column row lines avoiding diagonal runs where possible.
- H. Restrained joints shall be used at tees and elbows to counteract internal pressure forces in mechanical joint pipe.
- I. Provide all holes, sleeves, flashing and concrete inserts required for erection and installation of piping.
  1. Cut holes thru existing concrete and masonry where required with a core drill and grout in sleeves or install link-seal devices.
  2. Field cut all openings required in grating and checkered plate. Openings larger than 4" in diameter thru grating shall be banded with a bar of the same size as the main bearing bars. Openings cut in steel shall be cleaned and painted with metal prime paint.
  3. Furnish and install hoods, flashing and caulking for all piping thru outside walls and roofs.
- J. Furnish all temporary hangers required for erection and installation of pipes.
- K. Welding:
  1. All pipe welders performing work under this contract shall be qualified per Section IX of the ASME Code or the American Welding Society Standard (AWS) B3.0-77 “Welding Procedure and Performance Qualification.”
  2. Documentation of welding procedure specifications and welders’ qualifications shall be submitted for approval.
  3. Piping shall be welded in accordance with ASME B31.3.
  4. All butt welds shall have full penetration and shall be smooth and uniform on the pipe interior.

5. Carbon steel welds shall be either gas tungsten arc welding or shielded metal arc welding on the root pass and completed by any of the acceptable metallic arc processes.
6. When welding low carbon grade stainless steel, low carbon electrodes or filler metal compatible to the base metal shall be used.
7. Fillet welds shall have complete penetration. Any cracks, holes, slag or lack of fusion appearing on the weld surface shall be removed before depositing the next layer.

L. Marking:

1. All gas piping systems shall be marked in accordance with ASME A13.1.

### 3.03 CONNECTIONS WITH EXISTING PIPING

- A. Connections between new work and existing piping shall be made using fittings suitable for the conditions encountered. Each connection with an existing pipe shall be made at a time and under conditions which will least interfere with service to customers, and as authorized by Owner. Facilities shall be provided for proper dewatering and for disposal of all water removed from the dewatered lines and excavations with damage to adjacent property.
- B. For connection to Dissimilar Pipe Materials. Where steel pipe is to be connected to buried or submerged concrete pipe, cast iron pipe, or to existing steel pipe, the connection shall be made by means of an insulating flange or transition coupling.

## PART 4 MEASUREMENT AND PAYMENT

### 4.01 MEASUREMENT

Measurement for the Gas Piping and Air Compressor Piping installation will be made at the Contract unit price per each, complete in place, at each location installed and accepted by the Engineer.

### 4.02 PAYMENT

All costs incurred by the Contractor by reason of compliance to satisfy the requirements under this section shall be considered incidental to and completely covered by the Contract unit price for the following bid items:

<u>Description</u>	<u>Unit(s)</u>
Natural Gas Inlet Piping Installation	Lump Sum
Vent Stack Piping Installation	Lump Sum
Air Compressor Piping Installation	Lump Sum
END OF SECTION	

## SECTION 15160B

### STAINLESS STEEL PIPING AND TUBING

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. This Section includes the specifications for CNG and compressed air application stainless steel pipe and tubing required for complete installation of the Work.
- B. CNG Piping design specifications:
- |                                   |                       |
|-----------------------------------|-----------------------|
| Operating Pressure:               | 4500 PSIG             |
| Design Pressure:                  | 5000 PSIG             |
| Pneumatic Pressure Test Pressure: | 5500 PSIG             |
| Design Temperature:               | -20 to +100 degrees F |
- C. Compressed Air Piping design specifications:
- |                                   |                       |
|-----------------------------------|-----------------------|
| Operating Pressure:               | 95 PSIG               |
| Design Pressure:                  | 175 PSIG              |
| Pneumatic Pressure Test Pressure: | 192.5 PSIG            |
| Design Temperature:               | -20 to +100 degrees F |
- D. The Contractor selected manufacturers shall be experienced in the design and manufacture of steel and stainless steel pipe and tubing for a minimum period of 5 years.
- E. For specifications pertaining to the valves to be installed in the piping installation, refer to Division 15, Section 15180A.

##### 1.02 REFERENCES

- A. Design, fabricate and test materials in accordance with manufacturers' recommended procedures and the following codes and standards:
1. ASME B31.3 - Code for Pressure Piping, Process Piping Section (2007)
  2. ASTM A312 - Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes
  3. ASTM A213 - Standard Specification for Seamless Ferritic and Austenitic Alloy-Steel Boiler, Superheater, and Heat-Exchanger Tubes
  4. ASTM A269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service

##### 1.03 COMPLIANCE SUBMITTALS

- A. Submit in accordance with Division 1.
- B. Submit the following for acceptance:
1. Affidavits of compliance.

##### 1.04 DELIVERY, STORAGE AND HANDLING

- A. Ship all pipe and tubing with suitable end covers to prevent entrance of foreign material into the pipe or tubing body.
- B. Protect pipe from externally induced preloading during loading and shipment.

#### 1.05 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
  - 1. Section 15160, Pipe Installation
  - 2. Section 15180A, Compressed Gas Valves

## **PART 2 PRODUCTS**

### 2.01 PIPE AND TUBING MATERIALS

- A. Pipe specification. Pipe containing compressed natural gas (CNG) or compressed air shall be seamless stainless steel in accordance with TP304 or TP316 alloy per ASTM A312. All piping shown on the plans shall be suitable for the full range of pressures, temperatures and loading to which they may be subjected to with a factor of safety of at least three (3). Any material used, including gaskets and packing, shall be compatible with natural gas and its service conditions. See Table 2 for commonly used pipe nominal reference pressure ratings at normal temperature range (less than 100 degrees F) as calculated per ASME B31.3.
- B. Tubing specification. Tubing containing compressed natural gas (CNG) or compressed air shall be TP 304 or TP316 alloy, cold drawn bright annealed seamless stainless steel per ASTM A213, ASME SA213, or ASTM A269. All tubing shown on the plans shall be suitable and new for the full range of pressures, temperature and loading to which they may be subjected to with a manufacturer-rated burst-safety factor of safety of at least three (3). See Table 2 for commonly used tubing nominal reference pressure ratings at normal temperature range (less than 100 degrees F) as calculated per ASME B31.3.
- C. Tube Fitting Specification: All fittings and other piping components shall be suitable for the full range of pressures, temperatures and loading to which they may be subjected with a factor of safety of at least three (3).
  - 1. Suppliers of tube fittings will meet the required design pressure for ¼-in., ⅜-in., and ½-in., ¾-in and 1-in OD tubing. Approved Suppliers: Parker Seal-Lok preferred. Swagelok may be used only with prior approval of the Engineer.
  - 2. Fittings selected shall be certified for use in CNG service.
- D. Conduit Specification: All stainless steel tubing which is to be buried shall be encased by MDPE tubing as described in Section 15110.

**Table 1**  
**ASTM A312 (TP304/TP316)**  
**Seamless Stainless Steel Pipe**  
**Reference Nominal Internal Pressure Rating (P)\* (less than 250 degrees F)**

Weight or Sch.	Nom. Size	OD (in)	Nom. Wall (in)	Min. Wall (in)	Seamless - Plain Ends (psi)
40	3/8	0.675	0.091	0.0796	5210
80	3/8	0.675	0.126	0.1103	7515
5S***	1/2	0.840	0.065	0.0569	2863
40	1/2	0.840	0.109	0.0954	4995
80	1/2	0.840	0.147	0.1286	6980
160	1/2	0.840	0.188	0.1649	9289
80	3/4	1.050	0.154	0.1348	5721
160	3/4	1.050	0.219	0.1916	8548
80	1	1.315	0.179	0.1566	5266
160	1	1.315	0.250	0.2188	7675

\* As calculated per ASTM B31.3 methods,  $P = ((2*S*E*W*t)/(D-2yt))$ ; W = 1.00, Y = 0.4, S = 20,000 psi, C = 0

\*\*\* Compressed air application only

**Table 2**  
**ASTM A213, ASME SA213 or A269 Seamless Stainless Steel Tubing**  
**Reference Nominal Internal Pressure Rating (P)\*\* (TP304/TP316)**  
**(less than 100 degrees F) – Plain Ends**

Nom. Size	OD (in)	Nom. Wall (in)	Weight/ft. (LB)	W/Bends (psi)	Straight (psi)
1/4	0.250	.035	0.050	5785	6248
3/8	0.375	.049	0.163	5358	5787
1/2***	0.500	.035	0.127	2734	2953
1/2	0.500	.065	0.299	5328	5754
3/4	0.750	.095	0.646	5177	5591
1	1.000	.120	0.891	4878	5268

\*\* As calculated per ASTM B31.3 methods,  $P = ((2*S*E*W*t)/(D-2yt))$ ; W = 1.00, Y = 0.4, S = 20,000 psi, wall thickness is reduced for a maximum of 6 times Diameter radius bends, c = 0

\*\*\* Compressed air application only



## PART 3.0 EXECUTION

### 3.01 CONSTRUCTION

- A. The Contractor shall install all materials and equipment required under this Section in accordance with the Project specifications, plans, and in accordance with the Manufacturer's instructions.
- B. Pre-start Pipe Cleaning. All piping sections between packaged components that include piping or tubing shall be blown clean prior to connection to equipment. Blow out shall be achieved by closing the downstream end of pipeline with a 5000 psi-rated ball valve, connecting a minimum 1650 psi source pressure vessel to the upstream end of the pipeline, opening outlet ball valve to atmosphere. Procedure shall be repeated until no solid or particulate matter is discharged from the pipeline or tubing.
- C. Pipe pigging: All internal pipe surface of piping between components shall be cleaned over its entire length, removing dirt, debris and loose corrosion products before pipe is lined up for welding. The open ends of all strings of pipe shall be securely closed to prevent the entrance of dirt, debris, water or animals into the pipe.
- D. Tubing may be bent where needed. The minimum mandrel bend radius must be equal to or greater than five (5) times the OD of the tubing.
- E. Installation of Tubing and Tube Fittings. New condition Parker Seal-Lok tube fittings shall be used for CNG connections to the maximum extent possible. Swagelok tube fitting may be used in alternate locations with prior approval of the Engineer. Contractor shall use tube fittings from a single manufacturer throughout a prepackaged component, so as to simplify use and consistency of appropriate repair parts. 300-series stainless steel fittings shall be used with stainless steel tubing.

Manufacturers' personnel who install tubing and tube fittings shall be trained and certified by the manufacturer for such activity, and proof shall be provided. Tubing shall be installed neatly and in a workman-like manner as per manufacturer's design and recommendation. All tubing shall be properly anchored, supported or pitched and shall be protected from impact. As CNG tubing dilates and contracts in response to its wide range of operating pressures, Unistrut Cush-a-Clamp assemblies, or approved similar resilient anchors, shall be used to support CNG tubing.

In general, above ground installed tubing (such as interconnections and control installations) shall be from straight "stick" stock and not be from rolled stock. Rolled stock may be used for below ground installations such as dispenser runs.

### 3.02 TESTING

- A. The information in this section applies to the testing of all constructed piping to ASME B31.3 "Process Piping".
- B. All circuits of the piping system must be tested per ASME B31.3 and this Specification before putting the system into operation. Testing should consist of both a pressure retention test and a leak test. Testing should be conducted using utmost caution. The CNG process lines downstream of the compressors will contain in excess 5,500 psig pressure during the test. ***Failure of a joint or component will expose test personnel to high-pressure gas, which could result in injury.*** The number of testing personnel should be kept to a minimum in the test area. A pressure test supervisor should be appointed to direct all pressure tests and to control the access of personnel into the test areas. Individuals will be performing the tests shall be familiar with procedures and safety precautions outlined in this specification and ASME B31.3.

- C. Maintain a minimum distance of 25 feet from the test circuit while the circuit is being pressurized and while it is under pressure. Test personnel should *continually monitor* the test until it is completed and test circuit is depressurized. Post test warning signs around the test area to warn personnel that high-pressure pneumatic testing is underway. Consider covering and restraining any fittings on test segment that may disconnect from the pipe under test pressures. The cover shall be substantial enough to capture any dead end fitting of the test segment that may become dislodged.
- D. Ensure all testing equipment and measuring devices are properly installed. Use a digital pressure gauge capable of 0.10% or better accuracy to supplement analog test charts along with a chart recorder capable of 2% or better accuracy to record temperature and pressure. Ensure that all digital gauges and analog test recorders (charts) used for test have current calibration/certification.
- E. Isolate the piping test segment from all other piping segments. *Isolate or remove* any components from the system that are not rated for 1.1 times the listed design pressure of the system. Ensure that all pre-fabricated and pre-tested fittings and devices such as hoses, couplings, valves, etc. have appropriate markings clearly identifying pressure ratings equal to or greater than the maximum test pressure to be applied to the test segment. Ensure that all fittings on the test segment have been properly attached and tightened.
- F. Clean dry nitrogen should be used for the test gas. Be sure that the testing is done in a ventilated area. Nitrogen is an asphyxiate. Leakage of nitrogen into the test area may create an oxygen-deficient atmosphere that can asphyxiate personnel in the area. Slowly pressurize the circuit, increasing the pressure in stages. Pressurize the system to 1.1 times the listed design pressure from a remote location, using an approved pressure testing control system. Hold the pressure in the system for 10 minutes. If the pressure declines more than a few psig then there is likely a leak in the section of pipe/tube. Depressurize the circuit to about 50 psi and locate the leak using an approved leak detection solution such as SNOOP. Apply the leak detection solution to each joint and look for the formation of bubbles. If no bubbles form within 30-60 seconds, the joint is acceptable. If bubbles form, the joint must be repaired and retested. After the system passes the 15-minute pressure retention test at 1.1 times the listed design pressure, reduce the pressure to 90% of times the listed design pressure. Record the pressure and temperature. Hold at this pressure for a minimum of 2 hours; then, observe the test pressure gauge for any loss of pressure. Loss of pressure that cannot be attributed to a change in temperature is an indication of a leak. Locate the leak point and repair the leak.

**PART 4 MEASUREMENT AND PAYMENT**

4.01 MEASUREMENT - Measurement for the Stainless Steel Piping installation will be made at the Contract unit price per each, complete in place, at each location as accepted by the Engineer.

4.02 PAYMENT - All costs incurred by the Contractor by reason of compliance to satisfy the requirements under this section shall be considered incidental to and completely covered by the Contract unit price for the following bid items:

<u>Description</u>	<u>Unit(s)</u>	
Stainless Steel Tubing Installation	Linear Foot	
		END SECTION
Small Arrow Engineering, LLC	Section 15160B - 5	High Pressure Piping

**SECTION 15180  
VALVES AND ACCESSORIES**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. This Section includes all process valves/accessories required for complete installation of Work.

**1.02 REFERENCES**

- A. Design, fabricate and test valves and materials in accordance with manufacturers' recommended procedures and the following codes and standards:
1. ANSI B16.1 - Cast Iron Flanges and Flanged Fittings, Class 25, 125, 250 and 800.
  2. ANSI B16.10 - Face to Face and End to End Dimensions of Ferrous Valves.
  3. ANSI B16.25 - Butt Welding Ends.
  4. ANSI B16.34 - Steel Butt Welding End Valves
  5. ANSI B16.5 - Steel Pipe Flanges, Valves and Fittings.
  6. ANSI B31.1 - Code for Pressure Piping, Power Piping Section.
  7. ASTM A216 - Carbon Steel Castings Suitable for Fusion Welding for High Temperature Service.
  8. ASTM A105 - Forgings, Carbon Steel for Piping Components.
  9. ASTM A48 - Gray Iron Castings.
  10. ASTM A126 - Gray Iron Castings for Valves, Flanges and Pipe Fittings.
  11. ASTM A536 - Ductile Iron Castings.
  12. AWWA C111 - Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings.
  13. AWWA C507 - Ball Valves, Shaft or Trunnion Mounted-6-inch through 48-inch-for Water Pressures up to 300 psi.
  14. AWWA C508 - Swing Check Valves for Water Works Service.
  15. AWWA C509 - Resilient Seated Gate Valves for Water and Sewage Service.
  16. AWWA C511 - Reduced Pressure Principle Back Flow-Prevention Assembly.
  17. AWWA C540 - Power Actuating Devices for Valves and Sluice Gate.
  18. AWWA C550 - Protective Interior Coatings for Valves and Hydrants.
  19. AWWA C600 - Installation of Gray and Ductile Cast-Iron Water Mains and Appurtenances.
- B. Manufacturers shall be experienced in the design and manufacture of specific valves and accessories for a minimum period of 5 years.

**1.03 COMPLIANCE SUBMITTALS**

- A. Submit in accordance with Division 1.
- B. Submit the following for acceptance:
1. Catalog data or illustrations showing principal parts and materials.
  2. Spare parts list.
  3. Assembly and disassembly or repair instructions.
  4. Affidavits of compliance.

## **1.04 DELIVERY, STORAGE AND HANDLING**

- A. Ship valves with suitable end covers to prevent entrance of foreign material into valve body.
- B. Protect valve threads, flanges, stems and operators from damage.

## **PART 2 - PRODUCTS**

### **2.01 VALVE BODY MATERIAL**

- A. Valve body shall be similar to the material of the pipe (for metallic pipe) in which it is installed and shall be one of the following:
  - 1. Carbon Steel - ASTM A216 WBC.
  - 2. Ductile Iron - ASTM A536.
  - 3. Stainless Steel - ASTM A182 316L.
  - 4. Cast Iron - ASTM A126 Class B.
  - 5. Bronze - ASTM B61.

### **2.02 GATE VALVES 2-1/2" AND LARGER**

- A. Acceptable Manufacturers:
  - 1. American.
  - 2. M&H.
  - 3. Mueller.
  - 4. Or approved equal.
- B. Gate valves from 3" - 12" size shall conform to AWWA C-509:
  - 1. Valves shall have a minimum design working pressure of 200 psi.
  - 2. Valves shall open counter clockwise and be non-rising stem.
  - 3. Valves stems shall use double O-ring seals.
  - 4. Buried valves shall have mechanical joint ends.
  - 5. Exposed valves shall have flanged ends. The valve interior shall be coated with the manufacturer's standard epoxy coating. The exterior coating shall conform to Division 9.
  - 6. Bolts shall be stainless steel. Gaskets and seals shall be non-asbestos materials.
  - 7. Buried valves shall be operated with a 2" x 2" nut and valve box unless a handwheel is indicated on drawings. Exposed valves shall have hand wheel operators.
  - 8. All valves shall be NSF approved.
- C. Cast iron or ductile iron gate valves of sizes other than those listed above installed in the process water or the sludge process systems shall conform to AWWA C500 and shall be as follows:
  - 1. Valves 2½" and smaller be designed for a 200psig minimum working pressure. Valves over 12" shall have a 150psig minimum working pressure.
  - 2. Double disc type.

