PROJECT SPECIFICATIONS
STORY MILL ROAD LANDFILL, BOZEMAN MONTANA
FLARE STATION EQUIPMENT UPGRADE AND SOIL VAPOR EXTRACTION SYSTEM INSTALLATION

BIDDING REQUIREMENTS, CONTRACT FORMS AND CONDITIONS OF THE CONTRACT

DIVISION 1 - GENERAL REQUIREMENTS

DIVISION 2 – SITE WORK

DIVISION 3 – CONCRETE

DIVISION 12 – EQUIPMENT

(MPWSS) – Montana Public Works Standard Specifications

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DIVISION 15 – MECHANICAL AND PLUMBING

DIVISION 16 – ELECTRICAL

Appendix A – Montana Department of Transportation

Appendix B – Flare Performance Envelope

Appendix C – Electrical Specifications

BIDDING REQUIREMENTS, CONTRACT FORMS AND CONDITIONS OF THE CONTRACT

SECTION 00100
INVITATION TO BID

Separate sealed bids for construction of_____
will be received by _____ at the office of
_____until _____ local time on
_____, and then publicly opened and read aloud.

The project consists of: _____
_____
_____
_____
_____.

The contract documents consisting of Drawings and Project Manual may be examined or obtained at the office of_____
in accordance with Article 2.01 of Instructions To Bidders. Required deposit is $_____
per set, which is not refundable.

In addition, the Drawings and Project Manual may also be examined at the following locations:
_____
_____
_____
_____.

There will be a Pre-Bid Conference at the office of _____
at_____ o'clock on _____. Interested CONTRACTORS are encouraged to attend.

CONTRACTOR and any of the CONTRACTOR'S subcontractors bidding or doing work on this project will be required to be registered with the Montana Department of Labor and Industry (DLI). Forms for registration are available from the Department of Labor and Industry, P.O. Box 8011, 1805 Prospect, Helena, Montana 59604-8011. Information on registration can be obtained by calling 1-406-444-7734. All laborers and mechanics employed by CONTRACTOR or subcontractors in performance of the construction work shall be paid wages at rates as may be required by the laws of _____(County) and the state of Montana. The CONTRACTOR must ensure that employees and applicants for employment are not discriminated against because of their race, color, religion, sex or national origin.

Each bid or proposal must be accompanied by a Certified Check, Cashier's Check, or Bid Bond payable to _____, in an amount not less than ten percent (10%) of the total amount of the bid. Successful BIDDERS shall furnish an approved Performance Bond and a Labor and Materials Payment Bond, each in the amount of one hundred

percent (100%) of the contract amount. Insurance as required shall be provided by the successful BIDDER(s) and a certificate(s) of that insurance shall be provided.

This project is funded in part or in whole with grant/loan funding from:_____
_____

Award of the project will be contingent upon receiving funding and award concurrence from __
_____

No bid may be withdrawn after the scheduled time for the public opening of bids, which is _____ .m. local time, _____ 20___.

The right is reserved to reject any or all proposals received, to waive informalities, to postpone the award of the contract for a period of not to exceed sixty (60) days, and to accept the lowest responsive and responsible bid which is in the best interest of the OWNER.

_____, is an Equal Opportunity Employer.
(Owner)

Published at _____, Montana, this _____day of _____ 20___.

_____

_____
(Title)

Address: _____

_____, Montana 59_____

SECTION 00200
INSTRUCTIONS TO BIDDERS

ARTICLE 1- DEFINED TERMS

1.1 Terms used in these Instructions to Bidders will have the meanings indicated in the General Conditions and the Supplementary Conditions. Additional terms used in these Instructions To Bidders have the meanings indicated below which are applicable to both the singular and plural thereof:

A. Bidder" - The individual or entity who submits a Bid directly to OWNER

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

C. "Successful Bidder" - The lowest responsible Bidder submitting a responsive Bid to whom OWNER (on the basis of OWNER's evaluations as hereinafter provided) makes an award.

ARTICLE 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 not be refunded.

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 on the Work and do not confer a license or grant for any other use.

ARTICLE 3- QUALIFICATION OF BIDDERS

3.1 To demonstrate Bidder's qualifications to perform the Work, within five (5) days of OWNERs request, Bidder shall submit written evidence, such as financial data, previous experience in performing comparable work, present commitments and other such data as may be called for in the Special Provisions.

3.2 In determining the lowest responsible bid, the following elements will be considered:

whether the BIDDER involved (a) maintains a permanent place of business; (b) has adequate plant and equipment to do the work properly and expeditiously; (c) has a suitable financial status to meet obligations incident to the work; and (d) has appropriate technical experience.

3.3 Each BIDDER may be required to show that former work performed by him has been handled in such a manner that there are no just or proper claims pending against such work. No BIDDER will be acceptable if he is engaged on any other work which impairs his ability to finance his contract. The BIDDER shall demonstrate his ability by meeting all requirements herein stipulated, if asked for them.

3.4 Bidder is advised to carefully review those portions of the Bid Form requiring Bidder's representations and certifications.

ARTICLE 4 - EXAMINATION OF BIDDING DOCUMENTS, OTHER RELATED DATA AND SITE

4.1 Subsurface and Physical Conditions

A. The Special Provisions identify:

1. Those reports of explorations and tests of subsurface conditions at or contiguous to the Site that ENGINEER has used in preparing the Bidding Documents.

2. Those drawings of physical conditions in or relating to existing surface and subsurface structures at or contiguous to the Site (except Underground Facilities) that ENGINEER has used in preparing the Bidding Documents.

4.2 Copies of reports and drawings referenced in paragraph 4.02.A 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 4.02 of the General Conditions has been identified and established in paragraph 4.02 of the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any "technical data" or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

4.3 Underground Facilities

A. Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or contiguous to the Site is based upon information and data furnished to OWNER and ENGINEER by owners of such Underground Facilities, including OWNER, or others. OWNER and ENGINEER

do not assume responsibility for the accuracy or completeness thereof unless expressly provided otherwise elsewhere.

4.4 Hazardous Environmental Condition

A. The Special Provisions identify those reports and drawings relating to a Hazardous Environmental Condition identified at the Site, if any, that ENGINEER has used in preparing the Bidding Documents.

B. Copies of reports and drawings referenced in paragraph 4.03.A 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 the Special Provisions has been identified and established in paragraph 4.06 of the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any "technical data" or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

4.5 Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, Underground Facilities and other physical conditions, and possible changes in the Bidding Documents due to differing or unanticipated conditions appear in paragraphs 4.02, 4.03, and 4.04 of the General Conditions. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to a Hazardous Environmental Condition at the Site, if any, and possible changes in the Contract Documents due to any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work appear in paragraph 4.06 of the General Conditions.

4.6 Upon request, OWNER will provide Bidder access to the site to conduct such examinations, investigations, explorations, tests, and studies as Bidder deems necessary for submission of a Bid. Bidder shall fill and compact all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies. Bidder shall comply with all applicable Laws and Regulations relative to excavation and utility locates.

A. Reference is made to the Special Provisions for the identification of the general nature of other 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.

B. Paragraph 6.13.C of the General Conditions indicates that if an Owner safety program exists, it will be noted in the Special Provisions.

4.7 It is the responsibility of each Bidder before submitting a Bid to:

A. Examine and carefully study the Biding Documents including any Addenda and the other related data identified in the Bidding Documents;

B. Visit the site and become familiar with and satisfy Bidder as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work; including but not limited to those general and local conditions affecting transportation, disposal, handling and storage facilities, availability of labor, water, power, roads, climactic conditions and seasons, physical conditions at the work Sites and project area as a whole, job site topography and ground conditions, equipment and facilities needed preliminary to and during work prosecution,

C. Become familiar with and satisfy Bidder as to all Federal, State and Local Laws and Regulations that may affect cost, progress, or performance of the Work;

D. Carefully study all 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 Special Provisions as provided in paragraph 4.02 of the General Conditions, and carefully study all reports and drawings of a Hazardous Environmental Condition, if any, at the Site which have been identified in the Special Provisions as provided in paragraph 4.06 of the General Conditions;

E. Obtain and carefully study (or assume responsibility for doing 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 expressly required by the Bidding Documents, and safety precautions and programs incident thereto;

F. Agree at the time of submitting its bid that no further examinations, investigations, exploration, tests, studies or data are necessary for the determination of its Bid for performance of the Work at the price bid and within the times and in accordance with the other terms and conditions of the Bidding Documents;

G. Become aware of the general nature of the work to be performed by OWNER and others at the Site that relates to the Work as indicted in the Bidding Documents;

H. Correlate the information know to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents.

I. Promptly give ENGINEER written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by ENGINEER is acceptable to the Bidders; and

J. Determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work.

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

ARTICLE 5 – PRE-BID CONFERENCE

5.1 A pre-Bid conference will be held at the time and place listed in the Invitation To Bid. Representatives of OWNER and ENGINEER will be present to discuss the project. Bidders are encouraged to attend and participate in the conference. ENGINEER will transmit to all prospective bidders of record such Addenda as ENGINEER considers necessary in response to questions arising at the conference. Oral statements may not be relied upon and will not be binding or legally effective.

ARTICLE 6- SITE AND OTHER AREAS

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

ARTICLE 7-INTERPRETATIONS AND ADDENDA

7.1 All questions about the meaning or intent of the Bidding Documents are to be submitted to ENGINEER in writing. 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 ENGINEER as having received the Bidding Documents. Questions received less than ten (10) 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.

7.2 Addenda may be issued to clarify, correct or change the Bidding Documents as deemed advisable by OWNER or ENGINEER.

7.3 Any addenda issued during the time of bidding, or forming a part of the Contract Documents loaned to the Bidder for the preparation of his proposal, shall be covered in the Bid and shall be made a part of the Agreement. Receipt of each addendum shall be acknowledged in the Bid. Any Bid in which all issued addenda are not acknowledged will be considered incomplete and will not be read.

ARTICLE 8-BID SECURITY

8.1 A Bid must be accompanied by Bid Security made payable to OWNER in an amount of ten percent (10%) of Bidder's maximum Bid price and in the form of cash, a cashier's check, certified check, bank money order, or bank draft, in any case drawn and issued by a national banking association located in Montana or by any banking corporation incorporated under the laws of Montana; or a Bid Bond (on a form attached if a form is prescribed) issued by a surety authorized to do business in Montana meeting the requirements of Paragraphs 5.01 and 5.02 of the General Conditions.

8.2 The Bid Security of the Successful BIDDER will be retained until such BIDDER has executed the Contract Documents and furnished the required contract security and met the other conditions of the Notice of Award, whereupon the Bid security will be returned. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within fifteen (15) 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 other Bidders whom OWNER believes to have a reasonable chance of receiving the award may be retained by OWNER until the earlier of (7) seven days after the Effective Date of the Agreement or (61) sixty-one days after the Bid opening, whereupon Bid Security furnished by such Bidders will be returned.

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

ARTICLE 9- CONTRACT TIMES

9.1 The number of days within which, or the dates by which, the Work is to be (a) Substantially Completed and (b) also completed and ready for final payment are set forth in the Agreement.

ARTICLE 10- LIQUIDATED DAMAGES

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

ARTICLE 11- SUBSTITUTE AND "OR-EQUAL" ITEMS

11.1 The Contract, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents without consideration of possible substitute or "or-equal" items. Whenever it is indicted in the Bidding Documents 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 6.05 of the General Conditions and may be supplemented in the General Requirements or Special Provisions.

ARTICLE 12 – SUBCONTRACTORS, SUPPLIERS AND OTHERS

12.1 If the Special Provisions require or the OWNER would request the identity of certain Subcontractors, Suppliers, individuals or entities to be submitted to OWNER in advance of a specified date prior to the Effective Date of the Agreement, the apparent Successful Bidder, and any other Bidder so requested, shall will within five (5) days after Bid opening submit to OWNER a list of all such Subcontractors, Suppliers, individuals or entities proposed for those portions of the Work for which such identification is required. Such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, individual, or entity if requested by OWNER. If OWNER or ENGINEER alter due investigation has reasonable objection to any proposed Subcontractor, Supplier, individual or entity OWNER may, before the Notice of Award is given, request apparent Successful Bidder to submit a substitute, without an increase in the Bid.

12.2 If the apparent Successful Bidder declines to make any such substitution, the OWNER may determine such Bidder to be non-responsive and reject the Bid. Declining to make

requested substitution will not constitute grounds for forfeiture of the Bid Security of any Bidder. Any Subcontractor, Supplier, individual or entity so listed and against which OWNER and ENGINEER makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to OWNER and ENGINEER subject to revocation of such acceptance after the Effective Date of the Agreement as provided in Paragraph 6.06 of the General Conditions.

12.3 CONTRACTOR shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom CONTRACTOR has reasonable objection.

ARTICLE 13- PREPARATION OF BID

13.1 The Bid Form is included with the Bidding Documents; additional copies may be obtained from the ENGINEER. Bids shall be strictly in accordance with the prescribed form. Any modifications thereof or deviations there from may be considered as sufficient cause for rejection. Bids carrying riders or qualifications to the Bid being submitted may be rejected as irregular.