3. Mechanical joint ends for buried valves.
4. Flanged ends for exposed and interior valves.
5. Shall have a handwheel operator for exposed valves. Buried valves shall be operated with nut and valve box unless handwheel is indicated on drawings.
6. Valves shall be non-rising stem and open counter-clockwise unless otherwise stated.
7. Stems shall be sealed with double O-rings.

### **2.03 ECCENTRIC PLUG VALVES**

#### **A. Acceptable Manufacturers:**

1. DeZurik Corporation.
2. Pratt Valves.
3. Or approved equal.

B. Plug valves shall be quarter-turn non-lubricated eccentric type with resilient faced plug. Alternate seat and plug materials may be considered provided this specification is met and, in addition, the manufacturer must prove prior to approval that the valve meets AWWA C504 "proof of design tests" (10,000 cycles) in both directions. Flanged valve ends shall be faced and drilled to conform to ANSI B16.1, Class 150 for diameter and drilling. Mechanical or push-on type rubber-gasketed joint ends shall conform to AWWA C111. Port areas for valves smaller than 20-inch shall be at least 80 percent of full pipe area. Port areas for valves 24-inch and larger shall be at least 70 percent of full pipe area.

#### **C. Materials and Construction:**

1. Bodies shall be of ASTM A126, Class B cast iron.
2. Valve plug shall be ASTM A126, Class B cast iron or ASTM A536 ductile iron. Resilient plug facing shall be synthetic rubber, neoprene or Buna N compound suitable for use with water and wastewater applications.
3. Seats shall be a raised welded overlay of 90% pure nickel, a minimum of .125" thick and 0.50" wide, conforming to AWWA C504. When the plug is in the closed position, the resilient plug facing shall contact only nickel. Sprayed or plated mating seat surfaces are not acceptable for resilient plugs.
4. Bearings shall be replaceable. Sleeve bearings in the upper and lower journals shall be permanently lubricated 316 stainless steel per ASTM A743 Grade CF-8M. Nonmetallic journal bearings shall not be acceptable. Thrust bearings shall be teflon.
5. Shaft seals shall be self-adjusting chevron-type conforming to AWWA C504. Valve shall be designed so it can be repacked while the valve is in line and under pressure without removing the actuator. O-ring seals shall not be acceptable in valves larger than 3".
6. All exposed fastening hardware shall be zinc plated or stainless steel. Provide stainless steel bolting on buried service valves.

#### **D. Manual Operators:**

1. All valves shall open counterclockwise.
2. Provide indicators to show position of plug except on buried operators.

3. Actuators: Manual valves shall have lever or worm gear actuators with handwheels, chainwheels, tee wrenches, extension stems, floorstands, etc., as show on the plans or as called for in the valve schedule. Lever actuators shall be furnished for valves 8" or smaller where the maximum shutoff pressure is 25 psi or less as indicated on the plans or in the valve schedule. Worm gear actuators shall be furnished for all valves 4" or larger where the maximum reverse shutoff pressure is greater than 25 psi. Worm gear actuators shall be sized for 150 psi. All gearing shall be enclosed in a semi-steel housing and be suitable for running in a lubricant with seals provided on all shafts to prevent entry of dirt and water into the actuator. The actuator shaft and the quadrant shall be supported on permanently lubricated bronze bearings. Actuators shall clearly indicate valve position and an adjustable stop shall be provided to set closing torque. This adjustable stop shall be the only adjustment necessary to set the clearance between the valve plug and the seat while the valve is in line and under pressure. Handwheel and chainwheel sizes for worm gear actuators shall be no smaller than 6" in diameter and no larger than twice the diameter of the actuator's gear sector. All exposed nuts, bolts, and washers shall be zinc plated.

Valves and gear actuators for buried or submerged service shall have seals on all shafts and gaskets on the valve and actuator covers to prevent the entry of water. Actuator mounting brackets for buried or submerged service shall be totally enclosed and shall have gasket seals. All exposed nuts, bolts, springs, and washers shall be stainless steel.

4. Handwheels shall be located for easy access on exposed valves.
5. Buried valves shall be operated by a 2" AWWA nut with valve box.

#### **E. Electric Powered Operators:**

1. Where shown on the plans, plug valves shall be operated by an electric powered valve operator. Operator shall be a quarter turn operator fully complying with AWWA C-540 as manufactured by E.I.M., Limatorque, or approved equal. The valve supplier shall be responsible for coordinating and supplying the complete valve assembly, including all controls and extension assemblies where required.

2. Electric motor and control enclosures shall be NEMA 4 rated and O-ring sealed. Seals shall be provided at all exit points to the gear case. Critical areas, subject to high wear, shall be double sealed.

3. The unit operator on 460 volt, 3-phase power and shall contain a reversing motor starter and control transformer. Motor shall have Class F insulation with a Class B temperature rise. Power shall be transferred through a removable splined bushing.

4. Unit shall be designed to operate against the line test pressure (Section 15160) applied in either direction. The fully open to fully closed operation time shall be approx. 200 seconds.

5. The unit shall be operated locally by OPEN-STOP-CLOSE signal. Operation shall be selected through a LOCAL-OFF-REMOTE switch. The valve position shall be shown on an indicator.

6. Four field adjustable limit switches shall be provided OPEN, CLOSED, or any intermediate point. Switch contacts shall be solid silver and have a minimum rating of 10 amps (break) inductive at 120 volts. Use of cams or screws in securing switches is not acceptable.

7. Mechanical stops shall be provided to withstand maximum operator torque.

8. The service of a minimum of one day of field start-up time shall be provided to coordinate valve operation with the instrumentation supplier. One day shall also be provided to assure proper installation and operation of the operator and to instruct plant staff on proper operation and maintenance of the valve.

**F. Testing:** Furnish certified copies of results of tests prior to shipment. All valves shall be subjected to an AWWA C504 procedure leak test at 150 psi against the face of the plug and a body hydrostatic test at 300 psi. Valves shall be capable of providing drip-tight shutoff up to the full leak rating with pressure in either direction.

## **2.04 BALL VALVES**

### **A. Acceptable Manufacturers:**

Under 6"

1. Henry Pratt Co.
2. Von Roll Co.
3. Or approved equal.

6" and Larger

1. Crane Co.
2. Nibco.
3. Or approved equal.

B. Ball valves shall be standard port type with 3-piece body. Flanged valve ends shall be faced and drilled to conform to ANSI B16.1, Class 150 for thickness and drilling. Mechanical or push-on type rubber-gasketed joint ends shall conform to AWWA C111.

### **C. Materials and Construction:**

1. Ball valves 6" and larger shall conform to AWWA C507 with a minimum design operating pressure of 150 psig.
2. Bodies shall be of ASTM 126, Class B cast iron for 2-1/2" and larger. Smaller valves shall be bronze body.
3. Valve trim shall be bronze.

### **D. Manual Operators:**

1. All valves shall open counterclockwise.
2. Exposed valves 3" and smaller shall be lever operated.
3. Provide indicators to show position of ball.
4. AWWA 2" size not operators by enclosed worm gear operators shall be provided for buried valves.
5. Exposed valves over 3" dia. shall be handwheel operated through an enclosed worm gear.

## **2.05 BALL VALVES (POLYMER SERVICE AND NON-POTABLE WATER 2" AND SMALLER)**

### **A. Acceptable Manufacturers:**

1. George Fischer.
  2. Nibco.
  3. Or approved equal.
- B. Ball valves shall be PVC true union with either solvent or threaded pipe connections. Pressure rating shall exceed 230 psi.
- C. Seats shall be PTFE with backing rings. Backing rings and seals shall be EPDM.
- D. PVC shall meet or exceed cell classification 12454B, ASTM D-1784.
- E. Socket end connections shall conform to ASTM D-2467. Threaded pipe connections shall conform to ANSI B2.1.
- F. Exposed valves shall be lever operated. Valve shall not be buried.

**2.06 SWING CHECK VALVES 2-1/2" AND LARGER** (To be used only when plans specified as “non-cushioned check valve”).

**A. Acceptable Manufacturers:**

1. American Cast Iron Pipe Co.
2. M&H
3. Mueller
4. Or approved equal.

**B. All check valves shall be as follows:**

1. Swing type with lever and spring
2. Bolted bonnet

**C. Swing check valve shall conform to AWWA C508 with a min. operating pressure of 175psig.**

1. Valve hinge pins shall be stainless steel.
2. Valve discs shall be full opening with a composition to metal seat. The composition material shall be suitable for use in domestic water and wastewater service.
3. Valves shall be flanged unless otherwise specifically stated on the drawing.
4. Valves shall be equipped with an external lever that is spring assisted. The spring tension shall be field adjustable by a hex nut. The lever arm shall be keyed to the valve hinge shaft.
5. Where valves are installed in other than horizontal alignment, the spring operator shall be designed to work in the position shown.
6. Valve exterior coatings shall conform to Division 9.

**2.07 CUSHIONED SWING CHECK VALVES**

**A. Acceptable Manufacturers:**

1. Golden Anderson Valve Specialty Company



2. Valve and Primer Corporation
3. Or approved equal

**B. Operational Requirements:**

1. Prevent reverse flow without shock or hammer.
2. Seat tightly with internal pipeline forces.
3. Cushioned in manner permitting adjustment of speed of closure.

**C. Design:**

1. Check valve shall conform to AWWA C508 except for addition of exterior cushion chamber.
2. Swing disc type with single stainless steel shaft and flanged body. Flanges shall be ANSI B16.1, Class 125.
3. Valve disc shall have external lever and adjustable counterweight to initiate closure.
4. Valves shall have a metal to composition seat.
5. Valve coatings shall conform to Division 9.

**2.08 BALL CHECK VALVES (To be used only above grade with PVC piping)**

**A. Acceptable Manufacturers:**

1. George Fischer
2. Nibco
3. Or approved equal

- B. Ball check valves shall be PVC true union with either solvent or threaded pipe connections. Pressure rating shall meet or exceed 150 psi.
- C. Body interior shall have molded ribs to serve as a ball cage and guide.
- D. Ball return to seated position shall be spring assisted.
- E. Seat and seals shall be EPDM.
- F. PVC body and ball shall meet or exceed cell classification 12454B, ASTM D-1784.
- G. Solvent socket pipe connections shall conform to ASTM D-2467. Threaded pipe connections shall conform to ANSI B2.1.

**2.09 GLOBE AND ANGLE VALVES 2-1/2" AND SMALLER**

**A. Acceptable Manufacturers:**

1. Crane
2. Nibco

3. Or approved equal
- B. Bronze 200 or 300 pound class shall be as follows:
1. Screwed ends.
  2. Non-rising stem.
  3. Union bonnet.
  4. Solid disc and separate seats of nickel alloy for gate valves.
  5. Plug-type disc and renewable seats for globe and angle valves.
  6. Back seating design.
- C. Carbon steel - 600 pound class shall be as follows:
1. Socket weld ends.
  2. Bolted or no bonnet.
  3. Outside screw and yoke.
  4. Stainless steel stem.
  5. Manufacturer's recommended disc and seat facing material for stem and water service.

## **2.10 BUTTERFLY VALVES**

- A. Butterfly valves in sizes 2"-20" shall be of the flangeless wafer body style conforming to AWWA C504. All valves shall be suitable for use with ANSI 125 or 150 pound flanges. Bodies shall be cast iron. Valves shall be rated at 175 psi and provide drip-tight shutoff at differentials up to 175 psi in both directions. Bodies of all flangeless wafer valves shall have 4 flange bolt guides to center the body in the pipeline.

All valves shall be furnished with self-lubricated bearings of bronze or TFE coated stainless steel. Shaft seals shall be provided to prevent leakage and to protect bearings from internal or external corrosion.

Seats shall be of the reinforced resilient type and shall be field replaceable. Seats shall also act as a body liner to prevent flow from contacting the body casting. Seats shall have flange sealing to provide a positive seal without use of flange gaskets.

Seats shall be of EPDM (Nordel) suitable for use with 290°F air. Shafts shall be one piece and shall be of 416 or 316 stainless steel. Shaft diameter shall meet the 75B standard from AWWA specification C504-87 for butterfly valves. Shafts shall be finish ground to minimize bearings and shaft seal wear. Shafts of 12" and larger shall have a non-adjustable thrust collar.

Discs shall be bronze or cast iron with welded nickel edge. The disc-to-shaft connections shall be type 316 stainless steel. Pins, shaft and disc of all valves shall be individually machined and completely interchangeable.

Valves shall be available with field interchangeable manual or powered actuators as required. The actuator-to-shaft connection shall be designed to shear and prevent internal valve damage if the disc closes on foreign material in the pipeline. All non-buried actuators shall provide external indication of disc position.

Latch lock levers shall provide automatic, positive latching in the open, closed or eight intermediate positions. These valves shall allow locking in any position with a standard padlock. Infinite position levers shall allow manual throttling and locking in any position from open to close.

All manually actuated valves 8" and larger shall be operated using a cast iron housed handwheel actuator available in standard, weatherproof, or buriable construction - as required - with optional chainwheel, crank, or 2" square nut input. All units to have adjustable open and closed position stops with provision to prevent accidental adjustment changes. Operating shaft to be supported axially and radially at input end by permanently lubricated bronze and thrust and sleeve bearings.

Valves shall be resilient seated butterfly, as manufactured by DeZurik, Figure 632, or equal.

## **2.11 BACKFLOW PREVENTER**

A. Backflow preventers shall consist of a dual check valve assembly with reduced pressure zones between the check valves. Backflow preventers shall be Cla-Val "Model RP-2", Febco "Model 825Y", Hersey "Beeco Model FRP-II", or Watts "No. 909" with bronze body and threaded end couplings. Valves shall conform to AWWA C-511 and be USC listed.

## **2.12 YARD HYDRANTS**

A. Yard Hydrants, Post Type: Non-freeze, post type, 3/4-inch inlet, integral or field installed vacuum breaker with outlet conforming to ASME B1.20.7 for garden hose thread. Hydrants shall be bronze casing, cast-iron or cast-aluminum casing guard, key operated, and tapped drain port in valve housing. Hydrant shall be of length required for installation of inlet valve below frost line.

## **2.13 FIRE HYDRANT MANUFACTURERS & MODEL - SEE SECTION 2515**

## **2.14 SHOP PAINTING**

- A. Prepare surfaces and paint or coat all buried valves and interior of exposed valve all related accessories standard of the manufacturer, unless otherwise specified herein.
- B. Exposed valves shall have exterior coating conforming to Division 9.
- C. Paint and coatings shall be suitable for the service intended.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. **General Application:** Use mechanical joint end valves for 3-inch and larger buried installation. Use threaded and flanged end valves for installation in pits and inside building.

- B. **Gate Valves:** Comply with AWWA C600. Install buried valves with stem pointing up and with cast-iron valve box.
- C. **Plug Valves and Butterfly Valves:** Shall normally be installed with horizontal shafts to protect bearings from settled solids.
- D. Thoroughly clean and remove all shipping materials prior to setting. Operate all valves from fully opened to totally closed.
- E. Install eccentric plug valves in reverse position (flow and pressure against the plug face when closed) in all lines. When installed horizontally with shaft in the horizontal, the plug shall rotate open to the top recess of the valve body.

### 3.02 FIELD TESTING

- A. Perform pressure tests on valves as specified in Division 18 for the adjoining piping.

### 3.03 CLEANING

- A. Clean and disinfect potable 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 prescribed by the authority having jurisdiction or, in case a method is not prescribed by that authority, use the procedure described in AWWA C651, or as described below:
    - a. Fill the system or part thereof with a water/chlorine solution containing at least 50 parts per million of chlorine. Isolate (valve off) the system or part thereof and allow to stand for 24 hours.
    - b. Drain the system or part thereof of the previous solution and refill with a water/chlorine solution containing at least 200 parts per million of chlorine and isolate and allow to stand for 3 hours.
    - c. Following the allowed standing time, flush the system with clean, potable water until chlorine does not remain in the water coming from the system.
    - d. 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.

END OF SECTION

## SECTION 15180A

### COMPRESSED GAS VALVES

#### PART 1 GENERAL

##### 1.01 DESCRIPTION

- A. This section covers valves used in the distribution of compressed air and natural gas for the CNG station WORK. The WORK in this section consists of providing the necessary check valves and ball valves as related materials as shown on the plans and herein specified and all labor, tools and equipment necessary to install the valves. The Work includes installation of valves for both low pressure natural gas distribution and medium to high pressure compressed air and natural gas sections of the CNG station.

##### 1.02 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
  - 1. Section 15160, Pipe Installation.
  - 2. For unique specifications pertaining to CNG and compressed air application stainless steel

##### 1.03 QUALITY ASSURANCE

- A. Acceptable Manufacturers

- 1. Ball Valves:

Low Pressure:

- a. Nibco Inc.
- b. Broen
- c. Apollo
- c. Approved equal.

High Pressure CNG Ball Valves:

- a. Swagelok
- b. Oasis
- c. Parker
- d. Approved equal.

- 2. Check Valves:

- a. Keckley
- b. US Valve

- c. Velan
- d. Approved equal

#### 1.04 REFERENCES

- A. Low pressure compressed air and natural gas distribution valves shall be designed and tested in accordance with manufacturers' recommended procedures and the following codes and applicable standards:

- 1. American Society of Mechanical Engineers (ASME):

- B16.5 - Pipe Flanges and Flanged Fittings
- B16.10 - Face-to-Face and End-to-End Dimensions of Valves
- B16.34 - Valves - Flanged, Threaded, and Welding End
- B31.3 - Process Piping

- 2. ASTM International:

- A216 - Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service
- A182 - Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service

- 3. ANSI/ API:

- 594 - Check Valves: Flanged, Lug, Wafer and Butt-welding
- 598 - Valve Inspection and Testing
- 607 - Fire Test for Soft-Seated Quarter Turn Valves
- 608 - Metal Ball Valves - Flanged and Butt-Welding Ends
- 609 - Butterfly Valves: Double Flanged, Lug- and Wafer-Type

#### 1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Take precautions so as not to damage materials during delivery or storage.
- B. Store valves off the ground and away from materials that could contaminate potable water systems.
- C. Take precautions to keep joints and internal parts clean.

## **PART 2 PRODUCTS**

#### 2.01 LOW PRESSURE DISTRIBUTION VALVES

- A. Ball Valves

- 1. All ball valves shall meet the minimum requirements of ANSI/API 608 and shall be installed in accordance with manufacturer's instructions and recommendations. Ball valves shall be compatible with operation in a compressed air or natural gas piping system designed to ASME B31.3 with a design pressure of 150 psig.

2. All valves shall be full opening with a ¼ turn actuation, with nut or handle actuation per the drawing. Valves bodies shall be carbon steel per ASTM A216 and shall be rated ANSI/ASME Class 150 and have flanged ends. Flanges shall conform to ASME B16.5, B16.10 and B16.34 and shall be of the same material as the valve body. Stems shall be of the anti-blow out design.
3. Ball valves shall be tested and inspected in accordance with ANSI/API 598 and 607.

#### B. Check Valves

1. All check valves shall meet the minimum requirements of ANSI/API 594 and shall be installed in accordance with manufacturer's instructions and recommendations. Check valves shall be compatible with operation in a compressed air or natural gas piping system designed to ASME B31.3 with a design pressure of 150 psig. Check valves shall be compatible with operation upstream of reciprocating gas compressors.
2. All valves shall be of a dual disc design. Valves bodies shall be carbon steel per ASTM A216 and shall be rated ANSI/ASME Class 150 and have flanged ends. Flanges shall conform to ASME B16.5, B16.10 and B16.34 and shall be of the same material as the valve body.
3. Check valves shall be tested and inspected in accordance with ANSI/ API 598 and 607.

### 2.02 HIGH PRESSURE DISTRIBUTION VALVES (STAINLESS STEEL)

#### A. Ball Valves

1. All ball valves for compressed air and CNG distribution piping shall meet the requirements of ANSI/API 608 and shall be installed in accordance with manufacturer's instructions and recommendations. Ball valves shall be compatible with operation in a compressed air or natural gas piping system designed to ASME B31.3 with a design pressure of 175 psig for compressed air system or 5000 psig for a CNG distribution system.
2. All valves shall be full opening with a ¼ turn actuation, with handle actuation per the drawing. Valves bodies shall be stainless steel 304 or 316 alloy per ASTM A182, have Swagelok® style tube fitting, SAW or NPT ends as selected by Contractor, and shall be rated for the design pressure or greater. Stems shall be of the anti-blow out design.
3. Ball valves shall be tested and inspected in accordance with ANSI/ API 598 and 607.

## **PART 3 EXECUTION**

### 3.01 INSTALLATION - VALVES

- A. Install Compressed Gas Valves per Sections 15160 and 15160B.

## **PART 4 MEASUREMENT AND PAYMENT**

### 4.01 MEASUREMENT

Measurement for the Compressed Gas Valve installation will be made at the Contract unit price per each, complete in place, at each location installed and accepted by the Engineer.

#### 4.02 PAYMENT

All costs incurred by the Contractor by reason of compliance to satisfy the requirements under this section shall be considered incidental to and completely covered by the Contract unit price for the following bid

<u>Description</u>	<u>Unit(s)</u>
Compressed Gas Valve Installation	Each

END OF SECTION



**SECTION 15210  
WELDING OF PIPE WORK**

**PART 1        GENERAL**

1.01    SUMMARY

- A. The purpose and intent of this Section are to define the necessary weld material and welding processes required to complete and workable piping systems specified in Division 15 and as indicated on the drawings.
- B. The Owner will furnish one or more representatives for welding inspection and qualifying of welds. At the Owner's expense, radiographic or other non-destructive inspection of production welds will be used. Contractor shall cooperate by arranging welding operations in a manner which will permit the maximum usage of the radiographic and non-destructive equipment and assist in moving such equipment and clearing the area of personnel during testing. Unsatisfactory welds shall either be repaired or removed and replaced in accordance with above specifications at no expense to the Owner.

1.02    RELATED SECTIONS:

A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

- 1. Section 15160, Pipe Installation

1.03    REFERENCES

- A. Pipe and fittings shall be designed and tested in accordance with manufacturers' recommended procedures and the following codes and applicable standards:
  - 1. Code of Federal Regulations (CFR):  
Title 49, Subpart D and E, Part 192 - Transportation of Natural and Other Gas by Pipeline
  - 2. American Petroleum Institute (API):  
API 1104    - Standard for Welding of Pipelines and Related Facilities
  - 3. American Society for Non-Destructive Testing (ASNT):  
SNT-TC-1A - Personnel Qualification and Certification in Nondestructive Testing

**PART 2        PRODUCTS**

2.01    MATERIALS

- A. The Contractor shall furnish all required oxygen, acetylene, welding rod, welding machine, gasoline or other construction material required for the completion of the welding of the pipe work.
- B. Welding rod shall be of a size and grade specified by the Owner's welding procedures.

## PART 3 EXECUTION

### 3.01 GENERAL

#### A. Preventing fire:

The Contractor shall take due precaution to prevent fires at all times during pipeline production welding and in the event any cutting or welding is required at the operating facilities. The Owner will assign an area for this work.

#### B. Welding Rod:

Contractor shall provide a suitable container for welding rod stubs for each welder. Welding rod will not be thrown on the ground or in the ditch. Contractor personnel at his expense will pick up welding rods left on the ground or in the ditch. Welding rod stubs shall be properly disposed of to the Owner's satisfaction at all times.

#### C. Marking welds:

Each welder, according to number assigned to the welders by Contractor, shall mark Welds on the top quarter of the pipeline. The Contractor shall provide the Owner with a list of welders and assigned numbers. Each welder shall put his symbol in sequence below the preceding welder if more than one welder works on the weld. Metal stamps or any other penetrating type *shall not* be used.

#### D. Movement:

Movement of the pipe during welding of the root bead shall be prohibited. The external line-up clamp shall not be removed until 50% of the root pass is completed. No two successive weld beads shall be started at the same location.

#### E. "Pup" Joints:

All usable "pup" joints must be six (6) feet or more in length. No more than one "pup" joint can be installed at one time without specific approval of Owner. No "pup" shall be installed in the pipeline that is less than one and one-half times the diameter of the pipe, or 18 inches, whichever is greater.

#### F. Weather Conditions:

In the case of cold, rainy or stormy weather, the Contractor shall provide protection for the welders at their work and care shall be taken to assure that weld are not subjected to sudden variation in temperature until such welds are thoroughly cool. Welding will not be carried on when in the judgment of Owner the quality of the completed weld may be impaired by prevailing condition, including but not limited to air borne moisture, blowing sands, high winds and air borne dust. If the welding operation is interrupted, when environmental condition may cause uneven or accelerated cooling of the weld, the joint shall be wrapped with an insulating protective material and the weld joint shall be preheated when preheat is required by the Welding Procedure Specification before welding commences.

#### G. Open ends

A suitable cover of about the same diameter as the pipe shall be placed over the open ends of the tie-in sections, or ends of long stringing operation. The open ends of the line shall be securely closed and the ends of all pipe raised and placed on skids above trench at the end of each day's work to prevent the entrance of small animals, water and obstructions, and shall not be reopened until the work recommences. When located in any flood area or swamp area where water could enter pipe ends during heavy rains, watertight night caps shall be used.

### 3.01 WELDING CODES

- A. All welding shall be in accordance with the most stringent requirement of the following codes and standards in this specification.
  - 1. Subpart D and E of the United States Department of Transportation CFR Title 49, Part 192.
  - 2. API Standard 1104
  - 3. Any other applicable Local, State, or Federal statutory regulations or codes.
  - 4. The Owner's Welding Procedures used to qualify Contractor's Welders.
- B. Type of Welds
  - 1. All pipeline welding shall be done with the shielded metal arc welding process. Except for certain welds for the fabrication of assemblies, welding shall be in the horizontal fixed position and the direction of welding shall be vertical down.
    - a. All pipeline welds shall be Butt Welds. All bevels for butt welds for pipe, flanges and fittings of wall thickness  $\frac{3}{4}$  inch and less shall be of the Vee type with 30-degree bevels.
    - b. Root spacing and application of root beads shall be such as to ensure complete fusion of the filler metal.
    - c. The number of passes of weld metal for weld metal for welded joints shall be no fewer than one per each  $\frac{1}{8}$  inch of pipe thickness to ensure adequate grain refinement of the filler metal.

### C. Miter Welds

Miter Welds shall not be permitted on any pressure piping, but may be used on non-pressure piping when specified or approved by Owner.

### 3.02 WELDING EQUIPMENT

- A. All welding equipment, beveling machines, external line-up clamps, cutting torches, and other equipment, tools and supplies used in connection with the pipeline welding, must be satisfactory to the Owner's Representative, and must be kept in good mechanical condition so as to product sound welds.
- B. The welding cables shall be of standard size and length so as not to permit more than 10% current drop for the full length. Splices in the welding cable shall be made by such a method that will keep

them secure and prevent their getting hot while in use. The electrode holders shall be of insulated type.

- C. The welding machine shall have adequate controls for obtaining current adjustment for all pipe welding requirements.
- D. Non-arcing grounding clamps shall be used exclusively for all welded pipe. Type of clamp shall be as approved by Owner's Representative.
- E. All field bevels must be made with a beveling machine and oxygen cutting torch wherever possible. A power grinder and/or buffer shall be used to finish the cut.
- F. Prior to alignment, the beveled ends of each joint of pipe shall be thoroughly cleaned by suitable means approved by Owner, of print, rust, loose mill scale, dirt or other foreign matter, coating material, to avoid defects in the completed welds. Cleaning may be effected by the use of power-driven wire buffing wheels or other methods approved by the Owner.
- G. The adjoining lengths of pipe shall be accurately aligned by the use of a suitable alignment clamp of a type and manufacture satisfactory to Owner. All joints shall be aligned and welded with a uniform spacing of approximately 1/16 inch with a maximum of 3/32 inch. In instances where pipe other than seamless is furnished by the Owner, the longitudinal seams of successive lengths of pipe shall be offset by a minimum distance equal to one fourth (1/4) the pipe diameter.
- H. Welding joints in steel pipe shall be preheated by a method acceptable to Owner and shall cover a band of at least 4 inches on each side of the weld. The temperature listed shall be checked by use of temperature indicating crayons or other approved means.

The minimum preheat temperatures required shall be as follows, when:

1. The ambient temperature is lower than 40 degrees F. and the pipe wall thickness is less than 1/2 inch, 200 degrees F. minimum, 350 degrees F. max.
2. When welding fitting to fitting and pipe to fitting: 200 degrees F.
3. If pipe is damp or wet it shall be dried by heating.

### 3.03 QUALIFICATION OF WELDERS

- A. Each welder shall be qualified in the manner presented in Paragraph 3.1, Qualification of Welders, API Standard 1104, latest approved edition, to determine the ability of welder to make sound butt or fillet welds using previously qualified procedures. A welder shall qualify for welding by performing a test on segments on full-size pipe nipples as specified in 3.2.1 of API 1104. When segments of pipe nipples are used, they shall be supported so that typical flat, vertical, and overhead welds are produced. Before any pipeline welding is performed, the welder shall be qualified according to the applicable requirement so 3.2 through 3.8 of API 1104. A welder who satisfactorily completes the procedure qualification test is a qualified welder.
- B. Single Qualification:

For single qualification, a welder shall make a test weld, using a qualified procedure to join pipe nipples. The welder shall make a butt weld in the fixed position. When the welder is qualifying in

the fixed position, the axis of the pipe shall be in the horizontal plane, in the vertical plane, or inclined from the horizontal plane at an angle of not more than 45 degrees.

C. Multiple Qualification:

For multiple qualification, a welder shall successfully complete the two tests described in Paragraph 3.3 of API 1104, latest approved edition, using qualified procedures. For the first test, the welder shall make a butt weld in the fixed position with the axis of the pipe either in the horizontal plane or inclined from the horizontal plane at an angle of not more than 45 degrees. For the second test, the welder shall lie out, cut, fit, and weld a full-size branch-on-pipe connection. These tests shall be made with pipe with a diameter at least 12¼ inches (323.8 millimeters).

The welds shall be acceptable if it meets the requirements in API 110, Paragraph 3.4, Visual Examination and API 1104, Paragraph 3.5, Non-Destructive tests.

D. Records:

The Contractor and Owner shall maintain a record of the qualified welders employed by the Contractor showing the date and result of qualification tests and identification mark assigned to each welder. The form should be similar to that shown in Figure 2 of API 1104. A welder may be required to re-qualify if a question arises about his competence.

### 3.04 TESTING OF WELDS

- A. The Owner reserves the right to require the Contractor to cut any production weld from the pipe and what weld shall be tested in the manner stated below. If the weld is found to be acceptable, the Owner will reimburse Contractor for the cost of cutting out and replacing the weld, by the Unit Price in Contractor's Proposal for Miscellaneous Items, except that Owner shall be permitted to cut one (1) test weld made by each welder from the pipeline at no cost to the Owner. If the test fails in any of the standard tests, the welder may not be permitted to continue welding on the pipeline. A failed weld will be at the expense of the Contractor both the cutting out, testing and replacement of the weld. When two (2) or more welders participate in making the weld that failed, Contractor and Owner shall determine which welder or welders are responsible for the defective weld.
- B. A joint record of results of each weld test shall be given to the Owner and Contractor for their record. The joint record made by Owner and Contractor shall indicate the location of the weld by location on job site and welder's number and weather condition and result of the test. This record shall be signed and dated by an authorized representative of both Owner and Contractor and must be made on the day test is performed. No reimbursement will be made for any weld not covered by signed record completed in the reimbursement described above.

### 3.05 NON-DESTRUCTIVE INSPECTION OF WELDS

- A. All welds in high-pressure gas pipe shall be subject to 100 percent non-destructive inspection by the Contractor and interpreted in the manner specified in "Standards for Welding Pipe Lines and Related Facilities", API 1104, latest approved edition. Nondestructive testing personnel shall be certified in accordance with the recommendations of ASNT Recommended Practice SNT-TC-1A for the test method used. Only level II or III personnel shall interpret test results by personnel having been certified or re-certified in the last 3 years.

### 3.06 NON-DESTRUCTIVE TESTING PERSONNEL

- A. A record of the certified nondestructive testing personnel shall be kept by the Owner. The record shall include the results of certification tests, the agency, and the person granting certification, and date of certification.

### 3.07 STANDARDS OF ACCEPTABILITY OF WELDS

- A. As specified in API 1104, latest approved edition, undercut will be radiographically determined for length of defect only, with a maximum acceptable length of 2 inches accumulated in any 12 inch circumference of 1/6 the weld length, whichever is smaller.

### 3.08 WELD DEFECT REPAIRS

- A. If any non-destructive inspection indicates a weld to be defective. Contractor, at no additional cost to Owner, shall cut from the pipeline a cylinder of pipe containing such weld and replace it with a good pipe, or at Contractor's option, weld may be repaired provided the following limits are applicable:

1. All repair welding shall conform to the latest approved edition of API Standard 1104 and CFR Title 49, Part 192.245.
2. Cracks, regardless of their location, shall not be repaired.
3. Defects, except cracks, that are externally exposed to the cover pass may be repaired without prior approval from the Engineer.
4. Defects beneath the surface of the cover pass specifically defined, in the opinion of the Engineer as slag inclusions, porosity or gas pockets may be repaired in compliance with API 1104 provided.
  - a. The defects can be removed without grinding completely through the welds.
  - b. No single area of defect shall exceed 25% of the pipe circumference length. A given single area of defect may consist of one or more defects.
  - c. Adjacent areas of defects shall be separated by sound weld metal of a length no less than 7% of the pipe circumference length.
  - d. Before such repairs are made, such defects shall be entirely removed to clean metal by grinding in a manner acceptable to the Engineer. All slag and scale shall be removed by wire bending.
  - e. Flame cutting and air carbon arc gouging shall not be used for removing defects in repair of tie-in welds.
  - f. An area covering a minimum of 4" on each side of the repair shall be preheated to a minimum of 200 degrees Fahrenheit and maintained during repair welding. Temperature shall be checked by use of a temperature-indicating crayon.
  - g. All repairs shall meet the standards of Acceptability Non-destructive Testing, Paragraph 6.0 of API 1104.

h. No future repairs shall be made in this area.

B. Qualification of Repair Welding Procedure

1. Prior to repair welding of an effect on a previously repaired area, a welding procedure specification incorporating these recommendations shall be qualified in accordance with API 1104.
2. The repair welding procedure specification shall include the information required in Section 2.3 and Section 7 of API 1104, as well as the following:
  - a. The method of removal or exploration of the crack area. (Grinding, air arc gouging, etc.)
  - b. The method of inspection to determine that the defect is removed (magnetic particles, dye penetrant, etc.)
  - c. Requirements for preheat and interpass heat treatment.

3.09 QUALIFICATIONS OF WELDERS MAKING REPAIRS

- A. All repair welding shall be performed by qualified welders.
- B. All repair welders must be fully familiar with the original welding procedure, the repair welding procedure and the additional requirements listed in the Non-Destructive Testing of Repairs.
- C. If the welder has qualified to original welding procedures and that procedure is within the essential variable for welder qualification listed in Paragraph 3.8 of API 1104 the repair procedure, the welder shall be considered qualified for repair welding.
- D. If the welder is not qualified to a welding procedure within the same essential variable as Paragraph 3.8 of API 1104, a welder qualification test must be successfully completed. The test shall include the steps outline in Section 3.4 of API 1104.

3.10 NON-DESTRUCTIVE TESTING OF REPAIRS

- A. Repaired area shall be re-radiographed, or inspected by the same means previously used.
- B. The Owner may elect to re-inspect the full circumference of the weld containing a repair in the same manner as the original production weld.

3.11 ARC BURNS AND WELDING PRECAUTION

- A. The Contractor shall take necessary precautions to insure that no arcing occurs between the ground leads of the welding machines and the pipe or fitting. Striking the arc on the pipe fittings at any point other than the welding groove shall not be permitted. All arc burns on the pipe shall be removed from the pipeline by cutting out a cylinder of pipe containing the arc burns and replacing with good pipe at no additional expense to the Owner. Arc burns in fittings, valves, and tie-in welds may be repaired by grinding with Engineer's prior authorization.
- B. Preheating shall be used when welding fitting-to-fittings and pipe-to-pipe fitting, and when the internal pipe temperature is 45°F or below. Preheating shall also be used when welding the pipe, for any reason, is wet or damp. Such preheating shall be accomplished by a method acceptable to

the Engineer and shall cover a band of at least four inches (4") wide on each side of the weld. A minimum temperature of 200° F. shall be maintained during welding and shall be checked by use of temperature indicating crayons.