13.2 All blanks on the Bid Form shall be completed by printing in ink or by typewriter and the Bid signed. A Bid price shall be indicated for each Bid item listed therein, or the words "No Bid", "No Change", or "Not Applicable" entered.

13.3 Bids by a corporation must be executed in the corporate name by the president or a vice-president or other corporate officer who is authorized to bind the corporation, and the corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation must be shown below the signature. The Bid of a corporation, which is signed by a person other than a corporate officer, must be accompanied by evidence of authority to sign.

13.4 A bid by a partnership shall 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.

13.5 A Bid by a limited liability company shall be executed in the name of the firm by a member and accompanied by evidence of authority to sign. The State of formation of the firm and the official address of the firm must be shown below the signature.

13.6 A Bid by an individual shall show the Bidder's name and official address.

13.7 A Bid by a Joint Venture shall be executed by each Joint Venturer in the manner indicated on the Bid form. The official address of the Joint Venture must be shown below the signature.

13.8 All signatures are to be in ink and names must be typed or printed below the signature. The title of the person(s) executing the Bid shall be clearly indicated beneath the signature.

13.9 The Bid shall contain an acknowledgment of receipt of all Addenda (the numbers of which must be filled in on the Bid Form). Bids in which all issued addenda are not acknowledged will be considered incomplete and will not be read.

13.10 The address and telephone number for communications regarding the Bid must be shown.

13.11 Current Montana Contractor's registration number, if any, must be shown.

ARTICLE 14- BASIS OF BID; EVALUATION OF BIDS

14.1 Bids.

A. Bidders shall submit a Bid on a unit price and/or lump sum basis for each item of Work listed in the Bid schedule as provided in the Bid form. The Bid will not be considered unless the Bid Form contains prices for all unit price and/or lump sum items, and alternates, as shown on the Bid Form. Bids and totals shall be shown legibly in their proper locations. The total amount of the Bid shall be legibly written and numerically presented in the proper places and the Bid Form shall be manually signed.

B. The total of all estimated prices will be determined as the sum of the products of the estimated quantity of each item and the unit price bid for the item. The final quantities and Contract Price will be determined in accordance with paragraph 11.03 of the General Conditions.

C. Discrepancies between the multiplication of units of Work and unit price 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.

ARTICLE 15 - SUBMITFAL OF BID

15.1 Each prospective Bidder is to execute one copy of the Bidding Documents. The Bid form is to be completed and submitted with the Bid security along with additional documents, if any, as identified in the Special Provisions.

15.2 A Bid shall be submitted no later than the date and time prescribed and at the place indicated in the Invitation to Bid and shall be enclosed in an opaque sealed envelope, plainly marked with the Project title (and, if applicable, the designated portion of the Project for which the bid is submitted), the name and address of Bidder, and, shall be accompanied by the Bid Security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate envelope plainly marked on the outside with the notation "BID ENCLOSED". A mailed bid shall be addressed to the address shown in the Invitation To Bid.

15.3

A. The Bid will not be considered unless accompanied by proper Bid Security in accordance with Article 8 of these Instruction to Bidders.

B. Alternative Bids will not be considered unless called for.

C. Bids by telephone, telegraph, fax or other telecommunication systems will not be considered.

ARTICLE 16- MODIFICATION AND WITHDRAWAL OF BIDS

16.1 Bids may be modified or withdrawn by art appropriate document duly executed in the manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids as called for in the Invitation to Bid. Requests for modification or withdrawal must be written and must be signed in the same manner and by the same person(s) who signed the Bid.

16.2 If, within twenty-four hours after 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, if the Work is rebid or negotiated, that Bidder will be disqualified from further bidding on the Work.

ARTICLE 17- OPENING OF BIDS

17.1 Bids will be opened at the time set for opening in the Invitation to Bid and, unless obviously non-responsive, read aloud publicly. An abstract of the amounts of the base Bids and major alternates (if any) will be made available to Bidders after the opening of Bids.

ARTICLE 18 – BIDS TO REMAIN SUBJECT TO ACCEPTANCE

18.1 All bids will remain subject to acceptance for sixty (60) 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 the end of this period.

ARTICLE 19- AWARD OF CONTRACT

19.1 OWNER reserves the right to reject any and all Bids, including without limitation, nonconforming, non responsive, unbalanced or conditional Bids. OWNER further reserves the right to reject the Bid of any Bidder whom it finds, after reasonable inquiry and evaluation, to be non-responsible. 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. OWNER reserves the right to reject the Bid of any Bidder if OWNER believes it would not be in the best interest of the Project to make an award to that Bidder whether because 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.

19.2 More than one Bid for the same Work from an individual or entity under the same or different names will not be considered. Reasonable grounds for believing that any Bidder has an interest in more than one Bid for the Work may be cause for disqualification of the Bidder and the rejection of all Bids in which that bidder has an interest.

19.3 In evaluating Bids, OWNER will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices and other data, as may be requested in the Bid Form or prior to the Notice of Award.

19.4 In evaluating Bidders, OWNER will consider the qualifications of Bidders and may consider the qualifications and experience of Subcontractors, Suppliers, and other individuals or entities proposed for those portions of the Work for which the identity of Subcontractors, Suppliers, and other individuals or entities must be submitted as provided in the Special Provisions.

19.5 OWNER may conduct such investigations as OWNER deems necessary to establish the responsibility, qualifications and financial ability of Bidders, proposed Subcontractors, Suppliers, individuals or entities to perform the Work in accordance with the Contract Documents.

19.6 If the Contract is to be awarded, OWNER will award the Contract to the responsible bidder whose Bid, conforming with all material terms and conditions of the Bidding Documents, is lowest price, in the best interest of the Project, and other factors considered, The OWNER reserves the right to accept or reject the Bids, or portions of

Bids if denoted in the Bid as separate schedules, and to award more than one Bid or schedule for the same Bid if any of the aforementioned combination of Bids or schedules will be in the best interest of the OWNER. The OWNER reserves the right to cancel the award of any Agreement at any time before the complete execution of said Agreement by all parties without any liability against the OWNER.

ARTICLE 20 – CONTRACT SECURITY

20.1 Article 5 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth OWNER's requirements as to Performance Bond, Payment Bond, and certificates of insurance. When the Successful Bidder delivers the executed Agreement to OWNER, it must be accompanied by such Bonds and insurance.

ARTICLE 21- SIGNING OF AGREEMENT

21. 1 When OWNER gives a Notice of Award to the Successful Bidder, it shall be accompanied by the required number of unsigned counterparts of the Agreement with the other Contract Documents which are identified in the Agreement as attached thereto. Within fifteen (15) days thereafter, Successful Bidder shall sign and deliver at least six (6) counterparts of the Agreement and attached documents to OWNER. Within fifteen (15) days thereafter OWNER shall deliver one fully signed counterpart to Successful Bidder with a complete set of the Drawings and Specifications.

ARTICLE 22- STATE LAWS AND REGULATIONS

22.1 All applicable laws, ordinances and the rules and regulations of authorities having jurisdiction over construction of the project shall apply to the Contract throughout. State laws and ordinances which the CONTRACTOR must comply with, include but are not limited to, those involving workmen's compensation insurance, contractor registration, employment preference to Montana contractors and Montana residents, and gross receipts tax.1

END OF SECTION 00200

SECTION 00300

BID FORM

PROJECT IDENTIFICATION:

_____

(Name of Project)

_____

(Location)

(If applicable, Project or portion of Project for which Bid is submitted)

CONTRACT IDENTIFICATION AND NUMBER:

(Title, Number, etc. that appears elsewhere in Bidding Documents.)

THIS BID SUBMITTED TO:

_____

(Organization)

_____

(Street; P.O. Box)

_____

(City) (State) (Zip Code)

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 and furnish all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

2.01 Bidder accepts all of the terms and conditions of the Advertisement or Invitation to Bid, and Instructions to Bidders, including without limitations those dealing with the disposition of Bid Security. This Bid will remain subject to acceptance for sixty (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, other related data identified in the Bidding Documents, and the following Addenda, receipt of all which is hereby acknowledged:

Addendum No.	Addendum Date
_____	_____
_____	_____
_____	_____

B. Bidder has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work

C. Bidder is familiar with and is satisfied as to all 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 Special Provisions as provided in paragraph 4.02 of the General Conditions, and (2) reports and drawings of a Hazard Environmental Condition, if any, which has been identified in the Special Provisions 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 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 the 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, explorations, 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 this Bid is submitted.

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 person, firm or corporation to refrain from bidding; and Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over Owner.

The Bidder certifies that no official of the Owner, Engineer or any member of such officials immediate family, has direct or indirect interest in the pecuniary profits or Contracts of the Bidder.

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

UNIT PRICE SCHEDULE

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE

TOTAL ESTIMATED BID PRICE $_____
(Figures)

TOTAL ESTIMATED BID PRICE_____
(Words)

{ or }

LUMP SUM BID

TOTAL LUMP SUM BID PRICE$_____
(Figures)

TOTAL LUMP SUM BID PRICE_____
(Words)

A. Unit Prices have been computed in accordance with paragraph 11.03.B. of the General Conditions.

B. 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.

C. The undersigned agrees that the unit prices shall govern in checking the Bid, and should a discrepancy exist in the Total Estimated Price and Total Amount of Unit Prices Bid as listed above after extensions are checked and corrections made, if any, the Total Amount of Unit Prices Bid as corrected shall be used in awarding this Contract.

D. The OWNER reserves the right to reject any or all bids.

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

6.02 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.

7.01 The following documents are attached to and made a condition of the Bid:

A. Required Bid security in the amount of 10% of the maximum Bid price including alternates, if any, and in the form of a Bid Bond identified in the Instructions To Bidders.

{Specific for each project}

B. AGENCY required certifications. (Refer to Special Provisions, for AGENCY certifications and requirements.)

C. Any requirements per Special Provisions, including: (1) tabulation of Subcontractors, Suppliers, and others; (2) individuals and entities required to be identified in this Bid; (3) required Bidder qualifications statement with supporting data; and,

D. List other documents as pertinent.

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

SUBMITTED on _____ , _____.
(Date)

Montana Contractor's Registration # (if any) _____.

Employer's Tax ID No. _____

If BIDDER is:

An Individual: _____
(Name typed or printed)
By: _____
(Individual's Signature)
Doing business as: _____

Business Address: _____

_____

Phone No.: _____ FAX No: _____

A Partnership: _____
(Partnership Name)
By: _____
(Signature)
_____
(Name, typed or printed)
Business Address: _____

_____

Phone No.: _____ FAX No: _____

A Corporation: _____
(Corporation Name)

State of Incorporation: _____

Type(General Business, Professional, Service, Limited Liability): _____

By: _____
(Signature of person authorized to sign)

Title: _____

Attest: _____
(Signature)

Business Address: _____

_____

Phone No.: _____ FAX No: _____

Date of Qualification To Do Business Is: _____

_____
(Corporate Seal)

A Joint Venture: Each Joint Venture Must Sign

Joint Venturer Name: _____
(Name)

By: _____
(Signature of Joint Venture Partner)

Name: _____
(Name, printed or typed)

Title: _____

Business Address: _____

_____

Phone No.: _____ FAX No: _____

Joint Venturer Name:_____
(Name)

By:_____
(Signature of Joint Venture Partner)

Name:_____
(Name, printed or typed)

Title:_____

Business Address:_____

_____

Phone No.:_____FAX No: _____

Address of Joint Venture for Receipt of Official Communication:
Address:_____

_____

Phone No.:_____FAX No: _____

(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.)

END OF SECTION

SECTION 00900

FUNDING AGENCY SPECIAL PROVISIONS FOR MONTANA PUBLIC FACILITY PROJECTS

This section supplements Division 0 of the Montana Public Works Standard Specifications, Sixth Edition, dated April, 2010.

Included herein are supplemental general conditions that are required by Montana public facility funding programs or agencies listed in 1.1 below but are not included in the Montana Public Works Standard Specifications, Division 0.

ARTICLE 1. SPECIAL PROVISIONS

1.1 FUNDING AGENCIES

This project is being funded with funds from one or more of the following public facility funding programs or agencies:

Renewable Resource Grant and Loan Program (RRGL)
Treasure State Endowment Program (TSEP)
United States Department of Agriculture Rural Development (USDA/RD)
Community Development Block Grant Program (CDBG)
Drinking Water or Water Pollution Control State Revolving Fund Loan Program (SRF)

1.1.1 Applicable Funding Agency Special Provisions

In addition to Section 1.2 below, the following sections also apply as indicated:

_____Section 1.03 (Additional USDA/RD Requirements)
_____Section 1.04 (Additional CDBG Requirements)
__X__Section 1.05 (Additional SRF Requirements)
__X__Exhibit C (Federal Labor Standards Provisions)
__X__Exhibit D (DBE Forms)
__X__Exhibit E (American Iron and Steel Forms)

1.2 SPECIAL PROVISIONS FOR ALL FUNDING AGENCIES

The following requirements pertain to all of the funding programs or agencies listed in 1.01 above. If project funding sources include any of the programs or agencies listed, the following general requirements must be met in addition to those required in the Montana Public Works Standard Specifications, Division 0:

1.2.1 Reports, Information, and Access to Records

The contractor, at such times and in such form as required by the owner (defined herein as the entity for which the project is being constructed) shall furnish reports pertaining to the work or services undertaken pursuant to this contract, the costs and obligations incurred or to be incurred in connection therewith, and any other matters covered by this contract.