- C. No “pup” joint shall be installed in the pipeline less than two (2) feet (0.61 meters) in length.
- D. When welding a weld end valve in the distribution system, the valve should be in the open position to prevent over-heating the valve thus damaging the valve.

### 3.12 CONDITION OF PIPE TO BE TAPPED

- A. Examination of the branch pipe and reinforcing members shall be for cracks, laminations, or other defects that may cause welding problems. Ultrasonic and visual inspection of the surface to be welded will be conducted.
- B. Thoroughly clean the area to be tapped of coating, rust, scale, oil, dirt, and other foreign material. Owner will check the area to be welded for thickness and laminations by an ultrasonic thickness tester. If indications of laminations are found in the area to be welded, move the tap location to another portion of the pipe that shows no defects.
- C. Hot taps in field welds and bends are prohibited.
- D. If possible, the area to be welded should not contain a longitudinal seam weld. However, if welding across a seam cannot be avoided, the seam should be inspected for cracks and other defects prior to welding.
- E. Thoroughly dry the pipe prior to welding. Remove any oil or grease using an appropriate solvent.
- F. Contractor shall coordinate with Owner to regulate the gas flow rate during welding to achieve an acceptable cooling rate of weld metal.
- G. After completion of welding, the area shall be ground free of spatter. Inspect the weld after it has cooled for toe cracks or other that extend to the surface by dye penetrant inspection.
- H. After installing reinforcement saddle or sleeve, an air test shall be conducted for a period of 5 minutes with the nipple pressurized to a maximum of 50 psig greater than the prevailing pressure.
- I. The coupon that is removed from the existing pipeline during a hot tap shall be immediately given to the Owner for use in corrosion evaluation and wall thickness.

## **PART 4 MEASUREMENT AND PAYMENT**

### 4.01 MEASUREMENT AND PAYMENT

Pipe Welding work shall be not be measured or paid for as a separate item but shall be included as part of the item listed below for which it is part of. Reference Section 15160.

END OF SECTION



## SECTION 15230

### PIPE JOINT COATING OR WRAPPING FOR NATURAL GAS PIPING

#### PART 1 GENERAL

##### 1.01 DESCRIPTION

- A. In installing the steel natural gas pipe for this project, the Contractor shall conform to the suggested procedures and specifications established by the National Association of Pipe Coating Applicators (NAPCA). The Contractor supplied materials shall conform to all standards established by NACE International Standard Practice No. SP0109-2019 using materials recommended by NAPCA Bulletins 1-65-94 or 6-69-94-2. All coating materials furnished by Contractor must approved by Owner before application. All coating mills are to be approved by the Engineer.

##### 1.02 RELATED SECTIONS:

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

- 1. Section 15160, Pipe Installation

##### 1.03 QUALITY ASSURANCE

- A. The Contractor duties and obligation necessary for the completion of a satisfactory application may require provisions contained in or omission of any essential provisions. All work to be done hereunder by Contractor shall be conducted diligently, continuously and in good faith in thorough, careful, skillful and workmanlike manner in full accordance with accepted pipeline construction practices and as approved by the Owner.

#### PART 2 PRODUCTS

##### 2.01 PIPE COATING AND WRAPPING – BURIED FABRICATION

- A. Contractor supplied coating materials are those necessary to coat girth welds of pre-coated pipe, coat buried fabrication piping and for the repair of cathodic coating damage.
- B. Mill Wrapped and/or Epoxy Coated Pipe. The Contractor shall use the following materials on all mill wrapped and coated steel pipe field joints, service tees, valves, and other miscellaneous fittings. Materials shall include self-adhesive polyethylene or PVC tape and epoxy based coatings. See Section 2.01 C. for FBE coated pipe requirements. Equivalent substitutions may be used if acceptable to the Engineer.

Approved Tape Suppliers:

Royston Greenline Tape with Royston Roybond 747 Primer  
Royston Laboratories, Inc.  
P. O. Box 1753  
Tulsa, OK 74410

Protecto Wrap, No. 200 with No. 1170 Primer  
Protecto Wrap Company  
2255 S Delaware Street  
Denver, CO 80223

Polyken Number 900, 920 or 930 with No. 1027 Primer  
Polyken Mechanical Protection Overwrap No. 955.  
Berry Plastics Corp.  
Houston, TX

Heat Shrinkable Sleeves (Girth/Joint only):  
Covalence HTLP60-3LPE or equivalent

Liquid Epoxy Coating:  
3M™ Scotchkote™ Liquid Epoxy Coating 323 or equivalent

Liquid Polyurethane Coating:  
3M™ Scotchkote™ Liquid Polyurethane Coating 352 or equivalent  
3M™ Scotchkote™ Urethane Repair Paste 165 TG or equivalent

- C. FBE Epoxy Coated Pipe. Fusion Bonded Epoxy (FBE) coated pipe will be supplied as mill coated. No field wrap joints of girth weld areas of FBE epoxy coated pipe will be permitted. The coating manufacturer's FBE repair materials and application methods shall be used. This included induction thermal application of field joint epoxy kits for joints and small repair sticks or two part epoxy kits for repairs.

Equivalent substitutions may be used if acceptable to the Engineer

Basecoat: Dupont/Axalta "Nap-Gard" 7-2500 (Red) or 7-2508 (Green) FBE  
Topcoat: Dupont/Axalta PCW601S9 UV protection coating

Repair kits:  
Basecoat: Dupont/Axalta 7-1861(Red) or 7-1868 (Green) Two Part Epoxy Repair Cartridge  
Topcoat: Dupont/Axalta 7-1854 Two Part Epoxy Repair Cartridge, UV coating repair

Repair Sticks:  
Dupont/Axalta EZ Patch Stick 7-1631S (Red) or 7-1677 (Green)

## 2.02 PIPE COATING– ABOVE GROUND EXPOSED PIPE

- A. Contractor supplied materials are those necessary to coat girth welds of pre-coated pipe, coat bare fabrication piping, valve and fittings, and for the repair of coating damage.
- B. The Contractor shall use the following materials:

Primer - Polyamide Cured High Build Epoxy Micaceous Iron Oxide Primer  
- PPG Sigmacover 435 or equivalent  
Top Coat - Aliphatic Isocytane cured Acrylic Polyurethane  
- PPG SigmaDur 550 or equivalent

## **PART 3 EXECUTION**

### 3.01 DESCRIPTION

In installing the steel natural gas lines, the Contractor shall apply pipe wrapping and coatings, both buried and above-ground exposed pipe, as follows:

### 3.02 WRAPPING AND COATING - BURIED PIPE

- A. Prior to wrapping or coating, steel pipe shall be cleaned of all loose mill scale, rust, dirt, oil, grease, or any objectionable material. Steel pipe shall be cleaned immediately before priming. The surface shall be dry and no primer shall be applied during damp conditions, unless in a suitable housing approved by the Engineer.
- B. Pipe wrapping shall be applied as follows:
  - 1. All buried carbon steel pipe shall be given a protective coating consisting of not less than two (2) spirally applied wrappings of polyethylene or PVC tape, over a suitable prime coat, to a minimum system thickness of not less than 40 mils. Each wrapping shall be lapped not less than ½ inch. A single wrap lapped 50 percent or more shall not be acceptable.
  - 2. The first wrapping shall consist of one (1) or two (2) plies of self-adhesive polyethylene or PVC tape to a minimum total thickness of approximately 20 mils.
  - 3. The finish wrapping shall consist of a self-adhesive protective overwrap of approximately 25 mils thickness.
  - 4. In wrapping welded joints, the sharp edges of weld spatter, slag, etc., at the welded joint shall be removed with a file or ball-peen hammer. A single thickness of tape shall first be applied around the weld. Then the wrapping shall be started 4 inches back on the pipe wrap, and the tape shall be spiral wrapped over the joint, holding the proper tension and overlap, and finished 4 inches back on the pipe wrap on the other side of the joint. The second wrapping shall then be applied.
  - 5. Fittings, valves, and other odd-shaped components in the pipeline shall be wrapped with not less than 2 thicknesses of conformable polyethylene or PVC tape over a suitable prime coat.
  - 6. After the coating has been applied, the coating shall be checked with an electrical holiday detector to the satisfaction of the Owner.
- C. Liquid Epoxy and Urethane Pipe coatings shall be applied per manufacturer's instructions to a minimum thickness of 25 mils.
- D. Flex couplings. The entire coupling shall be given a 20 mil coat of Bitumastic® 300M.

### 3.03 REPAIR OF YARD APPLIED EPOXY COATING – BURIED PIPE

- A. Repairs to pinhole or bubble type defects on epoxy coated pipe shall require application of a liquid epoxy coating per manufacturer's recommendations.
- B. Repairs to pinhole or bubble type defects on FBE coated pipe shall require a thermally activated Epoxy stick or two part epoxy. These repairs should be made per the Manufacturer's recommendations.

### 3.04 COATING OF VALVES, FITTINGS, IRREGULAR SHAPES - BURIED PIPE

- A. For factory-coated valves, the coating shall be inspected for holidays. Damaged areas are to be repaired with manufacturer's recommended coating.
- B. For weld and threaded fittings and irregular shapes, Liquid Epoxy Coating may be applied in accordance with manufacturer's recommendation.

### 3.05 FINAL COATING INSPECTION AND REPAIR – BURIED PIPE

- A. An electrical holiday detector or other electrical flow detector furnished by Contractor that is satisfactory to Owner and under Owner's supervision. Contractor shall furnish all labor and transportation to operate the detector.
- B. Any defects in the coating found in this final inspection, including but not limited to, all torn, abraded, damaged, mutilated, or otherwise defective spots in the pipe coating shall be repaired by Contractor to the satisfaction of Owner prior to pipe testing and at no additional expense to Owner. Repairs of defects in the coating shall be made using the methods previously stated for repairs to applicable coating. All coating repairs shall be re-inspected. All coated pipe under test shall be positively grounded by a means satisfactory to Owner.
- C. The minimum electrical holiday detector voltage shall be determined by the formula:  $V$  equals 1,250 times the square root of the coating. Coating thickness is to be expressed in mils (thousandths of an inch).

### 3.06 COATING OF PIPE, VALVES, FITTINGS – ABOVE GROUND

- A. Exposed above grade bare steel pipe shall be coated (painted) with a minimum of one (1) coat of metal primer and no less than two (2) coats of acrylic polyurethane paint. All steel gas inlet piping shall be painted white in color.
- B. Prior to coating, steel pipe shall be cleaned of all loose mill scale, rust, dirt, oil, grease, or any objectionable material. Steel pipe shall be cleaned immediately before priming. The surface shall be dry and no primer shall be applied during damp conditions, unless in applied a suitable housing approved by the Engineer.
- C. Repairs to pinhole or bubble type defects on FBE coated pipe shall require a thermally activated Epoxy stick or two-part epoxy. These repairs should be made per the Manufacturer's recommendations.

## **PART 4 MEASUREMENT AND PAYMENT**

### 4.01 MEASUREMENT AND PAYMENT

Pipe Joint Coating and Wrapping work shall be not be measured or paid for as a separate item but shall be included as part of the item listed below for which it is part of. Reference Section 15160.

END OF SECTION

## SECTION 15600

### RACEWAYS & UNDERGROUND CONDUIT FOR STAINLESS TUBING

#### A. General

The Contractor shall furnish gas pipe as shown on drawing.

#### B. Drawings

1. The design drawings, which constitute an integral part of this contract, shall serve as the working drawings. They indicate the general arrangement and are generally diagrammatic with locations of outlets and equipment being approximate, except as noted. Exact routing of raceways, locations of outlets and equipment shall be governed by structural conditions and obstructions. This is not to be construed to permit redesigning systems. All outlets shall be interconnected as shown on the drawings.

2. The Contractor shall review all plans and shall adjust his work to conform to all conditions indicated thereon. All modifications or relocations shall be approved by the Engineer prior to actual work.

#### C. Materials

1. Pipe specification: Pipe containing flammable material shall be seamless carbon steel manufactured in accordance with ASTM A-106 Grade B. All pipe, fittings, and other piping components shall be suitable for the full range of pressures, temperatures and loading to which they may be subjected with a factor of safety of at least four (4). Any material used, including gaskets and packing, shall be compatible with natural gas and its service condition.

2. High Pressure. Gas tubing shall be stainless steel ASTM A 213 of TP 304/316 ASME SA213 cold drawn bright annealed seamless tubing. All tubing components shall be suitable and new for the full range of pressures, temperature and loading to which they may be subjected with a manufacturer-rated burst-safety factor of at least 4.

3. Installation of Tubing and Tube Fittings. **NEW** Swagelok, Parker A-Lok, or Hoke tube fittings shall be used. Contractor shall use tube fittings from a single manufacturer throughout a prepackaged component, so as to simplify use and consistency of appropriate repair parts. 300-series stainless steel fittings shall be used with stainless steel tubing. Compression fittings are acceptable if rated for the operating pressure of the system and if properly installed and leak tested. Manufacturers' personnel who install tubing and tube fittings shall be trained and certified by the manufacturer for such activity, and proof shall be provided. Tubing shall be installed neatly and in a workmanlike manner as per manufacturer's design and recommendation. All tubing shall be properly anchored, supported or pitched and shall be protected from impact. As CNG tubing dilates and contracts in response to its wide range of operating pressures, Unistrut Cash-a-Clamp assemblies, or approved similar resilient anchors, shall be used to support gas tubing. Tubing shall be from straight "stick" stock and not be from rolled stock.

4. Valve Clearance. All valves shall be accessible for easy operation and maintenance.

5. Table I

Seamless, not corroded  
ASTM A106, A312-TP or TP316

Weight or Sch.	Nom. Size	OD (in)	Nom. Wall (in)	Min. Wall (in)	Plain Ends Max. psi
	3/8	0.675	0.049	0.0465	5460
40S	1/2	1/2	0.109	0.0953	4995.4
80S	1/2	0.84	0.147	0.1286	6980
40S	3/4	1.05	0.113	0.0988	4073.5
80S	3/4	1.05	0.154	0.1347	5720.6
40S	1	1.315	0.133	0.1163	3796.4
80S	1	1.315	1	0.1566	5266

6. Tube fittings. Several suppliers of tube fitting will meet the required 7000-psig design pressure for ¼-in., ½-in., and ¾-in., tubing. Cajon (Swagelok), Parker, and Hoke all can supply Stainless Steel tube fittings for this application. Cajon fitting should be used, as they are the only manufacturer to certify their products for use in CNG service.

D. Construction

1. The Contractor shall install all materials and equipment required under the stainless steel tubing assembly in accordance with the documents, drawings and in accordance with the Manufacturer's instructions.

2. Pre-start Pipe Cleaning. All piping sections between packaged components that include piping or tubing shall be blown clean prior to connection to equipment. Blow out shall be achieved by closing the downstream end of pipeline with a 5000 psi-rated ball valve, connecting a minimum 1650 psi source pressure vessel to the upstream end of the pipeline, opening outlet ball valve to atmosphere. Procedure shall be repeated until no solid or particulate matter is discharged from the pipeline or tubing.

3. Pipe pigging. All internal pipe surface of piping between components shall be cleaned over its entire length, removing dirt, debris and loose corrosion products before pipe is lined up for welding. The open ends of all strings of pipe shall be securely closed to prevent the entrance of dirt, debris, water or animals into the pipe.

4. Tubing may be bent where needed. The minimum mandrel bend radius must be equal to or greater than five times the OD of the tubing.

## E. Testing

1. All circuits of the piping system must be tested before putting the system into operation. Testing should consist of both a pressure retention test and a leak test. Testing should be conducted using utmost caution. The process lines will contain in excess 5,625psig. *Failure of a joint of component will expose test personnel to high-pressure gas, which could result in injury.* The number of testing personnel should be kept to a minimum in the test area. A pressure test supervisor should be appointed to direct all pressure tests and to control the access of personnel into the test areas. Maintain a minimum distance of 25 feet from the test circuit while the circuit is being pressurized and while it is under pressure. Test personnel should continually monitor the test until it is completed and test circuit is depressurized. Post test warning signs around the test area to warn personnel that high-pressure pneumatic testing is underway.

2. Clean dry nitrogen should be used for the test gas. Be sure that the testing is done in a ventilated area. Nitrogen is an asphyxiate. Leakage of nitrogen into the test area may create an oxygen-deficient atmosphere that can asphyxiate personnel in the area. Isolate to remove any components from the system that are not rated for 1.1 times the maximum allowable working pressure of the system. Slowly pressurize the circuit, increasing the pressure in stages. Pressurize the system to 1.1 times the MAWP from a remote location, using an approved pressure testing control system. Hold the pressure in the system for 15 minutes. If the pressure declines more than a few psig then there is likely a leak in the section of pipe/tube. Depressurize the circuit to about 150 psi and locate the leak using an approved leak detection solution such as SNOOP. Apply the SNOOP solution to each joint and look for the formation of bubbles. If no bubbles form within 30-60 seconds, the joint is acceptable. If bubbles form, the joint must be repaired and retested. After the system passes the 15-minute pressure retention test at 1.1 times MAWP, reduce the pressure to 90% of MAWP. Record the pressure and temperature. Hold at this pressure for 24 hours; then, observe the test pressure gauge for any loss of pressure. Loss of pressure that cannot be attributed to a change in temperature is an indication of a leak. Locate the leak point and repair the leak.

## **SECTION 16010**

### **ELECTRICAL SYSTEM**

#### **PART 1 GENERAL**

##### **1.01 SUMMARY**

- A. This Section covers general requirements applying to Sections included in Division 16.
- B. Install complete systems in accordance with the intent of the Contract Documents.
- C. Furnish and install incidental items not actually shown or specified, but which are required by good practice to provide complete functional systems.
- D. Coordinate details of facility equipment and construction for Specification Sections which affect the Work covered under this Division.
- E. Drawings show only general locations of equipment and devices. Proper routing, connecting, and testing of all electrical work, complete, is the responsibility of the Contractor.

##### **1.02 DEPARTURES FROM CONTRACT DOCUMENTS**

- A. Submit to the Engineer in writing details of any necessary proposed departures from these Contract Documents, and the reasons. Submit such requests as soon as practicable and within 30 days after award of the Contract. Make no departures without written approval of the Engineer.

##### **1.03 SUBSTITUTION OF MATERIALS AND EQUIPMENT**

- A. In accordance with provisions elsewhere in these Contract Documents, manufacturers' names and catalog numbers stated herein are intended to indicate the type and quality of equipment or materials desired.
- B. Substitution will be considered if submitted in accordance with these Specifications and the Bid Form.

##### **1.04 SUBMITTALS**

- A. Provide complete manufacturer's descriptive information and shop drawings for equipment, material, and devices furnished under this Division, including certified outline drawings, arrangement drawings, elementary (schematic) diagrams, and interconnection and connection diagrams.
- B. Provide the number of copies required for the Engineer, Contractor, and Operation and Maintenance Manuals.
- C. Provide certified shop drawings, literature, and requested samples showing items proposed for use, size, dimensions, capacity, special features required, schematic (elementary) control diagrams equipment schedules rough-in, or other required data as required by the Engineer for complete review and for installation. Use NEMA device designations and symbols for electric circuit diagrams submitted. Make content of schematic (elementary) connection or interconnection diagrams in accordance with the latest edition of NEMA ICS.



- D. Check submittals for proper number of copies, adequate identification, correctness, and compliance with Drawings and Specifications and initial copies indicating this has been done. Revise, change, and resubmit submittal information until acceptable to the Engineer.
- E. Obtain Engineer's acceptance before commencing fabrication or installation of any materials or equipment. Review of submittal information by the Engineer shall not relieve the Contractor from responsibility for deviations from Drawings and Specifications unless he has in writing at time of submission requested and received written approval from the Engineer for specific deviations. Review of submittal information shall not relieve the Contractor from responsibility for errors and omissions in shop drawings or literature.
- F. Manufacturer's standardized elementary diagrams shall not be acceptable unless applicable portions of the diagram have been clearly identified and non-applicable portions deleted or crossed out.

#### 1.05 CODES, PERMITS, AND REGULATIONS

- A. Perform Work, furnish and install materials and equipment in full accordance with the latest applicable rules, regulations, requirements, and specifications of the following:
  - 1. Local laws and ordinances.
  - 2. State and federal laws.
  - 3. National Electric Code (NEC).
  - 4. State Fire Marshall.
  - 5. Underwriters Laboratories (UL).
  - 6. National Electric Safety Code (NESC).
  - 7. American National Standards Institute (ANSI).
  - 8. National Electrical Manufacturer's Association (NEMA).
  - 9. Institute of Electrical and Electronics Engineers (IEEE).
  - 10. Insulated Cable Engineers Association (ICEA).
  - 11. Occupational Safety and Health Act (OSHA).
  - 12. American Society of Testing and Materials (ASTM).
- B. Conflicts that may exist between the above items will be resolved at the direction of the Engineer.
- C. Wherever the requirements of the Specifications or Drawings exceed those of the items above, the requirements of the Specifications or Drawings shall govern.
- D. Code compliance is mandatory. Nothing in the Contract Documents shall be construed as permitting work not in compliance with these codes.
- E. Obtain permits and pay fees required by any governmental agency having jurisdiction over the Work. Arrange inspections required by these agencies.
- F. On completion of the Work, furnish satisfactory evidence to the Engineer that the Work is acceptable to the regulatory authorities having jurisdiction.

#### 1.06 EQUIPMENT ACCESSORIES

- A. Furnish and install equipment, accessories, connections, and incidental items necessary for the work, ready for use, occupancy, and operation by the Owner.

- B. Where equipment requiring different arrangement or connections than shown or approved, it shall be the responsibility of the Contractor to install the equipment to operate properly and in harmony with the intent of the Drawings and Specifications.
  - 1. Submit shop drawings showing the proposed installation.
  - 2. After proposed installation is approved make incidental changes in supports insulations, wiring, heaters, panelboards, and similar items.
  - 3. Provide additional fittings and other additional equipment necessary for the proper operation of the system resulting from the selection of equipment, including changes in affected trades.
  - 4. Provide proper location of rough-in and connections for other work of this Contract.
  - 5. Changes shall be made at no increase in the contract amount of additional cost to the other trades.
  
- C. Concrete Pads: Floor-mounted electrical equipment; switchgear, dry-type transformers, and similar equipment shall be mounted on concrete pads. Each concrete pad shall be 4-inches high and shall project 3-inches on sides beyond the equipment. Concrete pads for electrical equipment shall be furnished and installed under the Section 03300. Under the Electrical Division 16, establish sizes and locations of the various concrete pads and provide necessary anchor bolts together with templates for holding these bolts in position. Anchor bolts shall be placed in steel pipe sleeves to allow for adjustment, with a suitable plate at bottom end of sleeve to hold the bolt.
  
- D. Contractor shall support plumb, rigid, and true to line all work and equipment furnished. Contractor shall study thoroughly Drawing including shop drawings, and catalog data to determine how equipment is to be supported, mounted or suspended; and shall provide extra steel bolts, inserts, pipe stands, brackets, and accessories, for proper support whether or not shown on Drawings. If requested, Contractor shall submit Drawings for approval that shows supports.

#### 1.07 NEW ELECTRICAL SERVICE

- A. Coordinate with local Electrical Utility Company (Ameren Missouri)

#### 1.08 RELATED SECTIONS:

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
  - 1. Section 16100, Wiring Methods
  - 2. Section 16110, Low Voltage Wiring
  - 3. Section 16120, Cable Raceways and Underground Conduits
  - 4. Section 16450, Grounding
  - 5. Section 03300, Reinforced Concrete

### **PART 2 PRODUCTS**

#### 2.01 GENERAL

- A. Unless otherwise indicated, provide first-quality, new materials and equipment, free from defects, in first-class condition, and suitable for the space provided.

- B. Provide materials and equipment listed by UL where standards have been established by that agency. Where two or more units of the same days of material or equipment are required, provide products of a single manufacturer. Component parts of materials or equipment need not be products of the same manufacturer.

## 2.02 STANDARD PRODUCTS

- A. Unless otherwise indicated, provide materials and equipment noted on the Plans that are standard products of manufacturers regularly engaged in the production of such materials and equipment.
- B. Provide the manufacturers' latest standard design that conforms to these Specifications.

## 2.03 EQUIPMENT FINISH

- A. Provide materials and equipment with manufacturer's standard finish system. Provide manufacturer's standard finish color, except where specific color is indicated. If manufacturer has no standard color, finish equipment with ANSI No. 61 light gray color.

## 2.04 OUTDOOR EQUIPMENT

- A. Equipment and devices installed outdoors or in unheated enclosures shall be capable of continuous Operation within an ambient temperature range of 105 degrees F to -5 degrees F.

# **PART 3 EXECUTION**

## 3.01 GENERAL

- A. Install materials and equipment in a workmanlike manner utilizing craftsmen skilled in the particular trade. Provide work with a neat and finished appearance.
- B. Coordinate electrical work with Owner and Engineer and work of other trades to avoid conflicts, errors, delays, and unnecessary interference with Operation of the plant during construction.
- C. Check the approximate locations of light fixtures, electrical outlets, equipment, and other electrical System components shown on Drawings for conflicts with openings, structural members, and components of other systems and equipment having fixed locations. In the event of conflicts, consult the Engineer. The Engineer's decision shall govern. Make modifications and changes required.

## 3.02 PROTECTION DURING CONSTRUCTION

- A. Throughout this Contract, provide protection for materials and equipment against loss or damage in accordance with provisions elsewhere in these Contract Documents.
- B. Protect from the effects of weather. Prior to their installation, store all electrical equipment items in a clean, dry, indoor location. Items subject to corrosion under damp conditions, and items containing electrical insulation, store in clean, dry, indoor, and heated locations.
- C. Energize space heaters furnished with equipment. Protect materials and equipment from corrosion, physical damage, and the effects of moisture on insulation.

- D. Cap conduit runs during construction with manufactured seals. Keep openings in boxes or equipment closed during construction.

### 3.03 MATERIAL AND EQUIPMENT INSTALLATION

- A. Follow manufacturers' installation instructions explicitly, unless otherwise indicated. Conflicts arising between manufacturers' instructions, codes and regulations, and these Contract Documents, follow Engineer's decision.
- B. Keep copy of manufacturers' installation instructions on the job site available for review at all times.

### 3.04 CUTTING AND PATCHING

- A. Lay out work carefully in advance.
- B. Do not cut or notch, structural member or building surface without specific approval of Engineer.
- C. If required, carefully carry out cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings, paving, or other surfaces required for the installation, support, or anchorage of conduit raceways or other electrical materials and equipment.
- D. Following work, restore surfaces neatly to original condition.

### 3.05 LOAD BALANCE

- A. After installation, balance electrical load between phases as nearly as possible on switchboards, panelboards, motor control centers or other required areas affected.

### 3.06 CLEANING AND TOUCH-UP PAINTING

- A. Keep the premises free from accumulation of waste material or rubbish.
- B. Upon completion of work, remove materials, scraps, and debris from premises and from interior and exterior of devices and equipment.
- C. Touch-up scratches, scrapes, or chips in interior and exterior surfaces of devices and equipment with finishes matching as nearly as possible the type, color, consistency, and type of surface of the original finish.

### 3.07 INSPECTION

- A. Materials, equipment, and installation shall be subject to inspection the Engineer or his representatives.
- B. Correct work, materials, or equipment not in accordance with the Contract Documents or found to be deficient or defective, in a manner satisfactory to the Engineer.

### 3.08 OPERATIONS AND MAINTENANCE MANUALS

- A. Provide three copies of operations and maintenance manuals containing:

1. Operation, maintenance, recommended spare parts, and renewal parts information for equipment furnished under this Division.
2. Set of complete as-reviewed information herein required to be submitted for review following Contract award.
3. Index of equipment suppliers listing current names, addresses, and telephone numbers of those who should be contacted for service, information, and assistance.
4. Provide Record Drawings marked with red indelible pencil to show departures from original Drawings, and electrical work revisions; prepare by obtaining new, clean sets of Contract Drawings from Engineer, and pay costs of same; field marked Record Drawings shall be initialed by the Engineer or his representative.
5. Field and factory test results.
6. Information listed under individual Specification items.
7. Use dividers with heading in accordance with Specification item title.
8. Submit material to Engineer for approval prior to delivery to Owner; make additions or changes as required by the Engineer.

### 3.09 TEMPORARY ELECTRIC POWER

- A. Make arrangements for temporary electric power and pay costs.

### 3.10 CHECKOUT AND STARTUP

- A. During checkout and startup of the various plant systems, provide a crew of skilled craftsmen to be available for check-out and troubleshooting activities as required by the Engineer.
- B. Since coordination with other crafts and contractors will often be required, the craftsmen assigned to checkout must be available outside normal working hours when necessary.

### 3.11 SYSTEM OPERATING TESTS

- A. After the successful completion of equipment start-up and test requirements, the following formal test shall be performed on the complete electrical system:

1. First Operating Test by Contractor:

The Contractor shall prove the operation of the electrical systems and of each individual item in the systems. At least 10 days' notice shall be given to the Engineer of such tests. If any item of the system fails to perform, correction shall be made and this test shall be repeated until the operating test is successful.

2. Three-Day Operating Test:

An operating test under occupied conditions shall then be performed by the Contractor for a period of three days. If elements of the systems do not perform properly, the Contractor shall make necessary corrections and the test shall be repeated until systems successfully perform.

3. Heat Scan Tests:

Heat scan test shall be made once each day of the three-day tests on the following items furnished in this contract:

- (1) Fixture Ballasts
- (2) Feeder Terminations
- (3) Circuit Breakers
- (4) Disconnect Switches
- (5) Panelboards
- (6) Switchboards
- (7) Transformers

An economical infrared heat gun that may be used in testing: 3M Company, Model No. IR-500.

- B. Instruments: Contractor shall provide instruments, materials, and labor to perform the tests to obtain and record the measurements specified herein, including furnishing of record forms as approved by the Engineer.
- C. Report: Copies of a written report of the (3-day) operating test, on the approved form of record, shall be submitted to the Engineer for approval and subsequent transmittal to the Owner.

### 3.12 CONDUIT

- A. Conduit Installation:
  1. Conduit floor stub ups shall be made by installing a coupling with the top of the coupling flush with the finished floor. Where an outlet is not indicated, the coupling shall be sealed with a flush plug.
  2. A No. 12 aluminum wire shall be left in all empty conduits:
  3. Running threads not permitted.

### 3.13 PENETRATIONS

- A. Seal raceways entering structures at the first box or outlet with oakum or suitable plastic expandable compound to prevent the entrance into the structure of gases, liquids, or rodents.
- B. Dry pack with non-shrink grout around raceways that penetrate concrete walls, floors, or ceilings aboveground, or use one of the methods specified for underground penetrations.
- C. Where an underground conduit enters a structure through a concrete roof or a membrane waterproofed wall or floor, provide an acceptable, malleable iron, watertight, entrance sealing device. When there is no raceway concrete encasement specified or indicated, provide a device having a gland type sealing assembly at each end with pressure bushings which may be tightened at any time. When there is raceway concrete encasement specified or indicated, provide a device with a gland type sealing assembly on the accessible side. Securely anchor devices into the masonry construction with one or more integral flanges. Secure membrane waterproofing to devices in a permanently watertight manner.
- D. Where an underground raceway without concrete encasement enters a structure through a non-waterproofed wall or floor, install a sleeve made of Schedule 40 galvanized pipe. Fill the space between the conduit and sleeve with a suitable plastic expandable compound, or an oakum and lead joint, on each side of the wall or floor in such a manner as to prevent entrance of moisture. A watertight entrance sealing device as specified may be used in lieu of the sleeve.

### 3.14 UNDERGROUND DIRECT BURIAL RACEWAYS

- A. Meet the following additional requirements for underground raceways:
  1. Coordinate installation of underground raceways with other outside and building construction work. Maintain existing outside utilities in Operation unless otherwise indicated by the Engineer.
  2. Remove and properly install raceway installations not in compliance with these requirements entirely.
  3. Do not use union type fittings underground except with approval of the Engineer.

### 3.15 TRENCH EXCAVATION AND BACKFILL

- A. Provide a minimum cover of 2 feet over underground raceways unless otherwise indicated.

### 3.16 WARNING TAPES

- A. Bury warning tapes approximately 12 inches above underground conduit. Align parallel to and within 6 inches of centerline of runs.

### 3.17 ARRANGEMENT AND ROUTING

- A. Arrange multiple conduit runs substantially in accordance with the Drawings.
- B. Make minor changes in location or cross-section as necessary to obstructions or conflicts. Where raceway runs cannot be installed substantially as shown because of conditions not discoverable prior to digging of trenches, refer the condition to the Engineer for instructions before further work is done.
- C. Where other utility piping systems are encountered or being installed along a raceway route, maintain a 12-inch minimum vertical separation between raceways and other systems at crossings. Maintain a 12-inch minimum separation between raceways and other systems in parallel runs. Do not place raceways over valves or couplings in other piping systems. Refer conflicts with these requirements to the Engineer for instructions before further work is done.
- D. Provide insulated grounding bushings on metallic raceways entering manholes. Provide bell ends flush with manhole walls on nonmetallic raceways entering manholes.
- E. In multiple conduit runs, stagger raceway coupling locations so that couplings in adjacent raceways are not in the same transverse line.

### 3.18 PREPARATION FOR PULLING IN CONDUCTORS

- A. Do not install crushed or deformed raceways. Avoid traps in raceways where possible. Take care to prevent the lodging of piaster, concrete, dirt, or trash in raceways, boxes, fittings, and equipment during the course of construction. Make raceways entirely free of obstructions or replace them. Ream raceways, remove burrs, and clean raceway interior before introducing conductors or pull wires.
- B. Immediately after installation, plug or cap raceway ends with watertight and dust-tight seals until the time for pulling in conductors.

## **PART 4 MEASUREMENT AND PAYMENT**

#### 4.01 MEASUREMENT

Measurement for the Electrical System and Equipment installation will be made at the Contract unit price per each component, complete in place, at each location installed and accepted by the Engineer or as a lump sum as noted below.

#### 4.02 PAYMENT

All costs incurred by the Contractor by reason of compliance to satisfy the requirements under this section shall be considered incidental to and completely covered by the Contract unit price for the following bid items:

Plan Item Number (Per BOM Sht 13,15)	Description	QTY	Unit(s)
Elec 1-4	Electrical Service Coordination, Primary Conduit Install	1	Lump Sum
Elec 5	5/8" x 8' Long Ground Rods	20	Each
Elec 6	400A 3 Phase Panelboard w/Breakers	1	Each
Elec 7	75 kVA 3 Phase Transformer	1	Each
Elec 8	25 kVA 1 Phase Transformer	1	Each
Elec 9	150A 1 Phase Panelboard	1	Each
Elec 10	8" x 8" x 60" NEMA Raceway	1	Each
Elec 11	Climate Control Cabinet w/ 800-BTU AC	1	Each
Elec 12	20 Amp Quadplex Outlet	1	Each
Elec 13	20 AMP Duplex Outlet - Weatherproof	1	Each
Elec 14	Lighting Control Panel w/ Astronomic Timer	1	Each
Elec 15	20 AMP Single Pole Switch - Weatherproof	2	Each
Elec 16	Champ CPMV LED Wall Pack Lights	3	Each
Elec 17	Lumark Navion LED Site/Area Lights, Incl. Poles, Bases	4	Each
Elec 18	Security System w/ NVR, 8 cameras	1	Lump Sum
Elec 19	ESD Control Panel	1	Each
Elec 20	ESD Push Buttons and Enclosures	8	Each
Elec 21	Conduits, Fittings, Connections, Trenching	1	Lump Sum
Elec 22	Electrical Cabling	1	Lump Sum
Elec 23	Communication Cabling	1	Lump Sum
Elec 24	(8) LED Canopy Lights – Coordination and Connection	1	Lump Sum

END OF SECTION



## SECTION 16100

### WIRING METHODS

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. The work covered by the specification shall include furnishing all labor, material, equipment, and services to construct the complete electrical system as shown on the accompanying plans and specified herein. The work, in general, includes the following principle items:
1. Furnish and install new service entrance as specified and shown on drawings.
  2. Furnish and install complete electrical system, including lights, receptacles, dry transformer, resistance heaters, exhaust fan, switches, receptacles etc.
  3. Combination motor starter and disconnect shall be supplied by pump suppliers and connected by the electrical contractor.

##### 1.02 CODE REQUIREMENTS

- A. All work shall be done in accordance with the latest rules and regulations of the National Electrical Code (NEC), the National Electrical Safety Code (NESC), and the local authorities having jurisdiction over this class of work. The provisions of these codes constitute minimum standards for wiring methods, materials, equipment, and construction. Strict compliance therewith will be required for all electrical work, except where the drawings and specifications require better materials, equipment, and construction than these minimum standards, in which case, the drawings and specifications shall precede the Code requirement.