The owner and any federal, state or local governmental agency having a valid interest in this project shall be permitted by the contractor to have full access to and the right to examine pertinent documents of the contractor involving transactions related to this contract during the period of the project and for three (3) years from the date of final payment or until all findings have been resolved to the satisfaction of the funding agencies.

1.2.2 Contractor Eligibility and Certification Regarding Debarment

The contractor certifies that the contractor's firm and the firm's principals are not debarred, suspended, or otherwise ineligible to receive any Montana public works contracts or subcontracts pursuant to 18-2-432 (2), MCA.

For federally funded projects, the contractor certifies that the contractor's firm and the firm's principals are not debarred, suspended, voluntarily excluded, or otherwise ineligible for participation in federally assisted contracts under Executive Order 12549, "Debarment and Suspension" (24 CFR 24.505).

1.2.3 Contractor Registration and Worker's Compensation Requirements

Title 39, Chapter 9, Parts 1 and 2 MCA stipulate contractor registration requirements for the State of Montana. Pursuant to 39-9-201 MCA, each construction contractor must be registered with the Montana Department of Labor and Industry. In accordance with 39-9-102 MCA, "construction contractor" means a person, firm, or corporation that, in the pursuit of an independent business, offers to undertake, undertakes, or submits a bid for construction.

No bid shall be considered that does not carry the bidder's Montana Contractor's Registration Number on the bid form.

Registration forms and additional information may be obtained by contacting the Montana Department of Labor and Industry, 1805 Prospect Ave., P.O. Box 8011, Helena, MT 59604-8011, or by calling 406-444-7734.

The contractor must provide certification that workers' compensation insurance will be maintained as required by the Montana Workers' Compensation Act (39-71-101 MCA).

1.2.4 Minimum Wage Requirements

Unless superseded by federal law, 18-2-401 MCA and 18-2-402 MCA require that each employer pay, as a minimum, the rate of wages, including fringe benefits and zone pay applicable for the work being performed, as provided in the current Montana Prevailing Wage Requirements as determined by the Montana Department of Labor and Industry.

The current wage determination(s) must be included in the contract documents.

If the SRF Loan Program is funding the project in whole or in part, federal and state laws require that each employer pay, as a minimum, prevailing wages for each classification in accordance with the Federal Labor Standards Provisions (Davis-Bacon) **(Exhibit C)** or Montana Prevailing Wage Requirements, whichever is greater.

If the CDBG Program is funding the project in whole or in part, HUD Form 4010-Federal Labor Standards Provisions **(Exhibit B)** must be included in the contract documents.

1.2.5 Compliance With State and Federal Laws and Regulations

All applicable laws, ordinances, rules and regulations of authorities having jurisdiction over construction of the project shall apply to the contract throughout.

The contractor must comply with all applicable state and federal occupational disease and health and safety laws and regulations.

1.2.6 Project Sign

All projects will have a sign erected at a prominent location near the major portion of the work in plain view of the general public prior to submittal of the first pay estimate. The sign will generally conform to the following:

"The CONTRACTOR, or such contractor as the ENGINEER may designate, when construction begins, shall erect a sign constructed of 4'X8'X¾" exterior plywood (A-B) and shall be supported by and bolted to two (2) 4"X4" posts with the bottom of the sign at a point at least two (2) feet above the ground line. The project sign shall be maintained in a good condition until project completion.

The sign will be edged, painted and lettered as shown on **Exhibit A.** The letters shall be approximately three (3) inches in height.

The cost of the sign is incidental to the contract price. The sign shall remain the property of the owner.

A statement indicating all agencies participating in the financing of the project shall be included on the sign. The sign shall be subject to agency approval prior to being erected.

1.2.7 Gross Receipts Withholding Requirements

Pursuant to Section 15-50-206(2)(3), MCA, the owner is required to withhold one percent (1%) of all payments due the contractor and is required to transmit such moneys to the Montana Department of Revenue as part of the public contractor's license fee. In like fashion, the contractor is required to withhold one percent (1%) from payments to subcontractors.

1.2.8 Clean Air and Clean Water Acts, Executive Order 11738 and EPA Regulations:

If this Contract exceeds $100,000, Contractor shall comply with all applicable standards, orders or requirements issued under Section 306 of the Clean Air Act (42 USC 1857(h)); Section 508 of the Clean Water Act (33 USC 1368); Executive Order 11738; and Environmental Protection Agency Regulations (40 CFR Part 15).

1.3 ADDITIONAL SPECIAL PROVISIONS FOR USDA/RD

1.3.1 The following documents shall be attached to and made a condition of the contract documents for any project funded, in whole or in part, by Rural Development:

If the bid amount exceeds $10,000, signed Compliance Statement (RD 400-6). Refer to specific equal opportunity requirements set forth in paragraph 18.10 of the General Conditions;

If the bid amount exceeds $25,000, signed Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions (AD-1048); and

If the bid amount exceeds $100,000, signed RD Instruction 1940-Q, Exhibit A-1, Certification for Contracts, Grants, and Loans. Refer to paragraph 18.11 of the General Conditions.

1.3.2 Free and Open Competition

All procurement transactions will be conducted in a manner that provides maximum free and open competition. Examples of what are considered to be restrictive of competition include but are not limited to: employment preferences to Montana Bidders or Montana Contractors and Montana residents.

1.3.3 Contractor's Retainage

No payments will be made that would deplete the retainage nor place in escrow any funds that are required for retainage or invest the retainage for the benefit of the contractor.

1.4 ADDITIONAL SPECIAL PROVISIONS FOR CDBG

1.4.1 Equal Employment Opportunity Provisions

a. Equal Employment Opportunity (Executive Order 11246). During the performance of this contract, the Contractor agrees as follows:

(i) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, transfer, recruitment or recruitment advertising, layoff or termination, rates of pay or other forms of compensation, and selection of training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting officer setting forth the provisions of this nondiscrimination clause.

(ii) The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex or national origin.

(iii) The contractor will send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, a notice to be provided by the Department's contracting officer advising the labor union or workers' representative of the contractor's commitments under Section 202 of Executive Order 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(iv) The contractor will comply with all of the provision of Executive Order 11246 of September 24, 1965, and of the rules, regulations and relevant orders of the Secretary of Labor.

(v) The contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to its books, records and accounts by the Department and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations and orders.

(vi) In the event of the contractor's noncompliance with the non- discrimination clauses of this contract or with any of such rules, regulations or orders, this contract may be canceled, terminated or suspended in whole or in part and the contractor may be declared ineligible for further government contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rules, regulations, or order of the Secretary of Labor, or as otherwise provided by law.

(vii) The contractor will include the provisions of paragraphs 1 through 7 in every subcontract or purchase order unless exempted by rules, regulations or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order 11246 of September 24, 1965, so that each provision will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the Department may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, however, that in the event the contractor becomes involved in or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the Department, the contractor may request the United States to enter into such litigation to protect the interest of the United States.

b. Title VII of the Civil Rights Act of 1964. Provides that no person shall, on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance.

c. Section 109 of the Housing and Community Development Act of 1974. "No person in the United States shall on the ground of race, color, national origin or sex be excluded from participation in, be denied the

benefits of, or be subjected to discrimination under any program or activity funded in whole or in part with funds available under this title. Any prohibition against discrimination on the basis of age under the Age Discrimination Act of 1975 or with respect to an otherwise qualified handicapped individual as provided in Section 504 of the Rehabilitation Act of 1973 shall also apply to any such program or activity."

d. Section 3 of the Housing and Community Development Act of 1968. The contractor will ensure that to the greatest extent feasible opportunities for training and employment arising in connection with this CDBG-assisted project will be extended to project area residents. Further, the contractor will, to the greatest extent feasible, utilize business concerns located in or substantially owned by residents of the project area, in the award of contracts and purchase of services and supplies.

e. Minority Business Enterprise. Under the provisions of Executive Order 11246 contractors on federally-funded projects are required to take affirmative steps to assure that minority businesses are used when possible as sources of supplies, equipment, construction and services. Additionally, the contractor must document all affirmative steps taken to solicit minority businesses and forward this documentation along with the names of the minority subcontractors and suppliers to the owner upon request.

f. Nondiscrimination Provision in all Public Contracts Pursuant to Section 49-3-207, MCA, the Contractor certifies that all hiring will be on the basis of merit and qualifications and there will be no discrimination on the basis of race, color, religion, creed, political ideas, sex, age, marital status, physical or mental handicap, or national origin.

1.4.2 Uniform Federal Accessibility Standards (UFAS)

All design specifications for the construction of any building shall provide access to the physically handicapped in accordance with the Uniform Federal Accessibility Standards and HUD regulations 24 CFR Part 8, "Nondiscrimination Based on Handicap in Federally Assisted Programs and Activities of HUD".

1.4.3 Certification of Compliance with Federal Clean Air and Water Acts (Applicable to Federally Assisted Construction Contracts and Related Sub-Contracts Exceeding $100,000.)

During the performance of this contract, the contractor and all subcontractors shall comply with the requirements of the Clean Air Act, as amended, 42 USC 1857 et seq., the Federal Water Pollution Control Act, as amended, 33 USC 1251 et seq., and the regulations of the Environmental Protection Agency with respect thereto, at 40 CFR 15, as amended.

1.4.4 Preconstruction Conference

After the contract(s) have been awarded, but before the start of construction, a conference will be held for the purpose of discussion requirements on such matters as project supervision, coordination with city or county officials, on-site inspections, progress schedules and reports, payrolls, payments to contractors, contract change orders, insurance, safety and other items pertinent to the project. The contractor shall arrange to have all supervisory personnel connected with the project on hand to meet with representatives of the engineer and owner to discuss any problems anticipated.

1.4.5 Contract Pricing

The cost plus a percentage of cost method of contracting shall not be used.

1.5 ADDITIONAL SPECIAL PROVISIONS FOR SRF

1.5.1 Equal Employment Opportunity and Affirmative Action Requirements on Federally Assisted Construction Contracts

NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY (EXECUTIVE ORDER 11246)

1. The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Specifications" set forth herein.

2. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

Goals for minority participation in each trade 3.3%
Goals for female participation in each trade 6.9%

These goals are applicable to all the contractor's construction work (whether or not it is Federal or Federally assisted) performed in the covered area. If the contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the contractor also is subject to the goals for both its federally involved and nonfederally involved construction.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from contractor to contractor or from project to project for the sole purpose of meeting the contractor's goals shall be a violation of the contract, the Executive Order, and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

3. The contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of $10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address and telephone number for the subcontractor; employer identification number of the subcontractor, estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the contract is to be performed (see form on page 11).

4. As used in this Notice, and in the contract resulting from this solicitation, the "covered area" is the **Billings Economic Area**.

This notice shall be included in, and shall be a part of, all solicitations for offers and bids on all federal and federally assisted construction contracts or subcontracts.

EQUAL OPPORTUNITY CLAUSE

The Equal Opportunity Clause published at 41 CFR Part 60-1.4(b) is required to be included in, and is part of, all nonexempt federally assisted construction contracts and subcontracts. The Equal Opportunity Clause shall be considered to be a part of every contract and subcontract required by the regulations in this part to include such a clause, whether or not it is physically incorporated in such contracts.

In addition to the clause described above, all federal contracting officers, all applicants, and all non-construction contractors, as applicable, shall include the specifications set forth in this section in all federal and federally assisted construction contracts in excess of $10,000 to be performed in geographical areas designated by the

Director pursuant to §60-4.6 of this part and in construction subcontracts in excess of $10,000 necessary in whole or in part to the performance of non-construction Federal contracts and subcontracts covered under the Executive Order.

STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT SPECIFICATIONS (EXECUTIVE ORDER 11246)

1. As used in these specifications:
a. "Covered Area" means the geographical area described in the solicitation from which this contract resulted;
b. "Director" means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the Director delegates authority;
c. "Employer identification number" means the Federal Social Security number used on the employer's quarterly Federal Tax Return, U.S. Treasury Department Form 941.
d. "Minority" includes:
(i) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);
(ii) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin, regardless of race);
(iii) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands);
(iv) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

2. Whenever the contractor, or any subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of $10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.

3. If the contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area, (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each contractor or subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other contractors or subcontractors toward a goal in an approved Plan does not excuse any covered contractor's or subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.

4. The contractor shall implement the specific affirmative action standards provided in paragraphs (7)(a) through (p) of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the contractor should reasonably by able to achieve in each construction trade in which it has employees in the covered area. Covered Construction contractors performing construction work in geographical areas where they do not have a Federal or federally assisted construction contract shall apply the minority and female goals established for the geographical area where the work is being performed. Goals are published periodically in the federal register in notice form, and such notices may be obtained from any Office of Federal Contract Compliance Programs office or from Federal procurement contracting officers. The contractor is expected to make substantially uniform progress toward its goals in each craft during the period specified.

5. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.

6. In order for the non-working training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the contractor during the training period, and the contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.

7. The contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:

a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the contractor's employees are assigned to work. The contractor, where possible, will assign two or more women to each construction project. The contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.

b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.

c. Maintain a current file of the names, addresses, and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the contractor by the union or, if referred, not employed by the contractor, this shall be documented in the file with the reason therefor, along with whatever additional actions the contractor may have taken.

d. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.

e. Develop on-the-job training opportunities and/or participate in training programs for the areas which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the contractor's employment needs, especially those programs funded or approved by the Department of Labor. The contractor shall provide notice of these programs to the sources compiled under (7)(b) above.

f. Disseminate the contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with on-site supervisory personnel such as superintendents, general foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

h. Disseminate the contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the contractor's EEO policy with other contractors and subcontractors with whom the contractor does or anticipates doing business.

i. Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a contractor's workforce.

k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.

l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.

m. Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the contractor's obligations under these specifications are being carried out.

n. Ensure that all facilities and company activities are nonsegregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

p. Conduct a review, at least annually, of all supervisor's adherence to and performance under the contractor's EEO policies and affirmative action obligations.

8. Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (7)(a) through (p). The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under (7)(a) through (p) of these specifications provided that the contractor actively participates in the group, makes every effort to assure that the group has positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the contractor. The obligation to comply, however, is the contractor's and failure of such a group to fulfill an obligation shall not be a defense for the contractor's noncompliance.

9. A single goal for minorities and a separate single goal for women have been established. The contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the contractor has achieved its goals for women generally, the contractor may be in violation of the Executive order if a specific minority group of women is under-utilized).

10. The contractor shall not use the goals and timetables of affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

11. The contractor shall not enter into any subcontract with any person or firm debarred from government contracts pursuant to Executive Order 11246.

12. The contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.

13. The contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph (7) of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.

14. The contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the government and to keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program)

CONTRACTOR'S NAME, ADDRESS & TELEPHONE NUMBER

_____

_____

_____

Return to:
USDOL/ESA/OFCCP
Denver District Office
1999 Broadway-Suite 1177
P.O. BOX 46550
Denver, CO 80201-6550

CONTRACTOR' EMPLOYER ID NUMBER:_____

CONTRACT INFORMATION

PROJECT AND LOCATION:				
Dollar Amount of Contract	Estimated Start Date	Estimated Completion Date	Contract No.	Geographical Area

NOTIFICATION OF SUBCONTRACTS AWARDED (>$10,000)

Subcontractors Name, Address, & Phone Number	Employer ID Number of Subcontractor	Estimated $ Amount of Subcontract	Estimated Start Date	Estimated Completion Date

1.5.2 Guidance for Utilization of Small, Minority, and Women Business Enterprises (DBE) Requirements of 40 CFR 35.3145(D)

The contractor shall not discriminate on the basis of race, color, national origin or sex in the performance of this contract. The contractor shall carry out applicable requirements of 40 CFR part 33 in the award and administration of contracts awarded under EPA financial assistance agreements. Failure by the contractor to carry out these requirements is a material breach of this contract which may result in the termination of this contract or other legally available remedies.

A. REQUIREMENTS

1. The recipient and prime contractor will exercise good faith efforts to attract and utilize small, minority, and women's business (DBEs) enterprises primarily through outreach, recruitment, and race/gender neutral activities. At a minimum, the recipient and project bidders will follow the six affirmative steps below:

a. Ensure DBEs are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities including placing DBEs on solicitation lists and soliciting them whenever they are potential sources;

b. Make information on forthcoming opportunities available to DBEs and arrange time frames and establish delivery schedules, when the requirements of the work permit, which will encourage participation by DBEs;

c. Consider in the contracting process whether firms competing for large contracts could subcontract with DBEs; including dividing total requirements, when economically feasible, into small tasks or quantities to permit maximum participation by DBEs;

d. Encourage contracting with a consortium of DBEs when a contract is too large for one of these firms to handle individually;

e. Using the services of the Small Business Administration and the Office of Minority Business Enterprise of the U.S. Department of Commerce, as appropriate; and

f. Require a. through e. to be taken if subcontracts are awarded.

B. FAIR SHARE OBJECTIVE

1. The fair share objective for this project is 2 %MBE's and 3 % WBE's.

C. DEFINITIONS

1. Minority Business Enterprise (MBE) is a business concern which is:

a. Certified as socially and economically disadvantaged by the Small Business Administration;

(1) Socially disadvantaged individuals are those who have been subjected to racial or ethnic prejudice or cultural bias because of their identity as a member of a group without regard to their individual qualities.

(2) Economically disadvantaged individuals are those socially disadvantaged individuals whose ability to compete in the free enterprise system is impaired due to diminished capital and credit opportunities, as compared to others in the same business area who are not socially disadvantaged. In determining the degree of diminished credit and capital opportunities, the Small Business Administration shall consider, but not be limited to, the assets and net worth of such socially disadvantaged individuals. Individuals who certify that they are members of named groups (Black Americans, Hispanic Americans, Native Americans, Asian-Pacific Americans, Asian-Indian Americans), are to be considered socially and economically disadvantaged. Economically and socially disadvantaged individuals are deemed to include women.

b. Certified as a minority business enterprise by a State or Federal agency; or

c. An independent business concern which is at least 51 percent owned and controlled by minority group member(s).

(1) A minority group member is an individual who is a citizen of the United States and one of the following:

(a) Black American:

(b) Hispanic American (with origins from Puerto Rico, Mexico, Cuba, South or Central America)

(c) Native American (American Indian, Eskimo, Aleut, native Hawaiian); or

(d) Asian-Pacific American (with origins from Japan, China, the Philippines, Vietnam, Korea, Samoa, Guam, the U.S. Trust Territories of the Pacific, Northern Marianas, Laos, Cambodia, Taiwan or the Indian subcontinent).

(2) In order to satisfy the third criteria of the MBE definition, the minority ownership's interest must be real, substantial and continuing. Such interest is characterized by:

(a) Risk of loss/share of profit commensurate with the proportional ownership; and

(b) Receipt of the customary incidents of ownership, such as compensation (i.e. salary and other personnel compensation).

(3) A minority owner must have and exercise control of the business decisions. Characteristics of control include, but are not limited to:

(a) Authority to sign bids and contracts;

(b) Decisions in price negotiations;

(c) Incurring liabilities for the firm;

(d) Final staffing decisions;

(e) Policy-making; and

(f) General company management decisions.

(4) Only those firms performing a useful business function according to custom and practice in the industry are qualified as MBEs. Acting merely as a passive conduit of funds to some other firm where such activity is unnecessary to accomplish the project does not constitute a "useful business function according to custom and practice in the industry." The purpose of this approach is to discourage the use of MBE "fronts" and limit the creation of an artificial supplier and broker marketplace.

2. Women's Business Enterprise (WBE) is a business which is certified as such by a State or Federal agency, or which meets the following definition:

"A women's business enterprise is an independent business concern which is at least 51 percent owned by a woman or women, who also control and operate it. Determination of whether a business is at least 51 percent owned by a woman or otherwise qualified WBE which is 51 percent owned by a married woman in a community property State will not be disqualified because her husband has a 50 percent interest in her share. Similarly, a business which is 51 percent owned by a married man and 49 percent owned by an unmarried woman will not become a qualified WBE by virtue of his wife's 50 percent interest in his share of the business."

As in the case of a MBE, only United States citizens will be deemed to be WBEs. Similar to the MBE criteria, WBE should meet the criteria cited in subparagraphs C.1.c.(2), (3), and (4).

3. Fair Share or Fair Share Objective A fair share or a fair share objective is an amount of funds reasonably commensurate with the total project funding and the availability of qualified MBEs and WBEs, taking into account experience on EPA-funded projects and other comparable projects in the area. A fair share objective does not constitute an absolute requirement, but a commitment on the part of the bidder to exercise good faith *efforts* as defined in this section to use MBEs and WBEs to achieve the fair share objective.

4. Small Business (SBE). Any business entity, including its affiliates, that is independently owned and operated, and not dominant in its field of operations in which it is bidding on Government contracts, and qualified as a small business under the criteria and size standards set forth in 13 CFR Part 121.

5. Small Business in a Rural Area. A small business in a rural area (SBRA) is a business entity meeting the definition of a small business, and is located and conducts its principal operations in a geographical area (county) listed in the Small Business Administration's Listing of Non-Metropolitan Counties by State.

6. Recipient. A party receiving SRF financial assistance.

7. Project. The work financed through an SRF loan.

8. Bidder. A party seeking to obtain a contract with a recipient through a competitive, advertised, sealed bid process.

9. Offeror. A party seeking to obtain a contract with a recipient through a negotiative procurement process.

10. Prime Contractor. A party that has obtained a contract with a recipient through a competitive, advertised, sealed bid process.

11. Good Faith Efforts. Good faith efforts by a recipient, prime contractor, and/or bidder/offeror means efforts to attract and utilize SBEs, MBEs, and WBEs (DBEs) primarily through outreach, recruitment, and race/gender neutral activities. The following are examples of activities to assist recipients, prime contractors and/or bidders/offerors to comply with good faith efforts.

a. Include qualified SBEs, MBEs, and WBEs on solicitation lists.

(1) Maintain and update a listing of qualified SBEs, MBEs, and WBEs and SBRAs that can be solicited for supplies, construction and/or services.

(2) Provide listings to all interested parties who requested copies of the bidding or proposing documents.

(3) Contact appropriate sources within your geographic area and State to identify qualified MBEs and WBEs for placement on your minority and women's business listings.

(4) Utilize other MBE/WBE listings such as those of the State's Minority Business Office, the Small Business Administration, Minority Business Development Agency, US EPA- Office of Small and Disadvantaged Business Utilization (OSDBU) and the Department of Transportation.

(5) Have the State environmental agency personnel review this solicitation list.

b. Ensure that SBEs, MBEs, and WBEs are solicited.

(1) Conduct meetings, conferences, and follow-ups with SBEs, MBEs, WBEs, and SBRAs, small, minority and/or women's business associations, minority media, etc., to inform these groups of opportunities to provide supplies, services, and construction.

(2) MBE utilization is facilitated if the recipient or prime contractor advertises through the minority media. Such advertisements may include, but are not limited to, contracting and subcontracting opportunities, hiring and employment, or any other matter related to the project.

(3) Conduct pre bid, pre-solicitation, and post-award conferences to ensure that consultants, suppliers, and builders solicit SBEs, MBEs, WBEs, and SBRAs.

(4) Provide bidders and offerors with listings of qualified SBEs, MBEs, WBEs, and SBRAs and establish that a fair share of contracts/procurements should be awarded to these groups.

(5) Advertise in general circulation, trade publications, State agency publications of identified source, minority or women's business focused media, etc., concerning contracting opportunities on your projects. Maintain a list of minority or women's business-focused publications that may be utilized to solicit MBEs or WBEs.

(6) Provide interested SBEs, MBEs, WBEs, or SBRAs with adequate information about plans, specifications, timing and other requirements of the proposed projects.

(7) Provide SBE, SBRA, MBE or WBE trade organizations with succinct summaries of solicitations.

(8) Notify SBEs, MBEs, WBEs, or SBRAs of future procurement opportunities so that they may establish bidding solicitations and procurement plans.

c. Make information on forthcoming opportunities available to DBEs and arrange time frames and establish delivery schedules, where requirements of the work permit, which will encourage participation by SBEs, MBEs, WBEs and SBRAs.

(1) Consider lead times and scheduling requirements often needed by SBE, MBE, WBE or SBRA participation.

(2) Develop realistic delivery schedules which may provide for greater SBE, MBE, WBE or SBRA participation.

(3) Whenever possible, post solicitations for bids or proposals for a minimum of 30 calendar days before the bid or proposal closing date

d. Consider in the contracting process whether firms competing for large contracts could subcontract with DBEs; including dividing total requirements when economically feasible, into small tasks or quantities to permit maximum participation of SBEs, MBEs, WBEs and SBRAs.

(1) Perform an analysis to identify portions of work that can be divided and performed by qualified SBEs, MBEs, WBEs and SBRAs.

(2) Scrutinize the elements of the total project to develop economically feasible units of work that are within the bonding range of SBEs, MBEs, WBEs and SBRAs.

(3) Analyze bid packages for compliance with the good faith efforts to afford SBEs, MBEs, WBEs and SBRAs maximum participation.

(4) Encourage contracting with a consortium of SBEs, MBEs, WBEs, and SBRAs when a contract is too large for one of these firms to handle individually

e. Use the services and assistance of the Small Business Administration and the Minority Business Development Agency of the US Department of Commerce, as appropriate.

(1) Use the services of outreach programs sponsored by the Minority Business Development Agency and/or the Small Business Administration to recruit bona fide firms for placement on SBEs', MBEs', WBEs', or SBRAs' bidders lists to assist these firms in the development of bid packaging.

(2) Seek out Minority Business Development Centers (MBDCs) to assist recipients and prime contractors in identifying MBEs for potential work opportunities on this project.

f. If the prime contractor awards subcontracts, require the prime contractor to take the steps in paragraphs a. through e. of this section.