##### 1.02 STANDARDS FOR THE WORK

- A. Contractor shall complete and make operable the electrical systems of all equipment and devices shown on the drawings. This consideration shall include all electrical interconnections, home runs, and Services. Contractor shall conduct an operational and functional check of the electrical systems involved.
1. Contractor shall install, connect, and complete all equipment and devices as per manufacturer's certified drawings approved by Engineer.
  2. All work, selection of materials, ratings, capacities and methods of construction shall be approved by the Engineer in writing before work is started.
  3. The Bidder may request to furnish equivalent items ONLY by submitting his request in writing to the Engineer no later than 10 days prior to bid opening. The Engineer will review the request, and if the items are deemed equivalent, approval will be made in writing.
  4. All new panels shall be provided with an 8-1/2" x 11" panel directory indicating the voltage, phase and current carrying capacity of the panel mains, as well as the branch circuit protection, number of poles, phases, wire size and device supplied for each branch circuit. The panels

shall be connected as shown on the drawings.

5. All control circuits shall operate at a nominal voltage not to exceed 120 volts to ground and shall be obtained from a fused 120 volt circuit or a transformer with an isolated secondary winding, with primary power taken from a source on the load side of the main disconnection device. One side of the control circuit shall be grounded, and the ungrounded side shall be properly fused at the point of transformation or supply.
- B. The Contractor shall provide labor, material, and test equipment, except as noted to the contrary herein, to test all wiring and equipment for continuity, proper polarity, proper phase relation, dielectric strength, operation and alignment after installation. Test equipment and methods shall meet the Engineer's approval. The Engineer shall be notified at least two working days prior to tests and reserves the right to witness any and all such tests. The Engineer shall interpret test results and pass on the acceptability. Contractor-supplied work which does not test out to the Engineer's satisfaction shall be corrected and re-tested as required without added cost to the Owner. The Engineer reserves the right to perform any test on any phase of the installation utilizing Contractor's personnel and test equipment.
- C. All wiring installed shall be megger tested. Installation resistance shall not be less than one megaohm. Where such tests shall indicate the possibility of faulty insulation, this Contractor shall locate the point of such faulty insulation, and he shall pull out the conductor at fault, replace same with new, and demonstrate by further tests the elimination of such fault.
- D. No electrical equipment may be energized before all applicable tests have been performed on wiring connections and equipment as specified and in no event may equipment be energized without first obtaining the Engineer's approval. Engineer's approval does not relieve the Contractor of responsibility for correctness of installation.
- E. The design drawings, which constitute an integral part of this contract, shall serve as the working drawings. They indicate the general arrangement and are generally diagrammatic; and locations of outlets and equipment shall be governed by structural conditions and obstructions.
- F. The Contractor shall review the plans of all phases of this project and shall adjust his work to conform to all conditions indicated thereon.
- G. All modifications or relocations shall be approved by the Engineer prior to actual work.
- H. The Contractor shall submit complete connection and schematic wiring diagrams, including a complete list of materials and components used in the electrical system for approval.
- I. After approval is granted on material and equipment, the Contractor may then install the equipment in the project.

#### 1.03 RELATED SECTIONS:

A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

1. Section 16010, Basic Electrical Requirements

## **PART 2        PRODUCTS**

### **2.01    RACEWAYS AND FITTINGS**

- A. All conduit shall be galvanized, heavy wall, rigid steel conduit; thin metallic tubing, galvanized by metalizing; or rigid, heavy wall, Type 40, polyvinyl chloride conduit as specified.
- B. All conduit shall bear the Underwriters' Laboratory (UL) Label of approval and shall be manufactured according to American National Standards Institute (ANSI) Specifications.
- C. Minimum size of conduit shall be three-fourths (3/4) inch, except as noted on the plans.
- D. Flexible conduit and fittings shall be used to complete the final twenty-four (24) inches of connection to rotating machinery and other equipment subjected to movement or vibration. Flexible conduit used outside shall be Type UA liquid-tight.
- E. All boxes used above floor inside the building shall be of galvanized sheet steel or malleable type. All boxes and fittings used outside the building and below grade shall be of the threaded malleable type.
- F. All control devices, junction boxes and other enclosures installed indoors shall conform to National Electrical Manufacturers Association (NEMA) Type 1. All above devices installed outdoors shall conform to NEMA Type 3R, unless otherwise indicated.

### **2.02    CONDUCTORS**

- A. All wire and cables shall be of copper, and shall comply with the standardization rules of the Institute of Electrical and Electronics Engineers (IEEE) as to conductivity and shall be free from kinks and defects when installed. Conductors shall be in accordance with the requirements of Insulated Power Cable Engineers Association (IPCEA) Publications: S-19-81, latest edition. Conductor sizes as shown on drawings or scheduled herein, are for copper conductors. No aluminum wire or conduit for aluminum shall be installed without approval in writing from the Engineer.
- B. All wire used in this project shall be new and shall be identified by type and manufacturer.
- C. All wire and cable shall be approved by the Engineer, as herein before outlined.
- D. Minimum wire size shall be No. 12 AWG and shall have six hundred (600) volt insulation unless otherwise specified.
- E. Power wiring No. 6 AWG and smaller shall be Type THWN, and larger sizes shall be Type XHHW, unless otherwise specified.
- F. Conductors in hazardous areas shall be Type RHW or XHHW.
- G. All control wiring shall be Type THW or THWN unless otherwise specified. Control cables shall be made up of 7 strand copper conductors with 20 mils of polyethylene insulation with 10 mils of color coded PVC covering on each conductor, enclosed in a Flamenol jacket overall.
- H. All direct buried cable shall be UL Type USE, 75°C, 600 volt, with thermosetting polyethylene

insulation.

- I. All wire of 10 AWG or larger shall be stranded for "Conduit" work.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION OF RACEWAYS AND FITTINGS**

- A. Conduit must be installed at least twelve (12) inches from hot water piping in parallel runs, at least six (6) inches in cross runs, and at least three (3) inches from cold water piping. Conduit shall in no case be secured to other piping, and where practical, shall be installed above other piping.
- B. Exposed conduit runs, where allowed, shall be parallel or perpendicular to building walls. Conduit shall be installed in an approved manner, and rigidly supported with approved conduit clamps. Distance between conduit supports shall not exceed five (5) feet. Drilling of, or welding to, building columns or main structure members for supporting means is not permissible.
- C. The opening of all conduit fittings shall be readily accessible.
- D. All metallic conduit shall be cut square and threads for rigid conduit shall be cut and cleaned before reaming. All joints in rigid steel conduit shall be threaded fully and pulled tight with a wrench. Each underground joint shall be sealed with spray plastic for waterproofing and corrosion protection. Conduit must be securely fastened to all outlet boxes with double locknuts to provide continuity of ground. Bushings of approved make must be used, care being exercised to see that the full number of threads project through to allow the bushings to butt up tight against the end of the conduit. Conduit shall be joined by approved couplings and shall have ends butted in all cases. The use of running threads will not be permitted. Where building construction or other conditions make it impossible to use standard threaded couplings, approved watertight conduit unions shall be installed as to make a continuous bond between the conduits connected.
- E. All polyvinyl chloride conduit shall be cut square and joints made with approved solvent cement. A grounding conductor shall be installed in conduit to insure continuity of ground.
- F. All conduit and fittings installed outdoors shall be rain tight and shall be pitched and drained as required by the National Electrical Code.
- G. All conduit installed below the floor or within the floor slab shall be encased in concrete with a minimum of three (3) inch cover on all sides. Burial of conduit in earth below floor slab will not be permitted.
- H. Whenever a conduit or duct enters an area from an exterior or underground distribution system, the end within the building shall be sealed with a suitable compound so as to prevent the entrance of moisture or gases. Spare or unused conduit shall also be sealed.
- I. All conduit or duct required to be encased in a concrete envelope shall have three (3) inches of concrete coverage all around. Conduits and ducts shall be racked on spacers with a minimum of one spacer every five (5) feet. Conduits and ducts shall be so placed that the joints are staggered.
- J. All underground conduit or ducts, where not located below the frost line, shall be arranged to drain in accordance with the NEC.

- K. All conduit and conduit fittings installed below grade or encased in concrete shall be rigid galvanized steel or rigid polyvinyl chloride. PVC runs shall not extend above concrete floor or grade except short lengths (8" maximum) concealed in non-combustible walls.
- L. All conduit installed above grade outdoors shall be rigid galvanized steel.
- M. All conduit installed above grade in the building shall be galvanized E.M.T. or galvanized rigid conduit.
- N. All underground conduit not encased in concrete shall be buried twenty-four (24) inches deep. PVC conduit shall further be laid in a bed of sand or selected backfill with a minimum of two (2) inch coverage top and bottom.
- O. Right angle turns shall consist of symmetrical bends or cast metal fittings, unless otherwise specified on the drawings. Bends and offsets shall be avoided wherever possible. Field bends shall be made so as to avoid changing the internal diameter of the conduit and so as not to damage its protective coating either outside or inside. Bends shall be free from kinks, indentations, or flattened surfaces and shall be made with approved conduit bending machines or devices, in accordance with recommended radii as per the NEC. No more than two ninety (90) degree bends will be allowed in any one conduit run. Where more bends are necessary, a suitable pull or junction box shall be installed, but not on a building expansion joint. All junction boxes shall be sized in accordance with the NEC.
- P. Conduit runs shall be concealed in walls, floors, or above the ceiling, except as follows:
  - 1. Horizontal runs of ceiling in any area which does not have a suspended ceiling or other ceiling cavity.
  - 2. Vertical runs to surface-mounted panel boards, disconnect switches, etc.

### 3.02 INSTALLATION OF CONDUCTORS

- A. All conductors shall be continuous from box to box and no splices shall be made in the conduit. All splices, taps, or connections shall be soldered or joined by mechanical means, STA-KON, or equal. All contact surfaces shall be cleaned to assure maximum conductivity. All equipment which is not furnished with connectors shall be provided with approved AL-CU lug-type terminal connectors.
- B. All splices and joints at the free ends of conductors shall be covered with an insulation composed of materials of thickness and insulation resistance equal to that on the conductors, as recommended by the wire manufacturer. A pulling compound used in pulling in any conductor shall not contain any oils or grease and shall be approved by the Engineer.
- C. Unless otherwise noted, equipment shall in all cases be wired so that on facing the front of the equipment, Phase "A" appears at the front, top or left, Phase "B" in the center, and Phase "C" at the bottom, back, or right hand side.
- D. Conductors for all power and light circuits shall be identified by the following color code:

	480 V	120/240V
Phase A	Black	Brown

Phase B	Red	Yellow
Phase C	Blue	-
Neutral	White	White
Equipment Ground	Green	Green

Identification of conductors, #4AWG and smaller shall be made by use of colored conductors only. Identifications of conductors of #3AWG and larger shall be made by use of colored conductors or colored plastic tape. If colored plastic tape is used for conductor identification, it shall be installed on conductors at every junction box and equipment enclosure. Control cable conductors shall be identified at the terminal designations in equipment to which it connects. Underground cables shall be properly identified as to phase by use of a non-corrosive metal tag at each end of the cable run. The metal tag shall be stamped with letters not less than one-half (1/2) inch in height.

- E. Direct buried conductors shall be installed so that the top conductor is at least two feet (2'-0") below finish grade. The trench for cables shall be excavated three inches (3") below the bottom cable line and the trench shall then be backfilled to the first cable line with sand. Cables shall then be installed, maintaining at least two inches (2") separation between cables. Subsequent backfilling and cable installation shall then be made. After the top layer of cables are installed, a three inch (3") layer of sand shall be installed. The trench shall then be backfilled to within eight inches (8") of the surface. At this point, lay continuous underground plastic utility marking tape with appropriate imprinting repeated every twenty-four inches (24") as manufactured by ALLEN UNDERGROUND DIVISION OF GRIFFOLYN COMPANY, INC. After the marking tape has been laid, the trench shall be backfilled and tamped.
- F. Supports for conduit shall consist of conduit clamps of an approved type, conduit hangers, pipe hangers designed for attachment to steel beams, steel angle trapeze with threaded rod hangers, or wall brackets as required to suit special conditions. Clamps for rigid steel conduit shall be malleable iron. EMT conduit shall be supported by malleable iron of steel conduit clamps.

### 3.03 MISCELLANEOUS INSTALLATION

- A. Outlet, pull, or junction boxes shall be supported by approved bar hangers in wood construction, by expansion anchors to masonry or concrete construction, and by suitable bolts or clamps to steel beams, etc. Nails shall not be used except to secure outlet switch boxes to wood studs. In no case shall nails enter or pass through the interior of the outlet box.
- B. All cutting, patching, and repairing required for the installation of the electrical work shall be performed by skilled mechanics in the trade involved. The Contractor shall accurately locate all chases, sleeves, inserts for hanger supports and fastenings, in advance of new construction so as to avoid needless cutting. Structural members shall not be cut, drilled, bored or altered, for any reason.
- C. The Electrical Contractor shall do all excavating required for the proper installation of any part of his work. After the work is installed and tested as required, excavations shall be backfilled and tamped to meet requirements as set forth under COT 302, Excavation and Backfill.
- D. All wiring shall be run in conduit as herein specified in this Section (16100), except as otherwise noted on the drawings.

- E. Each 120 volt branch circuit must be provided with a neutral wire and in no case may the neutral wire be interrupted or fused. Common neutrals may be used as permitted by the NEC.
- F. Branch circuits shall be installed in conduit and shall meet all applicable provisions of this Section (16100).

**PART 4 MEASUREMENT AND PAYMENT**

This work shall not be measured or paid separately, but will be included in the bid item for which it is a part of. Refer to Section 16010.

END SECTION

## SECTION 16110

### LOW VOLTAGE WIRING

#### PART 1 SUMMARY

##### 1.01 GENERAL DESCRIPTION

- A. The work included under this section includes furnishing all labor, material and equipment and services required to construct control house lighting, heating, receptacle systems, low voltage power wiring, outdoor receptacles and lighting as specified on the plans. This assembly unit also includes all above ground steel conduit and raceway systems and all excavation and backfill for below grade raceways and direct burial cables.
  
- B. Drawings:
  - 1. The design drawings, which constitute an integral part of this contract, shall serve as the working drawings. They indicate the general arrangement and are generally diagrammatic and locations of outlets and equipment are approximate, except as noted. Exact routing of raceways, locations of outlets and equipment shall be governed by structural conditions and obstructions. This is not to be construed to permit redesigning systems. All outlets shall be interconnected as shown on the drawings.
  - 2. The Contractor shall review all plans and shall adjust his work conform to all conditions indicated thereon. All modifications or relocations shall be approved by the Engineer prior to actual work.
  - 3. The Contractor shall submit complete and schematic wiring diagrams, including a complete list of materials and components used in this electrical system.
  
- C. General Requirements:
  - 1. General:
    - a. Contractor shall complete and make operable the electrical systems of all equipment and devices shown on the drawings. This consideration shall include all electrical interconnections, home runs, and services. Contractor shall provide an operational and functional check of the electrical systems installed.
    - b. Contractor shall install, connect and complete all equipment and devices as per manufacturer's certified drawings approved by the Engineer.
    - c. All work, selection of materials, ratings, capacities and methods of construction shall be approved by the Engineer before work is started.
    - d. The Contractor shall visit the job site for conformance to existing methods as a guide criteria for his work.
    - e. All new panels shall be provided with 8-1/2" x 11" panel directory indicating the voltage, phase and current carrying capacity of the panel mains, as well as the branch circuit protection, number of poled, phases, wire size and device supplied for each branch circuit.



The panels shall be connected as shown on the drawings.

- f. All control circuits shall operate at a voltage not to exceed 120 volts and shall be obtained from a transformer with an isolated secondary winding, with primary power taken from a source on the load side of the main disconnect device. One side of the control circuit shall be grounded, and the ungrounded side shall be properly fused at the point of transformation or supply.
- g. All control devices, disconnect switches, junction boxes and other enclosures installed indoors shall conform to NEMA Type 1. All above devices installed outdoors shall conform to NEMA Type 3R, unless otherwise indicated.

#### 1.02 CODES

- A. All work shall be done in accordance with the latest rules and regulations of the National Electric Code, the National Electric Safety Code and the local authorities having jurisdiction over this class of work. The provisions of these codes constitute minimum standards for wiring methods, materials, equipment and construction. Strict compliance therewith will be required for all electrical work, except where the drawings and specifications require better materials, equipment and construction than these minimum standards, in which case the drawings and specifications shall precede the Code requirements.

#### 1.03 MOTORS

- A. All motors shall be provided with fuses or horsepower rated circuit breakers and full voltage motor starters with overload heater elements sized in accordance with NEC requirements.
- B. Contractor will check direction of rotation of all motors and reverse connections if necessary.

#### 1.04 CUTTING, PATCHING AND REPAIRING

- A. All cutting, patching and repairing required for the installation of the electrical work shall be performed by skilled mechanics in the trade involved. This Contractor shall accurately locate all chases, sleeves, inserts for hangers, supports and fastenings in advance of new construction so as to avoid needless cutting. Structural members shall not be cut, drilled, bored or altered, for any reason.

#### 1.05 BRANCH CIRCUITS

- A. Each 120volt branch circuit must be provided with a neutral wire and in no case may the neutral wire be interrupted or fused. Common neutrals may be used as provided by the NEC.

#### 1.06 RELATED SECTIONS:

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

1. Section 16010, Basic Electrical Requirements

## **PART 2 PRODUCTS**

### **2.01 GENERAL REQUIRMENTS**

- A. The materials as specified on the drawings are equivalent items. The Contractor may request to furnish equivalent items if the request is made in writing to the Engineer. The Engineer will review the request, and if the items are deemed equivalent, approval will be made in writing.
- B. Materials and equipment of the types for which there are Underwriters' Laboratories Standard requirements, listings, and labels, shall have listing of Underwriters' Laboratories and be so labeled, or shall conform to the requirements, in which case certified statements to the effect shall be furnished, if requested. Use new materials and equipment throughout.
- C. Materials other than those listed shall be the size, type, and capacity indicated by the drawings and the specifications.