D. ADDITIONAL CONTRACT PROVISIONS

1. The prime contractor must pay its subcontractors for satisfactory performance no more than 30 days from the prime contractor's receipt of payment from the owner.

2. The prime contractor must notify the owner in writing prior to any termination of a DBE subcontractor for convenience.

3. If a DBE subcontractor fails to complete work under the subcontract for any reason, the prime contractor must employ the six good faith efforts if soliciting a replacement subcontractor, even if the fair share objectives have already been achieved.

4. The prime contractor must distribute EPA Form 6100-2, DBE Program Subcontractor Participation Form (see Exhibit D) to all of its DBE subcontractors. The subcontractors can submit completed forms to the EPA DBE Coordinator (address included on the form) at any time during the project period of performance.

5. The prime contractor must have its DBE subcontractors complete EPA Form 6100-3, DBE Program Subcontractor Performance Form (see Exhibit D) and include completed forms in its bid / proposal package or submit the form within seven (7) calendar days of the bid opening.

6. The prime contractor must complete EPA Form 6100-4, DBE Program Subcontractor Utilization Form (see Exhibit D) and submit as part of its bid or proposal package or submit the form within seven (7) calendar days of the bid opening.

7. Failure to submit the requested information (Form 6100-3 and Form 6100-4) within seven (7) calendar days of the bid opening may be viewed as non-responsive.

8. Additional DBE forms can be downloaded at http://www.epa.gov/osdbu/grant.htm

E. REPORTING

1. Bidders/offerors shall demonstrate compliance with "good faith" efforts in order to be deemed responsible. At a minimum this will include completing EPA forms 6100-3 and 6100-4 as discussed above. Additional efforts could include maintaining phone/mail logs (see attached MBE/WBE Subcontractor Solicitation Sheet), submitting proof of DBE solicitation advertisements, completion of the on-line DBE quote request form located at http://www.mdt.mt.gov/business/contracting/civil/quotereq.shtml, etc.. The owner may specify other methods of demonstrating compliance.

2. Documentation of a "good faith" effort should be submitted with the bid.

MBE/WBE SUBCONTRACTOR SOLICITATION INFORMATION						
Name, Address & Phone No. of Subcontractor Contacted	Date Request for Quote Sent	Description of Work Offered	Date of Phone Follow-up & Person Contacted	Amount of Quote or Reason for Not Quoting*	Quote Accepted? If not, list reason for rejection	Indicate MBE, WBE, or other Subcontractor

* - Use additional sheets if necessary.

The undersigned hereby certifies that the above information is true and correct:

Contractor:_____

By:_____ _____

Signature Title

Date:_____

1.5.3 Certification Regarding Debarment, Suspension and Other Responsibility Matters

A. INSTRUCTIONS

Under Executive Order 12549, an individual or organization debarred or excluded from participation in Federal assistance or benefit programs may not receive any assistance award under a Federal program, or a subagreement thereunder for $25,000 or more. The status of prospective individuals or organizations can be checked at:

http://www.sam.gov/

A prospective prime contractor must submit a completed certification (see form on the following page) or explanation to the project owner for the project. Each prospective subcontractor must submit a completed certification or explanation to the prime contractor for the project.

B. HOW TO OBTAIN FORMS

Additional forms may be obtained from the State or may be reproduced.

SRF Project Number

United States Environmental Protection Agency
Washington, DC 20460

Certification Regarding Debarment, Suspension, and Other Responsibility Matters

The prospective participant certifies to the best of its knowledge and belief that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

(b) Have not within a three year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a government entity (Federal, State, or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and

(d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State, or local) terminated for cause or default.

I understand that a false statement on this certification may be grounds for rejection of this proposal or termination of the award. In addition, under 18 USC Sec. 1001, a false statement may result in a fine of up to $10,000 or imprisonment for up to 5 years, or both.

Typed Name & Title of Authorized Representative

Signature of Authorized Representative Date

_____I am unable to certify to the above statements. My explanation is attached.

1.5.4 Prohibition against Listed Violated Facilities

A. REQUIREMENTS

(1) To comply with all the requirements of section 114 of the Clean Air Act, as amended (42 U.S.C. 1857, et seq., as amended by Pub. L. 92-604) and section 308 of the Clean Water Act (33 U.S.C. 1251, as amended), respectively, which relate to inspection, monitoring, entry, reports, and information, as well as other requirements specified in section 114 and section 308 of the Air Act and the Water Act, respectively, and all regulations and guidelines issued thereunder before the award of this contract.

(2) That no portion of the work required by this prime contract will be performed in a facility listed on the Environmental Protection Agency list of violating facilities on the date when this contract was awarded unless and until the EPA eliminates the name of such facility or facilities from the listing.

(3) To use his best efforts to comply with clean air and clean water standards at the facilities in which the contract is being performed.

(4) To insert the substance of the provisions of this clause, including this paragraph (4), in any nonexempt subcontract.

B. DEFINITIONS

(1) Air Act means the Clean Air Act, as amended (42 U.S.C. 1857 et seq.).

(2) Water Act means the Clean Water Act, as amended (33 U.S.C. 1251 et seq.).

(3) Clean Air Standards means any enforceable rules, regulations, guidelines, standards, limitations, orders, controls, prohibitions, or other requirements which are contained in, issued under, or otherwise adopted under the Air Act or Executive Order 11738, an applicable implementation plan as described in section 110 (d) of the Air Act (42 U.S.C. 1857c-5(d)), an approved implementation procedure or plan under section 111 (c) or section 111(d), or an approved implementation procedure under section 112(d) of the Air Act (42 U.S.C. 1857c-7(d)).

(4) Clean Water Standards means any enforceable limitation, control, condition, prohibition, standard, or other requirement which is promulgated under the Water Act or contained in a permit issued to a discharger by the Environmental Protection Agency or by a State under an approved program, as authorized by section 402 of the Water Act (33 U.S.C. 1342), or by a local government to ensure compliance with pretreatment regulations as required by section 307 of Water Act (33 U.S.C. 1317).

(5) Compliance means compliance with clean air or water standards. Compliance shall also mean compliance with a schedule or plan ordered or approved by a court of competent jurisdiction, the Environmental Protection Agency in accordance with the requirements of the Air Act or Water Act and regulations.

(6) Facility means any building, plant, installation, structure, mine, vessel, or other floating craft, location, or site of operations, owned, leased, or supervised by a contractor or subcontractor, to be used in the performance of a contract or subcontract. Where a location or site of operations contains or includes more than one building, plant, installation, or structure, the entire location or site shall be deemed to be a facility except where the Director, Office of Federal Activities, Environmental Protection Agency, determines that independent facilities are located in one geographical area.

1.5.5 Discovery of Archaeological and other Historical Items

In the event of an archaeological find during any phase of construction, the following procedure will be followed:

(1) Construction shall be halted, with as little disruption to the archaeological site as possible.

(2) The Contractor shall notify the Owner who shall contact the State Historical Preservation Officer.

(3) The State Historical Preservation Officer may decide to have an archaeologist inspect the site and make recommendations about the steps needed to protect the site, before construction is resumed.

(4) The entire event should be handled as expediently as possible in order to hold the loss in construction time to a minimum while still protecting archaeological finds.

A similar procedure should be followed with regard to more recent historical resources. Should any artifacts, housing sites, etc., be uncovered, the same procedure should be followed as for an archaeological find.

In the event archaeological/historical data are evaluated to meet National Register criteria, the Advisory Council on Historic Preservation may be notified and asked to comment.

1.5.6 Williams-Steiger Occupational Safety and Health Act of 1970

A. AUTHORITY

(1) The contractor is subject to the provisions of the Williams-Steiger Occupational Safety and Health Act of 1970.

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

a. Williams-Steiger Occupational Safety and Health Act of 1970, Public Law 94-596;

b. Part 1910 - Occupational Safety and Health Standards, Chapter XVII of Title 29, Code of Federal Regulations;

c. Part 1926 - Safety and Health Regulations for Construction, Chapter XVII of Title 29, Code of Federal Regulations.

B. SAFETY AND HEALTH PROGRAM REQUIREMENTS

(1) This project, its prime contractor and its subcontractors, shall at all times be governed by Chapter XVII of Title 29, Code of Federal Regulations, Part 1926 - Safety and Health Regulations for Construction (29 CFR 22801), as amended to date.

(2) To implement the program and to provide safe and healthful working conditions for all persons, general project safety meetings will be conducted at the site at least once each month during the course of construction, by the construction superintendent or his/her designated safety officer. Notice of such meeting shall be issued not less than three (3) days prior, stating the exact time, location, and agenda to be included. Attendance by the owner, architect, general foreman, shop steward(s), and trades, or their designated representatives, witnessed in writing as such, shall be mandatory.

(3) To further implement the program, each trade shall conduct a short gang meeting, not less than once a week, to review project safety requirements mandatory for all persons during the coming week. The gang foreman shall report the agenda and specific items covered to the project superintendent, who shall incorporate these items in his/her daily log or report.

(4) The prime contractor and all subcontractors shall immediately report all accidents, injuries, or health hazards to the owner and architect, or their designated representatives, in writing. This shall not obviate any mandatory reporting under the provisions of the Occupational Safety and Health Act of 1970.

(5) This program shall become a part of the contract documents and the contract between the owner and prime contractor, prime contractor and all subcontractors, as though fully written therein

1.5.7 Wage Determination

The Contractor and all subcontractors shall pay for all labor employed at no less than the minimum standard prevailing rate of wages for each classification, which shall be the higher of either the Montana Prevailing Wage Rates or the Federal Davis-Bacon Prevailing Wage Rates.

Please refer to EXHIBIT C for Federal Labor Standards Provisions for Federally Assisted Construction Contracts.

If you have a question about complying with the prevailing wage regulations (occupations, payroll forms, payment of fringe benefits, travel or per diem, etc.), you should contact the Labor Standards Bureau Wage and Hour Unit of the Montana Department of Labor and Industry or visit their website: http://dli.mt.gov/

1.5.8 Access

1. The recipient must insure that representatives of the Environmental Protection Agency and the State will have access to project records and the project work whenever it is in preparation or progress and must provide proper facilities for such access and inspection. The recipient must allow the Regional Administrator, the Comptroller General of the United States, the State agency, or any authorized representative, to have access to any books, documents, plans, reports, papers, including records of contractors which are pertinent to the project for the purpose of making audit, examination, excerpts, copies, and transcriptions thereof. The recipient must insure that a party to a subagreement will afford access to such project work, sites, documents, and records.

1.5.9 Construction Site Erosion and Sediment Control Measures

Every effort shall be made by the contractors and subcontractors to prevent and correct problems associated with erosion and runoff processes which could occur during and after project construction. The efforts should be consistent with applicable local ordinances, the EPA Nonpoint Source Pollution Control Guidance and Department of Environmental Quality Stormwater Management Plan.

Wherever appropriate, the contractor's efforts shall reflect the following engineering principles:

1. When appropriate, land grading and excavating should be kept at a minimum to reduce the possibility of creating runoff and erosion problems which require extensive control measures.

2. Whenever possible, topsoil should be removed and stockpiled before grading begins.

3. Land exposure should be minimized in terms of area and time.

4. Exposed areas subject to erosion should be covered as quickly as possible by means of mulching or vegetation.

5. Natural vegetation should be retained whenever feasible.

6. Appropriate structural or agronomic practices to control runoff and sedimentation should be provided during and after construction.

7. Early completion of stabilized drainage systems (temporary and permanent systems) will substantially reduce erosion potential.

8. Roadways and parking lots should be paved or otherwise stabilized as soon as feasible.

9. Clearing and grading should not be started until a firm construction schedule is known and can be effectively coordinated with the grading and clearing activity.

1.5.10 American Iron and Steel (AIS) Requirements

On January 17, 2014, H.R. 3547, "Consolidated Appropriations Act, 2014," (Public Law 113-76, Section 436) was enacted. This law provides appropriations for both the Clean Water State Revolving Fund and the Drinking Water State Revolving Fund for federal fiscal year 2014, while adding an American iron and steel requirement to these already existing programs.

The Act includes a provision to for "Use of American Iron and Steel," in Section 436(a)(1). None of the funds made available by a State water pollution control revolving fund as authorized by title VI of the Federal Water Pollution Control Act (33 U.S.C. 1381 et seq.) or made available by a drinking water treatment revolving loan fund as authorized by section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j-12) shall be used for a project for the construction, alteration, maintenance, or repair of a public water system or treatment works unless all of the iron and steel products used in the project are produced in the United States.

The term "iron and steel products" means the following products made primarily of iron or steel: lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, rebar, and construction materials. The iron and steel products used in the project must comply with the American Iron and Steel requirements of Section 436 of the Consolidated Appropriations Act of 2014 (P.L. 113-76) and as further interpreted by applicable EPA guidance (see http://water.epa.gov/grants_funding/aisrequirement.cfm).

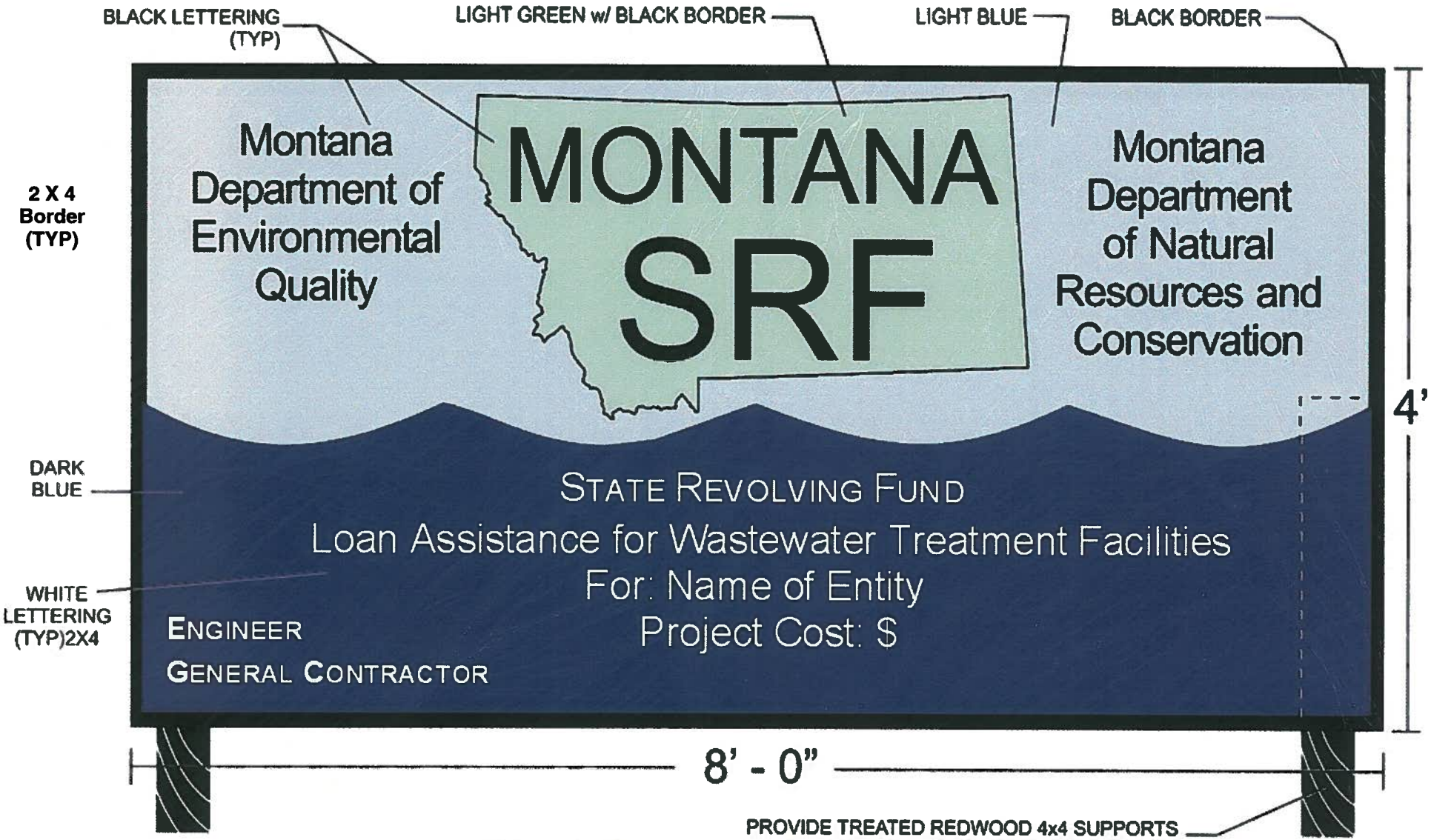
The Contractor will be required to provide the Owner with a certifying statement upon project completion that all of the qualifying iron and steel components used in the project are produced in the United States. Contractor shall ensure that all subcontractors and suppliers on the project have met the AIS requirements. Certification forms for the contractor and subcontractors/suppliers are found in Exhibit E of Section 00900.

A waiver from the American Iron and Steel requirements may be issued by the Administrator of the Environmental Protection Agency if it is found that: 1) applying the American Iron and Steel provisions would be inconsistent with the public interest; 2) iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or 3) inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than 25 percent. Waiver requests must be submitted to the state for review and submittal to the EPA.

1.6 Exhibits

EXHIBIT A (Required for All Projects)

Project Sign Detail



PROJECT SIGN

EXHIBIT B (Required for CDBG Projects)

HUD Form 4010-Federal Labor Standards Provisions

EXHIBIT C (Required for SRF Projects)

Federal Labor Standards Provisions
For
Federally Assisted Construction Contracts
United States Department of Labor
CFR Code of Federal Regulations Pertaining to ESA
(Federal Davis-Bacon Wages)

Federal Labor Standards Provisions
For
Federally Assisted Construction Contracts
United States Department of Labor
CFR Code of Federal Regulations Pertaining to ESA
(Federal Davis-Bacon Wages)

Title 29, Chapter I, Part 5, Subpart A (29 CFR 5.5)

Section Name: Contract provisions and related matters.

(a) The Recipient shall assure that the subrecipient(s) shall insert in full in any contract in excess of $2,000 which is entered into for the actual construction, alteration or repair, including painting and decorating, of a treatment work under the CWSRF or a construction project under the DWSRF financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated), and which is subject to the labor standards provisions of any of the acts listed in § 5.1 or the applicable FY appropriation requirements, the following clauses:

(1) Minimum wages. (i) All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in Sec. 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(ii)(A) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:
(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and
(2) The classification is utilized in the area by the construction industry; and
(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the

contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii) (B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(2) Withholding. The loan or grant recipient shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the contract, the (Agency or SRF program) may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) Payrolls and basic records. (i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the

registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the SRF program if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant, sponsor, or owner, as the case may be, for transmission to the SRF program. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at http://www.dol.gov/whd/forms/wh347instr.htm or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the SRF program if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit them to the applicant, sponsor, or owner, as the case may be, for transmission to the SRF program, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sponsoring government agency (or the applicant, sponsor, or owner).

(B) Each payroll submitted shall be accompanied by a ``Statement of Compliance,'' signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under Sec. 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under Sec. 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the ``Statement of Compliance'' required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the loan or grant recipient or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) Apprentices and trainees

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually

registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

(5) Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

(6) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the SRF program may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) Contract termination: Debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

(9) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

(10) Certification of eligibility. (i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

(b) Contract Work Hours and Safety Standards Act. The Agency Head shall cause or require the contracting officer to insert the following clauses set forth in paragraphs (b)(1), (2), (3), and (4) of this section in full in any contract in an amount in excess of $100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by Sec. 5.5(a) or 4.6 of part 4 of this title. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (b)(1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (b)(1) of this section, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.

(3) Withholding for unpaid wages and liquidated damages. The loan or grant recipient shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (b)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (b)(1) through (4) of this section.

(c) In addition to the clauses contained in paragraph (b), in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in Sec. 5.1, the Agency Head shall cause or require the contracting officer to insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Agency Head shall cause or require the contracting officer to insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the loan or grant recipient and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

http://www.dol.gov/dol/allcfr/ESA/Title_29/Part_5/29CFR5.5.htm

EXHIBIT D (Required for SRF Projects)

DBE Forms 6100-2, 6100-3, and 6100-4

DBE REQUIREMENTS

BIDDER'S attention is directed to Section 00900 (Funding Agency Special Provisions for Montana Public Facility Projects) of these Contract Documents. The successful BIDDER shall comply with all applicable articles therein.

DBE solicitation requirements are located in Section 1.05.2 [Guidance for Utilization of Small, Minority, and Women Business Enterprises (DBE) Requirements of 40 CFR 35.3145 (D)] of Section 00900. An online DBE quote request form is available to BIDDERS at http://www.mdt.mt.gov/business/contracting/civil/quotereq.shtml. The BIDDER should fill out and submit the quote request form as early in the bidding period as possible to allow sufficient time for qualified DBE firms to respond. A DBE must be certified as such by a state or federal agency (e.g., the Small Business Administration, the Department of Transportation, or EPA) or by a state, local, or independent private organization, provided their criteria match those under section 8(a) (5) and (6) of the Small Business Act and Small Business Administration's 8(a) Business Development Program Regulations. **Self certification of DBEs is not allowed.** BIDDERS must complete: i) EPA Form 6100-4 (DBE Subcontractor Utilization Form), for contractor's actual and anticipated use of identified certified DBE subcontractors, and ii) completed EPA Form(s) 6100-3, if any DBE subcontractors are obtained. Inadequate DBE solicitation efforts by the BIDDER may be grounds for the MDEQ State Revolving Fund program to withhold funds for the project and withhold authorization to award the construction contract. In accordance with Section 00900 Article 1.05.2, **failure to submit evidence showing a "good faith effort" may cause the bid to be rejected as non-responsive.**

DEBARMENT CERTIFICATION

BIDDER'S attention is directed to Section 1.05.3 (Certification Regarding Debarment, Suspension and Other Responsibility Matters) of Section 00900 with respect to Certification Regarding Debarment. Federal funding is being utilized on this project and the successful bidder must provide the debarment certification statement at the time of bid opening with the bid and other forms required.

EQUAL EMPLOYMENT OPPORTUNITY

BIDDER'S attention is directed to the requirement for ensuring that employees and applicants for employment are not discriminated against because of their race, color, religion, national origin, sex, marital status, age, or political ideas. Bidders on this work will be required to comply with the President's Executive Orders No. 11246 as amended, 11458, 11518, and 11625.

COMPLIANCE WITH WAGE RATE REQUIREMENTS

Under all Schedules of this Contract with the Owner, the Contractor and all subcontractors shall pay for all labor employed at no less than the minimum standard prevailing rate of wages for each classification, which shall be the higher of either the Montana Prevailing Wage Rates or the Federal Davis-Bacon Prevailing Wage Rates, as appended.

AMERICAN IRON AND STEEL (AIS) REQUIREMENTS

BIDDER'S attention is directed to ARTICLE 1.5.10 of Section 00900 with respect to American Iron and Steel (AIS) requirements. All of the iron and steel products used in the project must be produced in the United States. The term "iron and steel products" means the following products made primarily of iron or steel: lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, rebar, and construction materials. The iron and steel products used in the project must comply with the American Iron and Steel requirements of Section 436 of the Consolidated Appropriations Act of 2014 (P.L. 113-76) and as further interpreted by applicable EPA guidance (see http://water.epa.gov/grants_funding/aisrequirement.cfm).

The Contractor will be required to provide the Owner with a certifying statement upon project completion that all of the qualifying iron and steel components used in the project were produced in the United States. Contractor shall ensure that all subcontractors and suppliers on the project have met the AIS requirements. Certification forms for the contractor and subcontractors/suppliers are found in Exhibit E of Section 00900.

A waiver from the American Iron and Steel requirements may be issued by the Administrator of the Environmental Protection Agency if it is found that: 1) applying the American Iron and Steel provisions would be inconsistent with the public interest; 2) iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or 3) inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than 25 percent. Waiver requests must be submitted to the state for review and submittal to the EPA.

United States Environmental Protection Agency

OMB Control No: 2090-0030
Approved: 8/13/2013
Approval Expires: 8/31/2015

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Participation Form

An EPA Financial Assistance Agreement Recipient must require its prime contractors to provide this form to its DBE subcontractors. This form gives a DBE[1] subcontractor[2] the opportunity to describe work received and/or report any concerns regarding the EPA-funded project (e.g., in areas such as termination by prime contractor, late payments, etc.). The DBE subcontractor can, as an option, complete and submit this form to the EPA DBE Coordinator at any time during the project period of performance.

Subcontractor Name	Project Name	
Bid/ Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact
Address		
Telephone No.	Email Address	
Prime Contractor Name	Issuing/Funding Entity:	

Contract Item Number	Description of Work Received from the Prime Contractor Involving Construction, Services, Equipment or Supplies	Amount Received by Prime Contractor

[1] A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

[2] Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

United States Environmental Protection Agency

OMB Control No: 2090-0030
Approved: 8/13/2013
Approval Expires: 8/31/2015

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Participation Form

Please use the space below to report any concerns regarding the above EPA-funded project:

Subcontractor Signature	Print Name
Title	**Date**

United States Environmental Protection Agency

OMB Control No: 2090-0030
Approved: 8/13/2013
Approval Expires: 8/31/2015

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Performance Form

This form is intended to capture the DBE[1] subcontractor's[2] description of work to be performed and the price of the work submitted to the prime contractor. An EPA Financial Assistance Agreement Recipient must require its prime contractor to have its DBE subcontractors complete this form and include all completed forms in the prime contractors bid or proposal package.

Subcontractor Name		Project Name
Bid/ Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact
Address		
Telephone No.		Email Address
Prime Contractor Name		Issuing/Funding Entity:

Contract Item Number	Description of Work Submitted to the Prime Contractor Involving Construction, Services , Equipment or Supplies	Price of Work Submitted to the Prime Contractor
DBE Certified By:___DOT ___SBA ___Other: _____	Meets/ exceeds EPA certification standards? ___YES_____NO____Unknown	

[1] A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

[2] Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

United States Environmental Protection Agency

OMB Control No: 2090-0030
Approved: 8/13/2013
Approval Expires: 8/31/2015

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Performance Form

I certify under penalty of perjury that the forgoing statements are true and correct. Signing this form does not signify a commitment to utilize the subcontractors above. I am aware of that in the event of a replacement of a subcontractor, I will adhere to the replacement requirements set forth in 40 CFR Part 33 Section 33.302 (c).