### **2.02 WIRE CABLES**

- A. Wire and cables shall be of copper except as elsewhere specified and shown on drawings, and shall comply with the standardization rules of the AIEE as to conductivity and shall be free from kinks and defects when installed. Conductors shall be in accordance with the requirements of IPCEA Publication S-19-81, latest edition.
- B. All wire used in this project shall be new, and shall be identified by type and by manufacturer.
- C. Minimum wire size shall be No. 12 AWG, and shall have six hundred (600) volt insulation, unless otherwise indicated.
- D. All control house wiring and outdoor wiring above grade shall be Type THHN unless otherwise specified.
- E. All underground cable shall be of the type specified on the construction drawings.
- F. All wire of No. 8 AWG or larger shall be stranded for "conduit" work.
- G. All control cables shall be terminated with BURNDY Type YAV non-insulated ring type terminals appropriately sized for the conductor and mounting screws.

### **2.03 CONDUIT AND RACEWAYS**

- A. Refer to Section 16120.

## **PART 3 EXECUTION**

### **3.01 TRENCHING & BACKFILL**

- A. All trenching and backfill for underground conduits and direct burial cables shall meet NMDOT Standard Specification 660, "Excavation for Structures" and also meet the following minimum requirements:
  - 1. Trenches for conduits and direct burial cables shall be excavated to the specified conduit or

cable depth plus 4".

2. Trenches for conduits shall have a uniform slope in the proper direction to permit drainage.
3. All large rocks and other type debris encountered shall be removed.
4. After excavation and installation of bedding material have been made, all trenches shall be backfilled and compacted to 95% optimum compaction. Backfill shall be made with material with the correct moisture content and in layers not exceeding 6", after which mechanical tampers shall be utilized to achieve the 95% compaction. The Contractor will be responsible for the compaction during life of this contract.

### 3.02 UNDERGROUND RACEWAYS

Underground raceways shall be installed per Section 16120 and as follows:

- A. After the trench is excavated, sand shall be placed and tamped in the trench to provide a uniform bearing for the underground raceway. The raceway shall then be installed with a minimum separation of 6" and selected backfill be placed over the raceway and shall be thoroughly tamped to a depth of 3". Marking tape shall be installed above the conduit as shown on the drawings. After installation of the marking tape, the trench may then be backfilled in accordance with provisions of Section 16120.

### 3.03 RACEWAYS - STEEL AND PLASTIC

Raceways shall be installed per Section 16120 and as follows:

- A. The openings of all raceways and conduit fittings shall be readily accessible.
- B. Raceways shall be parallel or perpendicular to building walls. Raceways shall be installed in an approved manner, and rigidly supported with approved conduit clamps. Distance between conduit supports shall not exceed five (5) feet, zero (0) inches. Drilling of or welding to building columns or main structure members for supporting means is not permissible.
- C. All cut threads shall be cleaned and painted with a galvanizing paint as the final step. Conduit ends shall be provided with a bushing to prevent wire insulation from being cut.
- D. All conduit shall be cut square and threads for rigid galvanized conduit shall be cut and cleaned before reaming. All joints in rigid galvanized conduit shall be threaded fully and pulled tight with a wrench. Each underground joint shall be sealed with spray plastic as provided by the National Electric Code.
- E. All raceways and fittings installed outdoors shall be rain-tight and shall be pitched and drained as required by the National Electric Code. Neoprene gaskets shall be used on all fittings.
- F. All conduits installed below the floor shall be encased in concrete with a minimum of 2" cover on all sides.
- G. Whenever a conduit or duct enters an area from an exterior or underground distribution system, the end within the building shall be sealed with a suitable compound so as to prevent the entrance of moisture or gases. Spare or unused conduits shall also be sealed.

- H. All conduits, or ducts, required to be encased in a concrete envelope shall have 3" of concrete coverage all around.
- I. All underground conduits, or ducts, where not located below the frost line, shall be arranged to drain, in accordance with the NEC.
- J. All conduit risers from underground runs shall be furnished with a grounding type bushing inside the enclosure. A #6-10 AWG copper conductor shall be connected from this bushing to a ground conductor.
- K. Fittings, Bends & Pull Boxes. Right angle turns shall consist of symmetrical bends or aluminum cast metal fittings, unless otherwise specified on the drawings. Bends and offsets shall be avoided wherever possible. Field bends shall be made so as to avoid changing the internal diameter of the conduit and so as not to damage its protective coating either outside or inside. Bends shall be free from kinks, indentations or flattened surfaces and shall be made with approved conduit bending machines or devices. In accordance with recommended radii as per the NEC, the use of heat in bending metallic conduit shall not be permitted. Not more than 2 - 90° bends will be allowed in any one conduit run. Where more bends are necessary, a suitable pull or junction box shall be installed. All junction boxes shall be sized in accordance with the National Electric Code.
- L. Supports, and Raceways and Outlets, Pull or Junction Boxes. Supports for conduit shall consist of malleable iron conduit clamps of an approved galvanized type, conduit hangers, pipe hangers and designed for attachment to steel beams, steel angle trapeze with threaded rod hangers, or wall brackets, as required to suit special conditions and in accordance with the NEC requirements.

### 3.04 WIRING

- A. All conductors shall be continuous from box to box and no splices shall be made in the conduit. All splices, taps or connections shall be soldered or joined by mechanical means, BURNDY YAV or equal.  
  
All contact surfaces shall be cleaned to assure maximum conductivity. All equipment which is not furnished with connectors shall be provided with approved lug-type terminal connectors.
- B. All splices and joints in the free ends of conductors shall be covered with an insulation composed of materials of thickness and insulation resistance equal to that on the conductors, as recommended by the wire manufacturer. No oils, grease, or compound other than Minerallac "Pull'in" compound or ideal "Wire Lube" shall be used.
- C. All compression connectors shall be installed with BURNDY HY Tool MR4 and MR8 ratcheted, or a ratcheted tool recommended by the manufacturer of the connector.
- D. All conductors #10 AWG and smaller shall be stripped with an ideal Stripmaster wire stripper or an approved equal.
- E. All multi-conductor cable outer jackets shall be removed with a Klein slitting tool or equal.

### 3.05 GROUNDING

Electrical grounding shall be installed per Section 16450 and as follows:

- A. All exposed non-current carrying metal parts of all equipment, enclosures, conduits, motor and

other devices and accessories, and the control house building shall be grounded whether such grounding is detailed on the plans or not.

- B. Wire for grounding shall be sized to meet NEC requirements unless the plans call for a larger AWG size.
- C. Equipment grounding wires may be insulated or bare, and shall be protected from mechanical damage by means equivalent to those provided for live conductors. If an insulated equipment grounding conductor is used, the insulation shall be green colored.

#### **PART 4 MEASUREMENT AND PAYMENT**

##### **4.01 MEASUREMENT AND PAYMENT**

Low voltage wiring work shall be not be measured or paid for as a separate item but shall be included as part of the item listed below for which it is part of. Refer to Section 16010.

END SECTION

## **SECTION 16120**

### **CABLE RACEWAYS AND UNDERGROUND CONDUIT**

#### **PART 1        SUMMARY**

##### **1.01    GENERAL**

A. The Contractor shall furnish and install the underground electrical raceways, outdoor overhead cable raceways, and related items as shown on the drawings, or specified herein. Excavation and compacted backfilling necessary to complete the work is included in this assembly unit.

##### **1.02    DRAWINGS**

A. The design drawings, which constitute an integral part of this contract, shall serve as the working drawings. They indicate the general arrangement and are generally diagrammatic with locations of outlets and equipment being approximate, except as noted. Exact routing of raceways, locations of outlets and equipment shall be governed by structural conditions and obstructions. This is not to be construed to permit redesigning systems. All outlets shall be interconnected as shown on the drawings.

B. The Contractor shall review all plans and shall adjust his work to conform to all conditions indicated thereon. All modifications or relocations shall be approved by the Engineer prior to actual work.

C. The Contractor shall submit a complete list of materials and components used in this electrical system. The Contractor shall also submit drawings dimensioned to show the installed location of all underground cable and conduit.

##### **1.03    RELATED SECTIONS**

A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

1. Section 16010, Basic Electrical Requirements

##### **1.04    SUBMITTALS**

1. Provide in accordance with Section 16010.

#### **PART 2        PRODUCTS**

##### **2.01    MATERIAL**

1. Concrete material shall conform to the requirements of those in NMDOT Standard Specification 509. Class "A" concrete shall be used in construction of the cable trenches.
2. Rigid plastic conduit and conduit fittings shall be PVC Schedule 40 and shall comply with NEMA TC2 and Federal Specification WC1904 on Semi-Rigid Plastic Conduit and Fittings. Joint cement shall be as recommended by the manufacturer.
3. Type P&C plastic conduit and conduit fittings shall be of the direct burial type, and shall

comply with NEMA TC6. Joint cement shall be as recommended by the Manufacturer.

4. Rigid Conduit. All metallic conduit shall be heavy wall, rigid galvanized steel and shall bear the Underwriters' label of approval and shall be manufactured according to American Standards Association Specifications.

Minimum size of conduit shall be 3/4". In no case will the use of 1-1/4" conduit be permitted. When this size is recommended by the NEC, the Contractor shall substitute 1-1/2" conduit and associated fittings.

All rigid conduit fittings shall be of the Malleable Type, Appleton, or approved equal.

All rigid conduit fittings used outdoors shall be equipped with neoprene rubber gaskets.

5. Flexible Conduit shall be Sealtite Type UA, gray color, or approved equal. Fittings shall be the insulated, liquid-tight type, with sealing O-rings and retainer.
6. Cement Asbestos conduit and fittings shall be of the "Transite" type as manufactured by Johns-Manville Company, or approved equal.
7. Clay Pipe shall be vitrified clay pipe tile with plain end and with Type B compression fitting per ASTM C594-72, or the latest revision thereof.
8. Concrete Conduit shall be of the multi-duct type and shall be as manufactured by CONDUX INTERNATIONAL, INC., 29 W. 701 North Aurora Road, Naperville, Illinois 60540.
9. Precast Concrete Raceways and covers shall be as manufactured by TRENWA PRODUCTS, INC., 211 East Fourth Street, Cincinnati, Ohio 45202, or approved equal.
10. Conduit Clamps and hardware shall be galvanized or stainless steel. These clamps shall also be of the type that do not require steel drilling.
11. Galvanized Steel Raceway Covers. Metal raceway covers shall be fabricated from 1/8" checkered floor plate as detailed on the drawings. These plates shall be hot dipped galvanized and straightened after fabrication.
12. Miscellaneous Items. Wire, bolts, nuts, screws and related items shall be of galvanized steel or stainless steel.
13. Galvanized Steel Items. All structural steel bolts and hardware shall be manufactured by the open hearth of electric furnace process and shall conform to the "Standard Specifications for Structural Steel for Bridges and Buildings" of the applicable ASTM Specification.
  - a. The minimum thickness of any metal for galvanized work shall be 3/16".
  - b. All material, including bolts and nuts, shall be hot dip galvanized after all shop work is completed except that nuts may be rerun after galvanizing.
  - c. Galvanizing for all material, except assembly bolts and step bolts, shall be in accordance with ASTM requirements except that galvanizing on all plates, bars, and shapes shall weigh a minimum of approximately three (3) ounces of zinc per square foot of area.

- d. Each galvanized piece shall have stamped on it, with a metal die, a number conforming with the piece mark on the erection diagrams and detail drawings. These mark shall be stamped into the steel before galvanizing with numbers at least 3/8" high, and in such a manner as to be plainly visible after galvanizing.
14. Galvanized Metal Paint. Paint for treating metal surfaces which have not been galvanized or which have had the galvanized surface disturbed shall be #810-C Zincilate, or equal.
15. Reinforcing Steel shall comply with specifications listed under NMDOT Standard Specification 540.
16. Wiring Troughs. The material for this type raceway shall be galvanized and of the type specified on the Material Lists.
17. Sand shall be clean River sand.
18. Junction Boxes shall be of the size and type specified on the drawings. Junction boxes shall be NEMA 4 with continuous hinge gasketed covers and back panels. Junction boxes shall be factory painted with a finish coat of ANSI Standard Sky Gray No. 70 (Munsell No. 5.OBG7.0/0.4).
19. Conduit Fittings which are installed for the entrance of conduit through the top of cabinets, junction boxes, etc., shall be the water-tight hub type. Entrance fittings on the side of cabinets, junction boxes, etc., shall be the water-tight hub type or be furnished with a water-tight gasket.
20. Conduit Bushings for all metallic conduit risers shall be of the insulated grounding type.
21. Conduit Sealer shall be of a non-hardening weatherproof type Permagum as manufactured by the Presslite Division of Interchemical Corporation or Scotchfil as manufactured by 3M or equal.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. The Contractor shall install all materials and equipment required under this assembly in accordance with the documents, drawings and in accordance with the Manufacturer's instructions.

All trenches for raceways, conduits, etc., shall be excavated to sufficient width and depth for proper installation of the material. Bottoms of trenches shall be evenly graded and sloped as required for proper drainage.

Where trenching in existing stations is required, the mixing of excavated material with the substation surfacing material will not be permitted.

All backfill shall be tamped to optimum compaction.

1. Concrete. Concrete construction shall conform to the requirements of NMDOT Standard Specification 509, "Concrete," where applicable. Trenches shall grade evenly from manhole to manhole, providing drainage from the trenches to the manhole drains. All construction joints



in the trenches and joints between the manholes and the trenches shall be keyed.

2. Raceways. Metallic conduit shall not be installed below grade. All raceways above grade shall be made with rigid galvanized steel conduit or specified wireways. All underground riser connections from underground conduits shall be made with an adapter to steel approximately 6" above the finished yard subgrade.
  - a. Raceways shall be parallel or perpendicular to building walls and substation members. Raceways shall be installed in an approved manner, and rigidly supported with approved conduit clamps. Distance between conduit supports shall not exceed five (5') feet, zero (0") inches. Drilling of or welding to building columns or main structure members for supporting means is not permissible.
  - b. All conduit shall be cut square and threads for rigid galvanized conduit shall be cut and cleaned before reaming. All joints in rigid galvanized conduit shall be threaded fully and pulled tight with a wrench. All PVC conduit joints shall be square cut, reamed and cleaned before sealing with joint cement.
  - c. All raceways and fittings installed outdoors shall be rain-tight and shall be pitched and drained as required by the National Electric Code. Neoprene gaskets shall be used on all fittings. Drilling of holes in raceways to permit water drainage will not be permitted.
  - d. Conduit risers to equipment and conduits entering the control building shall be sealed to prevent the entrance of moisture and gases. Sealant shall be installed at the cabinet and control building interior ends of these conduits. Spare and unused conduits shall also be sealed.
  - e. All underground conduits or ducts, where not located below the frost line, shall be arranged to drain.
  - f. All metallic conduit risers from underground runs shall be furnished with a grounding type bushing inside the enclosure. A #6 AWG copper conductor shall be connected from this bushing to a ground conductor.
3. Fittings, Bends & Pull Boxes. Right angle turns shall consist of symmetrical bends of malleable metal fittings, unless otherwise specified on the drawings. Bends and offsets shall be avoided wherever possible. Field bends shall be made so as to avoid changing the internal diameter of the conduit and so as not to damage its protective coating either outside or inside. Bends shall be free form kinks, indentations or flattened surfaces and shall be made with approved conduit bending machines or devices. In accordance with recommended radii as per the NEC, the use of heat in bending metallic conduit shall not be permitted. Bends exceeding a total of 180° will not be allowed in any one conduit run. Where more bends are necessary, a suitable pull or junction box shall be installed. All junction boxes shall be sized in accordance with the National Electric Code.

Conduit exits from cable trenches, manholes, hand holes and the control house shall be equipped with bell ends.

4. Galvanized Finish Restoration. The Contractor shall clean all exposed conduit threads, damaged galvanized surfaces and shall then apply two full coats of Galvacon allowing 24 hours drying time after the first coat.

5. Conduit Installation - Direct Burial. Conduits shall be installed in accordance with the manufacturer's recommendations and the requirements set forth herein.
  - a. Conduit trenches shall be excavated to the correct slope and shall be excavated at least 4" deeper than the bottom of the bottom layer of conduit. The trenches shall have a uniform slope from one manhole to the other and the trenches shall slope so as to drain the conduit to the manholes as shown on the drawings.
  - b. After preparing the trench, sand shall be placed and tamped in the trench to provide a uniform bearing for the bottom row of the conduit and drain. The bottom layer of conduit shall then be installed and sand shall be placed over the conduits and shall be thoroughly tamped. Each row of conduits shall then be covered with sand and thoroughly tamped until the surface gives the proper separation of the next layer of conduits from the first.
  - c. The top row of conduits shall be covered to a depth of three (3") inches with sand. Where specified on the drawings, the conduits shall be covered with the correct amount of concrete. The remaining depth of the trench may be backfilled with excavated material taking care to remove unusually large stones and other hard objects from the fill.
  - d. The inside edges of all conduit and nipples shall be rounded before installation. An approved joint sealing compound shall be used on all connections except those that are equipped with rubber rings and the threaded ends of adapters for steel conduit. Expansion couplings shall be installed at each conduit riser, and flexible connections shall be installed at each entrance to manhole as shown on the drawings. Conduit, in which wiring will not be installed under this contract, shall have riser ends capped as shown on the drawings, and shall have manhole terminals suitably plugged to prevent the entrance of foreign matter. Conduit "Stub Outs" shall extend through the manhole walls and be properly capped to permit future conduit installations.
6. Conduit Installation - Concrete Encased. Conduits for concrete encasement shall be type P&C shall be installed in accordance with the manufacturer's recommendations and the requirements set forth herein.
  - a. Conduit trenches shall be excavated to the correct slope and shall be excavated at least 4" deeper than the bottom of the bottom layer of conduit. The trenches shall have a uniform slope from one manhole to the other and the trenches shall slope so as to drain the conduit to the manholes as shown on the drawings.
  - b. After preparing the trench, the floor and wall reinforcement and floor concrete shall be placed. The layers of conduit shall then be installed and supported.
  - c. The floor and wall reinforcement shall be installed and the floor concrete shall then be placed. The successive layers of conduit shall be placed in the trench and supported in accordance with the manufacturer's directions. The top reinforcement shall then be placed with concrete finally being installed. The concrete mixture shall be of such gradation and mixture that the voids around the conduit can be filled without mechanical vibration.
7. Excavation & Backfill. The WORK under this section includes earth excavation and backfill required for conduit installation. Excavation and backfill shall be performed per NMDOT 660. The Contractor shall furnish the necessary mechanical tampers to effect the specified

compaction. Compaction testing of trench backfill will be required as directed by the Engineer.