Prime Contractor Signature	Print Name
Title	**Date**

Subcontractor Signature	Print Name
Title	**Date**

United States Environmental Protection Agency

OMB Control No: 2090-0030
Approved: 8/13/2013
Approval Expires: 8/31/2015

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Utilization Form

This form is intended to capture the prime contractor's actual and/or anticipated use of identified certified DBE[1] subcontractors[2] and the estimated dollar amount of each subcontract. An EPA Financial Assistance Agreement Recipient must require its prime contractors to complete this form and include it in the bid or proposal package. Prime contractors should also maintain a copy of this form on file.

Prime Contractor Name		Project Name
Bid/ Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact
Address		
Telephone No.		Email Address
Issuing/Funding Entity:		

I have identified potential DBE certified subcontractors	__ YES	__ NO
If yes, please complete the table below. If no, please explain:		

Subcontractor Name/ Company Name	Company Address/ Phone/ Email	Est. Dollar Amt	Currently DBE Certified?

Continue on back if needed

[1] A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

[2] Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

United States Environmental Protection Agency

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Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Utilization Form

I certify under penalty of perjury that the forgoing statements are true and correct. Signing this form does not signify a commitment to utilize the subcontractors above. I am aware of that in the event of a replacement of a subcontractor, I will adhere to the replacement requirements set forth in 40 CFR Part 33 Section 33.302 (c).

Prime Contractor Signature	Print Name
Title	**Date**

EXHIBIT E

American Iron and Steel (AIS) Forms

GENERAL CONTRACTOR CERTIFICATION

Consolidated Appropriations Act, 2014

USE OF AMERICAN IRON AND STEEL

On January 17, 2014, H.R. 3547, "Consolidated Appropriations Act, 2014," (Public Law 113-76, Section 436) was enacted. This law provides appropriations for both the Clean Water State Revolving Fund and the Drinking Water State Revolving Fund for federal fiscal year 2014, while adding an American iron and steel requirement to these already existing programs.

The Act includes a provision for "Use of American Iron and Steel," in Sec. 436(a)(1). None of the funds made available by a State water pollution control revolving fund as authorized by title VI of the Federal Water Pollution Control Act (33 U.S.C. 1381 et seq.) or made available by a drinking water treatment revolving loan fund as authorized by section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j-12) shall be used for a project for the construction, alteration, maintenance, or repair of a public water system or treatment works unless all of the iron and steel products used in the project are produced in the United States.

As the general contractor for the project(s) using revolving loan funds, the undersigned attests that they have performed the necessary oversight to ensure this provision was met on the project(s) being funded.

I, the undersigned authorized representative of _____, do hereby certify that by accepting funds allocated from the State Revolving Fund (SRF), I attest that all subcontracts and supplies used on the project(s), where any SRF funds were used, have complied with the above provision of the Consolidated Appropriations Act.

Project Name _____,

DEQ Loan Project Number _____,

Authorized Signature _____, Date _____,

Title _____,

Print Name _____

SUBCONTRACTOR OR SUPPLIER CERTIFICATION

Consolidated Appropriations Act, 2014

USE OF AMERICAN IRON AND STEEL

On January 17, 2014, H.R. 3547, "Consolidated Appropriations Act, 2014," (Public Law 113-76, Section 436) was enacted. This law provides appropriations for both the Clean Water State Revolving Fund and the Drinking Water State Revolving Fund for federal fiscal year 2014, while adding an American iron and steel requirement to these already existing programs.

The Act includes a provision to for "Use of American Iron and Steel," in Section 436(a)(1). None of the funds made available by a State water pollution control revolving fund as authorized by title VI of the Federal Water Pollution Control Act (33 U.S.C. 1381 et seq.) or made available by a drinking water treatment revolving loan fund as authorized by section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j-12) shall be used for a project for the construction, alteration, maintenance, or repair of a public water system or treatment works unless all of the iron and steel products used in the project are produced in the United States.

This certification applies to the following specific iron and steel products to be incorporated into this project:

Manufacturer Name:_____

Material/Product Description:_____

Location of factory where these products will be manufactured: _____

As a subcontractor or supplier for the project(s) using revolving loan funds, the undersigned attests that they have performed the necessary oversight to ensure this provision was met on the project(s) being funded.

I, the undersigned authorized representative of _____, do hereby certify that by accepting funds allocated from the State Revolving Fund (SRF), I attest that all qualifying iron and steel products purchased for or used on the project(s), where any SRF funds were used, have complied with the above provision of the Consolidated Appropriations Act.

Project Name _____,

DEQ Loan Project Number _____,

Authorized Signature _____, Date _____,

Title _____,

Print Name _____.

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01010
SUMMARY OF WORK

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. The Project consists of dismantling the existing landfill gas flare and processing equipment and the installation of new landfill gas processing equipment at the Story Mill Road Landfill in Bozeman, Montana and other appurtenances as identified on the plans and herein.

B. The work shall include the construction of below grade landfill gas piping, compressed air, condensate and lateral piping, below grade condensate sump, connection, the dismantling of the existing landfill gas processing skid and flare, the unloading and installation of a landfill gas processing skid and flare, the unloading and the installation of an above grade condensate holding tank, the installation of a compressed air system, and all other appurtenant equipment as shown in the Construction Drawings and as specified herein. The CONTRACTOR shall replace in kind any existing improvements (drainage channels, asphalt millings roads, etc.) damaged during the course of construction at no cost to the City of Bozeman (OWNER).

C. The OWNER may award separate contracts for portions of the Project that are to be completed simultaneously with the Work. The CONTRACTOR shall cooperate with the OWNER and other CONTRACTORS so that the OWNER'S work, including landfill and farming operations, or work by other CONTRACTORS, can be carried out smoothly.

D. No additional and/or extra compensation will be given for all and/any increases to direct labor costs, subcontract costs, costs of materials and equipment, which includes all fuels.

1.02 WORK HOURS

A. Unless otherwise changed by the OWNER, construction activities and material deliveries to the Facility shall be limited to the hours of 7AM to 6 PM, from October 1 to April 30, and 6AM to 7PM from May 1 to September 30. No work outside these hours will be allowed without written approval from the OWNER.

1.03 DISPOSAL OF REFUSE

A. All removal and disposal of construction debris or waste generated during construction is the responsibility of the CONTRACTOR at no additional cost to the OWNER.

1.04 FAMILIARIZATION

A. Prior to implementing any work, the CONTRACTOR shall become thoroughly familiar with the site, the site conditions, and all portions of the work falling within this Project and the CQA Plan.

B. Inspection:

1. Prior to implementing any of the work, the CONTRACTOR shall carefully inspect the site and equipment and verify that the existing piping is complete to the point where the work may properly commence without adverse impact. This would include the location and condition of the header pipe daylight.

2. If the CONTRACTOR has any concerns regarding the site, the CONTRACTOR shall notify the ENGINEER and the OWNER in writing within 48 hours of the site visit. Failure to notify the OWNER or the ENGINEER prior to installation of all items shall be construed as CONTRACTOR'S acceptance of the related work of all other Sections.

3. The CONTRACTOR shall verify as-built conditions prior to placement and/or excavation of any material.

4. The CONTRACTOR shall be responsible for contacting Blue Stake and locating all underground utilities prior to excavation of any material.

1.05 PRECEDENCE OF DOCUMENTS

A. The Montana Public Works Standard Specifications and Montana Department of Transportation Specifications will be referenced where applicable. In case there is a discrepancy or conflict between these specifications and the project specific Construction Drawings and Project Specifications, the project specific documents will govern.

1.06 CONTRACTOR'S USE OF PREMISES

A. CONTRACTOR shall coordinate use of the premises, for his storage and the operation of his workmen, with OWNER and utility service companies.

B. The full use of the premises for storage, the operations of workmen and for all other construction activities will not be available to CONTRACTOR. CONTRACTOR must operate entirely within the space allowed to him. The Drawings define the area allocated to CONTRACTOR.

C. CONTRACTOR shall be solely responsible for obtaining and paying all costs in connection with any additional work area, storage sites, and access to the site or temporary right-of-way that may be required for proper completion of the Work.

D. It shall be understood that responsibility for protection and safe-keeping of equipment and materials on or near the site will be entirely that of CONTRACTOR and that no claim shall be made against the OWNER or his authorized representatives by reason of any act. It shall

be further understood that should any occasion arise necessitating access to the sites occupied by these stored materials or equipment, the ENGINEER shall direct CONTRACTOR owning or responsible for the stored materials and equipment to immediately move the same. No materials or equipment may be placed upon the property of the OWNER, other than in the designated areas as shown on the Drawings, unless the ENGINEER has agreed to the location contemplated by CONTRACTOR to be used for storage. All stored materials shall be labeled according to the appropriate CONTRACTOR or SUBCONTRACTOR with the manufacturer's label as well. Appropriate material safety data sheets (e.g., MSDS) shall be provided.

E. CONTRACTOR shall be required to share use of the premises with other CONTRACTORS whose services the OWNER has obtained or will obtain for construction of other facilities on the site.

1.07 AGENCY AND PRIVATE ENTITY COORDINATION & PERMITTING

The work to be performed for this project will require significant planning and coordination with City, County, and private agencies. The ENGINEER is responsible for obtaining the building permit. The CONTRACTOR is responsible for obtaining all other permits, payment of fees and/or coordinating with all involved as needed to perform the construction as indicated on the project plans.

The following is a list of anticipated public agencies and private entities requiring involvement in this project:

Montana811
Underground Utility Locator
Dial 811

1.08 PROJECT SCHEDULING

Information pertaining to the preparation and submittal of the construction schedule is contained in Section 1300. The timing of construction is critical. It is imperative that the collection system downtime is minimized. To the greatest extent possible, the site should be prepared beforehand to accommodate the expeditious dismantling of the existing equipment and the prompt installation of the new equipment such that the system downtime is limited to 5 days. Based on the anticipated flare delivery on XXXXX, the construction should be substantially complete by XXXXX.

1.09 SUBSTANTIAL COMPLETION

A. Substantial Completion means, but is not limited to the completion of the following:
   1. Green tag on all electrical work;
   2. All systems in place, functional, and displayed to the OWNER or its representatives;
   3. Construction Complete;
   4. Materials and equipment installed;

5. Punch List items have been identified, itemized, and scheduled for completion;
6. Draft O&M Manuals and record documents reviewed and accepted by the OWNER;
7. HVAC test and balance completed (provide minimum 30 days prior to projected substantial completion);
8. Landscaping and site work completed; and
9. Final cleaning.

1.10 FINAL ACCEPTANCE

A. Final Acceptance means the project work is complete; the ENGINEER and the OWNER has approved and accepted the project work as complete. This shall include, but is not limited to:

1. All punch list items have been completed;
2. All systems reviewed and accepted by the OWNER;
3. Final O&M Manuals and record documents reviewed and accepted by the OWNER;
4. OWNER's operation and maintenance training complete

1.11 LIQUIDATED DAMAGES

A. Liquidated damages shall be Five Thousand Dollars ($5,000) per day that substantial completion extends beyond the date determined by the contract time as adjusted.

B. Liquidated damages shall be Two Thousand Five Hundred Dollars ($1,500) per day that final acceptance extends beyond the date determined by the contract time as adjusted.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

END OF SECTON

SECTION 01029
MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.01 CONTRACT PAY ITEMS

This section includes the items of work and the basis of payment for City of Bozeman Story Mill Road Landfill Gas Extraction System Expansion and Soil Vapor Extraction/Air Injection System Installation. The CONTRACTOR shall bid Items 1 through 51 below separately and provide unit prices and a total sum for all work items. The CONTRACTOR is responsible for supplying all materials, equipment and labor necessary for the complete construction and installation of all work as described in these specifications and as shown on the Construction Drawings. Payment for each work item will be made on either a unit price, lineal foot or lump sum basis, and only after that portion of the project has been completed.

1. Drill Rig Mobilization/Demobilization: This task includes any and all temporary facilities and utilities, safety plans, and construction equipment required for this project. Payment for this work will be made on a lump sum basis. Fifty (50) percent of the lump sum price bid will be paid with the first payment request following satisfactory evidence of mobilization of sufficient labor, equipment and material to adequately progress the work of this contract. Fifty (50) percent of the lump sum price bid will be paid with the Final Payment request once drilling has been completed. The price bid in the proposal for this item shall not exceed five (5) percent of the original drilling total amount.

2. SVE Well Vertical Drilling and Completion: Supply all material, equipment and labor necessary for the drilling of approximately 298 vertical feet of SVE well as shown on the Construction Drawings (Detail 2 on Sheet 8). This item shall include all resources necessary to prepare access roads and drill rig pads, drilling the SVE well borings, and returning the drill location to its original condition. This item includes the installation of the well casing, backfill material, and finishing. This item does not include well vaults. Payment for this item shall be per vertical foot installed.