**PART 4 MEASUREMENT AND PAYMENT**

4.01 MEASUREMENT AND PAYMENT

Cable raceways and underground conduit work shall be paid for as described in Section 16010.

END SECTION

## **SECTION 16450**

### **GROUNDING**

#### **PART 1 GENERAL**

##### 1.01 DESCRIPTION

- A. The WORK shall consist of furnishing all labor, materials, equipment, and tools necessary for all electrical grounding for installation of the CNG station related equipment as shown on the plans or as necessary to complete the project.

##### 1.02 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
  - 1. Section 16010 – General Electrical Requirements
  - 2. Section 16110 – Low Voltage Wiring
  - 3. Section 16120 – Cable Raceways and Underground Conduit

##### 1.03 SUBMITTALS

- A. Provide in accordance with Section 16010.

#### **PART 2 PRODUCTS**

##### 2.01 GROUND RODS

- A. Provide copper-clad steel ground rods not less than 5/8-inch diameter, 10 feet long, driven full length into earth. Special requirements shall be as shown and as specified.

##### 2.02 GROUND CONDUCTORS

- A. Provide grounding conductors of size and type specified in Section 16120 and shown on Drawings.

##### 2.03 GROUND CONNECTIONS

- A. Below-Grade Connections: Provide exothermic-welded connectors as manufactured by Cadweld, Thermoweld, or equal.
- B. Above-Grade Connections: Provide exothermic-welded, compression, or brazed connectors.

## **PART 3 EXECUTION**

### **3.01 GENERAL**

- A. Except where specifically indicated otherwise round exposed noncurrent-carrying metallic electrical equipment, the neutral of wiring systems in strict accordance with NEC, state, and other applicable laws and regulations.
- B. Where grounding conductors are shown, or called for, bond wires to metallic enclosures at each end and to intermediate metallic enclosures. Connect grounding conductors to grounding bushings and raceways. Where equipment contains ground bus, extend and connect grounding conductors to that bus. Connect enclosure of equipment containing ground bus so that bus runs ground conductors inside conduits enclosing power conductors.
- C. Install sufficient ground rods in addition to code-required grounding so that resistance to ground as tested by standard methods does not exceed 3 ohms unless otherwise accepted. Where more than one rod is required, install rods at least 3 feet apart.
- D. Ground shields of shielded power cable at each splice or termination in accordance with recommendations of splice or termination manufacturer. Ground shields of control cables in accordance with equipment manufacturer's recommendations.
- E. Ground metal sheathing and exposed metal vertical structural elements of buildings. Ground metal fences enclosing electrical equipment. Bond metal equipment platforms which support electrical equipment to that equipment. Provide good electrical contact between metal frames and railings supporting pushbutton stations, receptacles, instrument cabinets, and raceways carrying circuits to these devices.
- F. Bond neutrals of transformers within buildings to System ground network, and to additional indicated grounding electrodes.

### **3.02 GROUNDING CONNECTIONS**

- A. Unless shown otherwise, make connections of grounding conductors to ground rods at upper end of rod with end of rod and connection point below finished grade.

### **3.03 FIELD TESTS**

- A. Test ground resistance of reconnected grounding system in Engineer's presence.
- B. Provide copies of reports of grounding system tests for inclusion in Operation and Maintenance Manuals and for review by Engineer.

## **PART 4 MEASUREMENT AND PAYMENT**

### **4.01 MEASUREMENT**

Measurement for the Electrical System and Equipment installation will be made at the Contract unit price per each component, complete in place, at each location installed and accepted by the Engineer or as a lump sum as noted below.

#### 4.02 PAYMENT

All costs incurred by the Contractor by reason of compliance to satisfy the requirements under this section shall be considered incidental to and completely covered by the Contract unit price for the following bid items:

<u>Description</u>	<u>Unit(s)</u>
Ground Rod	Each

END OF SECTION

**SECTION 16510**  
**LIGHTING POLES**

**PART 1 - GENERAL**

1.1 SUMMARY

- A. Section Includes:
  - 1. Poles and accessories for support of luminaires.

1.2 DEFINITIONS

- A. EPA: Equivalent projected area.
- B. Luminaire: Complete lighting fixture.
- C. Pole: Luminaire-supporting structure, including tower used for large-area illumination.
- D. Standard: See "Pole."

1.3 ACTION SUBMITTALS

- A. Product Data: For each pole and accessories.
- B. Shop Drawings:
  - 1. Include plans, elevations, sections, and mounting and attachment details.
  - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 3. Detail fabrication and assembly of poles and pole accessories.
  - 4. Foundation attachment details, including material descriptions, dimensions, anchor bolts, support devices, and calculations, signed and sealed by a professional engineer licensed in the state of installation.
  - 5. Anchor bolt templates keyed to specific poles and certified by manufacturer.
  - 6. Method and procedure of pole installation. Include manufacturer's written installations.

1.4 INFORMATIONAL SUBMITTALS

- A. Pole and Support Component Certificates: Signed by manufacturers of poles, certifying that products are designed for indicated load requirements according to AASHTO LRFDLTS-1 and that load imposed by luminaire and attachments has been included in design. The certification shall be based on design calculations signed and sealed by a professional engineer.

- B. Material test reports.
- C. Field quality-control reports.
- D. Sample warranty.
- E. Soil test reports.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data for pole-mounted accessories.

#### 1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of pole(s) that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within a specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs from special warranty period.
  - 1. Warranty Period: One (1) year from date of Substantial Completion.

### **PART 2 - PRODUCTS**

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer to design pole foundation and pole power system.
- B. Seismic Performance: Foundation and pole shall withstand the effects of earthquake motions determined according to ASCE/SEI 7-16, Seismic Design Requirements for Non-structural Components.
  - 1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified.
  - 2. Component Importance Factor ( $I_p$ ): 1.0.
  - 3. Component Amplification Factor ( $a_p$ ): 1.0.
  - 4. Component Response Modification Factor ( $R_p$ ): 1.5.
- C. Structural Characteristics: Comply with AASHTO LRFDLTS-1.
- D. Dead Load: Weight of luminaire and its horizontal and vertical supports, lowering devices, and supporting structure, applied according to AASHTO LRFDLTS-1.
- E. Ice Load: Load according to AASHTO LRFDLTS-1 for applicable areas on the Ice Load Map.
- F. Wind Load: Pressure of wind on pole and luminaire, calculated and applied according to AASHTO LRFDLTS-1.



1. Basic wind speed for calculating wind load for poles per ASCE7-16.
- G. Strength Analysis: For each pole, multiply the actual EPA of luminaires and brackets by a factor of 1.1 to obtain the EPA to be used in pole selection strength analysis.
- H. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.

## 2.2 STEEL POLES

- A. Suggested Sources:
  1. Lithonia Lighting
  2. Cooper Lighting
  3. Kim Lighting
- B. Source Limitations: Obtain poles from single manufacturer or producer.
- C. Poles: Comply with ASTM A 500/A 500M, Grade B carbon steel with a minimum yield of 50,000 psig; one-piece construction up to 40 feet in height with access hand hole in pole wall.
  1. Shape: Square straight.
  2. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.
- D. Brackets for Luminaires: Detachable, cantilever, without underbrace.
  1. Adaptor fitting welded to pole, allowing the bracket to be bolted to the pole-mounted adapter, then bolted together with stainless-steel bolts.
  2. Cross Section: Tapered oval, with straight tubular end section to accommodate luminaire. Match pole material and finish.
- E. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.
- F. Fasteners: Stainless steel, grade, finish size and type as determined by manufacturer. Corrosion-resistant items compatible with support components.
  1. Materials: Compatible with poles and standards as well as the substrates to which poles and standards are fastened and shall not cause galvanic action at contact points.
  2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.
- G. Grounding and Bonding Lugs: Welded 1/2-inch threaded lug, complying with requirements in Section 16450 "Grounding", listed for attaching grounding and bonding conductors of type and size indicated, and accessible through hand hole.
- H. Hand hole: Oval shaped, with minimum clear opening of 2-1/2 by 5 inches, with cover secured by stainless-steel captive screws.

- I. Cable Support Grip: Wire-mesh type with rotating attachment eye, sized for diameter of cable and rated for a minimum load equal to weight of supported load multiplied by a 5.0 safety factor.
- J. Factory-Painted Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.
  - 1. Surface Preparation: Clean surfaces according to SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, according to SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
  - 2. Interior Surfaces of Pole: One coat of bituminous paint, or otherwise treat for equal corrosion protection.
  - 3. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high gloss, high-build polyurethane enamel.
    - a. Color: As selected by Owner from manufacturer's full range.

## 2.3 POLE ACCESSORIES

- A. Base Covers: Manufacturers' standard metal units, finished same as pole, and arranged to cover pole's mounting bolts and nuts.

## 2.4 MOUNTING HARDWARE

- A. Anchor Bolts: Manufactured to ASTM F1554, Grade 55, with a minimum yield strength of 55,000 psi.
  - 1. Galvanizing: Hot dip galvanized according to ASTM A 153, Class C.
  - 2. Bent rods, diameter and bend length and overall length to be determined by manufacturer.
  - 3. Threading: Uniform National Coarse, Class 2A.
- B. Nuts: ASTM A 563, Grade A, Heavy-Hex
  - 1. Galvanizing: Hot dip galvanized according to ASTM A153, Class C.
  - 2. Two (2) nuts provided per anchor bolt, shipped with nuts pre-assembled to the anchor bolts.
- C. Washers: ASTM F 436, Type 1 or ANSI B27.2.
  - 1. Galvanizing: Hot dip galvanized according to ASTM A153, Class C.
  - 2. Four (4) washers provided per anchor bolt.
- D. Lock Washers: ANSI B18.21.1.
  - 1. Galvanizing: Hot dip galvanized according to ASTM A153, Class C.
  - 2. Two (2) lock washers provided per anchor bolt.

## 2.5 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## **PART 3 - EXECUTION**

### 3.1 POLE FOUNDATION

- A. Concrete Pole Foundations: Poles will be mounted in cast in place concrete foundations. Poles shall be provided with anchor bolts to match pole-base flange with strength required to support pole, luminaire, and accessories. Concrete, reinforcement, and formwork are provided separately and specified in Section 03300 "Reinforced Concrete."
- B. Anchor Bolts: Install plumb using manufacturer-supplied template, uniformly spaced.

### 3.2 POLE INSTALLATION

- A. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Section 03300 "Reinforced Concrete."
- B. Raise and set pole using web fabric slings (not chain or cable) at locations indicated by manufacturer.

### 3.3 CORROSION PREVENTION

- A. Steel Conduits: Comply with requirements in Section 16120, "Cable Raceways and Underground Conduit." In concrete foundations, wrap conduit with conduit sealer.

### 3.4 GROUNDING

- A. Ground Metal Poles and Support Structures: Comply with requirements in Section 16450 "Grounding."
  - 1. Install grounding electrode for each pole unless otherwise indicated.
  - 2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

END OF SECTION

## SECTION 16520

### LIGHTING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Section Includes:

1. Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.
2. Luminaire supports.
3. Other Miscellaneous Interior Lighting.

###### B. Related Requirements:

1. Section 16510 "Lighting Poles" for poles used to support exterior lighting equipment if/as required by the Plans.

##### 1.2 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color rendering index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating

E. Lumen: Measured output of lamp and luminaire, or both.

F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

##### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of luminaire.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, and required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Delegated-Design Submittal: For luminaire supports.

1. Include design calculations for luminaire supports.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans, drawn to scale and coordinated.
- B. Product Certificates: For each type of the following:
  1. Luminaire.
- C. Sample warranty.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.
  1. Provide a list of all lamp types used on Project. Use ANSI and manufacturers' codes.

#### 1.6 FIELD CONDITIONS

- A. Mark locations of exterior luminaires for approval by Engineer prior to the start of luminaire installation.

#### 1.7 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
  1. Warranty Period: Five (5) year(s) from date of Substantial Completion.

### **PART 2 - PRODUCTS**

#### 2.1 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. NRTL Compliance: Luminaires shall be listed and labeled for indicated class and division of hazard by an NRTL.
- C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
- D. UL Compliance: Comply with UL 1598 and listed for wet location.
- E. Lamp base complying with ANSI C81.61 or IEC 60061-1.
- F. CRI of minimum 70. CCT of 3000 - 4000 K.

- G. L70 lamp life of 50,000 hours.
- H. Nominal Operating Voltage: 120 VAC.
- I. In-line Fusing: On the primary for each luminaire.
- J. Lamp Rating: Lamp marked for outdoor use and in enclosed locations.
- K. Source Limitations: For luminaires, obtain each color, grade, finish, type, and variety of luminaire from single source with resources to provide products of consistent quality in appearance and physical properties.
- L. Miscellaneous Interior: Ceiling Mount Type, Fluorescent Lamps: F32T8/35K, minimum lamp life rating of 30,000 hours (3 hours operation per start cycle). Lamp Start: Electronic Ballast.

## 2.2 LUMINAIRE TYPES

- A. Area/Site:
  - 1. Luminaire Shape: Square or rectangular.
  - 2. Mounting: Wall Sconce
  - 3. Distribution: Standard Symmetrical
  - 4. Suggested Source/Type: Cooper/Eaton Champ® FMV or approved equal
- B. Canopy:
  - 1. Luminaire Shape: Square or rectangular.
  - 2. Suggested Source/Type: LSI Industries Legacy or approved equal
- C. Wall Flood:
  - 1. Luminaire Shape: Square or rectangular.
  - 2. Mounting: Yoke
  - 3. 11,000 Lumens minimum (nominal)
  - 4. Suggested Source/Type: Cooper/Eaton Champ® Pro PFM or approved equal
- D. Entry Door Flood:
  - 1. Luminaire Shape: Small Cylinder.
  - 2. Mounting: Wall/Frame
  - 3. Suggested Source/Type: McGraw Edison/Eaton ISC Impact Elite LED or approved equal
- E. Miscellaneous - Building Interior:
  - 1. Luminaire Shape: Rectangular, 4 foot nominal length.
  - 2. Mounting: Ceiling/Frame
  - 3. Dual Fluorescent Bulb, 2800 Lumens minimum per lamp (nominal)
  - 4. Suggested Source/Type: Cooper/Eaton Metalux WE 232 or approved equal

## 2.3 LUMINARE MATERIALS

- A. Metal Parts: Free of burrs and sharp corners and edges.
- B. Sheet Metal Components: Corrosion-resistant aluminum, stainless steel or epoxy-coated steel. Form and support to prevent warping and sagging.

- C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit re-lamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during re-lamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.
- D. Diffusers and Globes:
  - 1. Acrylic Diffusers: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
  - 2. Glass: Annealed crystal glass unless otherwise indicated.
  - 3. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
- E. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.
- F. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:
  - 1. White Surfaces: 85 percent.
  - 2. Specular Surfaces: 83 percent.
  - 3. Diffusing Specular Surfaces: 75 percent.
- G. Housings:
  - 1. Exterior: Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.
  - 2. Provide filter/breather for enclosed luminaires.
  - 3. Interior: Rigidly formed enclosure that will not warp, sag, or deform in use.

## 2.4 LUMINARE FINISHES

- A. Variations in Finishes: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- B. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and tested luminaire before shipping. Where indicated, match the finish process and color of pole or support materials.
- C. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
  - 1. Finish with TGIC polyester powder coat paint, 2.5 mil nominal thickness
    - a. Color: As selected by Owner from manufacturer's full range (Graphite is default).
- D. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
  - a. Color: As selected by Owner from manufacturer's full range.

## 2.5 LIGHTING CONTROLLER

- A. Day Astronomic Time Switching
- B. Independent 7-Day programming
- C. 120VAC Input Voltage, Max Loading 30 AMP
- D. 40°F to 155° Operating Temperature Range
- E. Automatic adjustment for Daylight Saving Time
- F. Battery Backup
- G. Source/Type: Intermatic ET8000 Series or approved equal.
- H. UL Listed

## 2.6 EXIT LIGHTING

- A. Universal Mounting
- B. LED Lamp(s), 3 Watt, 50,000 hours minimum rated lamp life.
- C. 120VAC Input Voltage
- D. Battery Backup, NiCad, 90 minute minimum backup run time
- E. Push to Test Switch
- F. UL Listed

## **PART 3 - EXECUTION**

### 3.1 GENERAL INSTALLATION REQUIREMENTS

- A. Install required lighting and miscellaneous lighting equipment per Plans.
- B. Comply with NECA 1.



- C. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.
- D. Install lamps in each luminaire.
- E. Fasten luminaire to structural support.
- F. Supports:
  - 1. Sized and rated for luminaire weight.
  - 2. Able to maintain luminaire position after cleaning and re-lamping.
  - 3. Support luminaires without causing deflection of finished surface.
  - 4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.
- G. Wiring Method: Install cables in raceways. Conceal raceways and cables.
- H. Install luminaires level, plumb, and square with finished grade unless otherwise indicated. Install luminaires at height and aiming angle as indicated on Plans.
- I. Coordinate layout and installation of luminaires with other construction.
- J. Adjust luminaires that require field adjustment or aiming.
- K. Comply with requirements in Section 16010 "Basic Electrical Requirements" and Section 16100 "Wiring Methods" and Section 16110 "Low-Voltage Wiring" for wiring connections and wiring methods

### 3.2 CORROSION PREVENTION

- A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.
- B. Steel Conduits: Comply with Section 16120 "Cable Raceways & Underground Conduit." In concrete foundations, wrap conduit with conduit sealer.

### 3.3 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 16100 "Wiring Methods."

### 3.4 FIELD QUALITY CONTROL

- A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.
- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative as needed:
  - 1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

C. Illumination Tests:

1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IES testing guide(s):
  - a. IES LM-5.
  - b. IES LM-50.
  - c. IES LM-52.
  - d. IES LM-64.
  - e. IES LM-72.
2. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

D. Luminaire will be considered defective if it does not pass tests and inspections.

3.5 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain luminaires.

**PART 4 MEASUREMENT AND PAYMENT**

4.01 MEASUREMENT

Measurement for the Lighting equipment installation will be made at the Contract unit price per each component, complete in place, at each location installed and accepted by the Engineer or as a lump sum as noted below.

4.02 PAYMENT

All costs incurred by the Contractor by reason of compliance to satisfy the requirements under this section shall be considered incidental to and completely covered by the Contract unit price for the following bid items:

<u>Description</u>	<u>Unit(s)</u>
Lighting Controller	Each
Interior Wall LED Flood Light	Each
Exterior Area/Site LED Light	Each
Canopy Light	Each

END OF SECTION