3. Landfill Gas Well Vertical Drilling and Completion: Supply all material, equipment and labor necessary for the drilling of approximately 300 vertical feet of LFG well as shown on the Construction Drawings (Detail 1 on Sheet 8). This item shall include all resources necessary to prepare access roads and drill rig pads, drilling the LFG well borings, dust control, removal and disposal of refuse, and returning the drill location to its original condition. This item includes the installation of the well casing, backfill material, and finishing. This item does not include well vaults. Payment for this item shall be per vertical foot installed.

4. Air Injection Well Vertical Drilling and Completion: Supply all material, equipment and labor necessary for the drilling of approximately 298 vertical feet of air injection well as shown on the Construction Drawings (Detail 3 on Sheet 8). This

item shall include all resources necessary to prepare access roads and drill rig pads, drilling the air injection well borings, and returning the drill location to its original condition. This item includes the installation of the well casing, backfill material, and finishing. This item does not include well vaults. Payment for this item shall be per vertical foot installed.

5. Piping Crew Mobilization and demobilization: This task includes any and all temporary facilities and utilities, safety plans, and construction equipment required for this project. Payment for this work will be made on a lump sum basis. Fifty (50) percent of the lump sum price bid will be paid with the first payment request following satisfactory evidence of mobilization of sufficient labor, equipment and material to adequately progress the work of this contract. Fifty (50) percent of the lump sum price bid will be paid with the Final Payment request once all field construction has been completed. The price bid in the proposal for this item shall not exceed five (5) percent of the original bid amount for field construction.

6. SVE Well Vault, Top of Well Transition & Assembly: Supply all materials, equipment and labor for the construction and installation of nine (9) SVE well vaults including sampling ports, sample valve, and all associated fittings, backfilling, backfill material, dust control, gravel, finishing, and returning the site to it's original condition. This item includes all materials as shown on the Construction Drawings (Detail 4 on Sheet 9). This item also includes the HDPE to Stainless Steel transition fitting. Payment for this item shall be per unit installed.

7. SVE Remote Wellhead & Assembly: Supply all materials, equipment and labor for the construction and installation of nine (9) SVE remote wellhead assemblies, sampling ports, sample valve, and all associated fittings, backfilling, backfill material, dust control, gravel, finishing, and returning the site to its original condition. This item includes all materials as shown on the Construction Drawings (Detail 2 on Sheet 9). Payment for this item shall be per unit installed.

8. Dual Extraction Well head Assembly and fittings: Supply all materials, equipment and labor for the construction of six (6) dual extraction wellhead assemblies per Details 1 & 2 on Sheet 11 of the Construction Drawings. Include all labor and materials for the HDPE pipe, fittings, valves, and necessary trenching, backfill material, backfilling, compaction, removal and disposal of refuse and returning the site to it's original condition. Payment for this item shall be per unit installed.

9. Pneumatic Submersible Pump and fittings: Supply all materials, equipment and labor for the construction of twelve (12) pneumatic submersible pumps for the dual extraction wellhead assemblies per Details 1 & 2 on Sheet 11 of the Construction Drawings. Include all labor and materials, bundled tubing, level probe/indicator, fittings, clamps, valves, and mounting to well. Payment for this item shall be per unit installed.

10. Air Injection Well Vault/Assembly and Top of Well Transition: Supply all

materials, equipment and labor for the construction and installation of six (6) air injection well vaults including sampling ports, sample valve, and all associated fittings, backfilling, backfill material, dust control, gravel, finishing, and returning the site to it's original condition. This item includes all materials as shown on the Construction Drawings (Detail 5 on Sheet 9). This item also includes the HDPE to Stainless Steel transition fitting. Payment for this item shall be per unit installed.

11. Air Injection Remote Wellhead & Assembly: Supply all materials, equipment and labor for the construction and installation of six (6) air injection remote wellhead assemblies, sampling ports, sample valve, and all associated fittings, backfilling, backfill material, dust control, gravel, finishing, and returning the site to its original condition. This item includes all materials as shown on the Construction Drawings (Detail 3 on Sheet 9). Payment for this item shall be per unit installed.

12. Manifold Vault/Assembly: Supply and install six (6) manifold vaults, 30" x 60" concrete vault with spring assisted covers. This item includes all materials, equipment and labor for the construction and installation of the manifold vaults including backfilling, backfill material, gravel, finishing, and returning the site to its original condition. This item includes just the vaults as shown on the Construction Drawings (Details 2 and 3 on Sheet 9). Payment for this item shall be per unit installed.

13. 8" SDR 17 HDPE pipe and fittings: Supply all materials, equipment and labor for the construction and installation of approximately 1,420 lineal feet of below grade 8" diameter HDPE SDR 17 piping as shown on Detail 7, Sheet 9 of the Construction Drawings. Include all labor and materials for the HDPE pipe, fittings, joining, and necessary trenching, excavation, shoring, backfill material, backfilling, compaction, removal and disposal of any refuse encountered and returning the site to its original condition. Payment for this item shall be per lineal foot installed.

14. 6" SDR 17 HDPE pipe and fittings: Supply all materials, equipment and labor for the construction and installation of approximately 1,050 lineal feet of below grade 6" diameter HDPE SDR 17 piping as shown on Detail 7, Sheet 9 of the Construction Drawings. Include all labor and materials for the HDPE pipe, fittings, joining, and necessary trenching, excavation, shoring, backfill material, backfilling, compaction, removal and disposal of any refuse encountered and returning the site to its original condition. Payment for this item shall be per lineal foot installed.

15. 4" SDR 17 HDPE pipe and fittings, in individual trench: Supply all materials, equipment and labor for the construction and installation of approximately 1,600 lineal feet of below grade 4" diameter HDPE SDR 17 piping as shown on Detail 7, Sheet 9 of the Construction Drawings. Include all labor and materials for the HDPE pipe, fittings, joining, and necessary trenching, excavation, shoring, backfill material, backfilling, compaction, removal and disposal of any refuse encountered and returning the site to its original condition. Payment for this item

shall be per lineal foot installed.

16. 4" SDR 17 HDPE pipe and fittings, in common trench: Supply all materials, equipment and labor for the construction and installation of approximately 250 lineal feet of below grade 4" diameter HDPE SDR 17 piping as shown on Detail 7, Sheet 9 of the Construction Drawings. Include all labor and materials for the HDPE pipe, fittings, joining, and necessary trenching, excavation, shoring, backfill material, backfilling, compaction, removal and disposal of any refuse encountered and returning the site to its original condition. Payment for this item shall be per lineal foot installed.

17. 4" SDR 9 HDPE Compressed Air pipe and fittings, in common trench: Supply all materials, equipment and labor for the construction and installation of approximately 2,420 lineal feet of below grade 4" diameter HDPE SDR 9 piping as shown on Detail 7, Sheet 9 of the Construction Drawings. Include all labor and materials for the HDPE pipe, fittings, joining, and necessary trenching, excavation, shoring, backfill material, backfilling, compaction, removal and disposal of any refuse encountered and returning the site to its original condition. Payment for this item shall be per lineal foot installed.

18. 2" SDR 11 HDPE Condensate pipe and fittings, in individual trench: Supply all materials, equipment and labor for the construction and installation of approximately 3,420 lineal feet of below grade 2" diameter HDPE SDR 11 piping as shown on Detail 7, Sheet 9 of the Construction Drawings. Include all labor and materials for the HDPE pipe, fittings, joining, and necessary trenching, excavation, shoring, backfill material, backfilling, compaction, removal and disposal of any refuse encountered and returning the site to its original condition. Payment for this item shall be per lineal foot installed.

19. 2" SDR 11 HDPE Condensate pipe and fittings, in common trench: Supply all materials, equipment and labor for the construction and installation of approximately 2,160 lineal feet of below grade 2" diameter HDPE SDR 11 piping as shown on Detail 7, Sheet 9 of the Construction Drawings. Include all labor and materials for the HDPE pipe, fittings, joining, and necessary trenching, excavation, shoring, backfill material, backfilling, compaction, removal and disposal of any refuse encountered and returning the site to its original condition. Payment for this item shall be per lineal foot installed.

20. 2" SDR 9 HDPE Compressed Air pipe and fittings, in individual trench: Supply all materials, equipment and labor for the construction and installation of approximately 620 lineal feet of below grade 2" diameter HDPE SDR 9 piping as shown on Detail 7, Sheet 9 of the Construction Drawings. Include all labor and materials for the HDPE pipe, fittings, joining, and necessary trenching, excavation, shoring, backfill material, backfilling, compaction, removal and disposal of any refuse encountered and returning the site to its original condition. Payment for this item shall be per lineal foot installed.

21. 2" SDR 9 HDPE Compressed Air pipe and fittings, in common trench: Supply all materials, equipment and labor for the construction and installation of approximately 5,800 lineal feet of below grade 2" diameter HDPE SDR 9 piping as shown on Detail 7, Sheet 9 of the Construction Drawings. Include all labor and materials for the HDPE pipe, fittings, joining, and necessary trenching, excavation, shoring, backfill material, backfilling, compaction, removal and disposal of any refuse encountered and returning the site to its original condition. Payment for this item shall be per lineal foot installed.

22. Condensate Sump #2 Assembly, below grade: Supply all materials, equipment and labor for the construction and installation of one condensate sump assembly as shown in Detail 2 on Sheet 12 of the Construction Drawings. Include all labor and materials for the HDPE pipe, joining, and necessary trenching, excavation, shoring, backfill material, backfilling, compaction, removal and disposal of refuse encountered and returning the site to its original condition. Payment for this item shall be per unit installed.

23. Condensate line connection to existing tank: Supply all materials, equipment and labor for the connection of the condensate line to the existing condensate holding tank as shown in Detail 1 on Sheet 10 of the Construction Drawings. Include all labor and materials for the HDPE pipe, joining, and necessary trenching, excavation, shoring, backfill material, backfilling, compaction, removal and disposal of refuse encountered and returning the site to its original condition. Payment for this item shall be per unit installed.

24. Corrugated 12" HDPE Sleeve: Supply all materials, equipment and labor to install sixty (60) lineal feet of 12" HDPE N-12 pipe sleeve as shown in Detail 1 on Sheet 9 of the Construction Drawings. Include all labor and materials for the HDPE pipe, joining, and necessary trenching, excavation, shoring, backfill material, backfilling, compaction, removal and disposal of refuse encountered and returning the site to its original condition. Payment for this item shall be per lineal foot installed.

25. Corrugated 18" HDPE Sleeve: Supply all materials, equipment and labor to install seventy (70) lineal feet of 18" HDPE N-12 pipe sleeve as shown in Details 8 or 9 on Sheet 9 of the Construction Drawings. Include all labor and materials for the HDPE pipe, joining, and necessary trenching, excavation, shoring, backfill material, backfilling, compaction, removal and disposal of refuse encountered and returning the site to its original condition. Payment for this item shall be per lineal foot installed.

26. Remove and Install Fencing: Remove and re-install 240 lineal feet of fencing to provide access to well drilling/trenching locations. Payment for this item shall be per lineal foot installed.

27. New 3-phase Electrical Service to the Flare Skid: Per electrical drawings Sheets 20, 21, 22, and 23 of the Construction Drawings. This item includes all on-site

electrical conduit and wiring not provided by the flare manufacturer. Payment for this item shall be on a lump sum basis.

28. Treatment Facility Mobilization/Demobilization: This task includes any and all temporary facilities and utilities, safety plans, and construction equipment required for this project. Payment for this work will be made on a lump sum basis. Fifty (50) percent of the lump sum price bid will be paid with the first payment request following satisfactory evidence of mobilization of sufficient labor, equipment and material to adequately progress the work of this contract. Fifty (50) percent of the lump sum price bid will be paid with the Final Payment request once construction has been completed. The price bid in the proposal for this item shall not exceed five (5) percent of the original drilling total amount.

29. Flare Station: Supply all materials and labor for the construction and installation of the Landfill's gas handling assemblies and flare, including supplying all spare parts listed in Specification Section 12600. Payment for this work will be made as follows, and only when each portion of the work is completed as determined by the Engineer.
    10% with order,
    30% with approval of submittals,
    55% upon shipment, and
    5% upon successful start-up.

30. Supply all materials and labor for the construction and installation of the process equipment concrete pad, including 15 cy of Class A concrete, preparation of the flare station area; removal and disposal of refuse and rocks; excavating and backfilling; compaction; forming, reinforcing and placing concrete as shown on the Construction Drawings. Payment for this work will be made based on the cubic yards (cy) installed.

31. Supply all materials and labor for the construction and installation of the flare concrete foundation, including 4 cy of Class A concrete, preparation of the flare station area; removal and disposal of refuse and rocks; excavating and backfilling; compaction; forming, reinforcing and placing concrete as shown on the Construction Drawings. Payment for this work will be on a lump sum basis.

32. Supply all materials and labor for the construction and installation of the flare concrete foundation, including 4 cy of Class A concrete, preparation of the flare station area; removal and disposal of refuse and rocks; excavating and backfilling; compaction; forming, reinforcing and placing concrete as shown on the Construction Drawings. Payment for this work will be on a lump sum basis.

33. The CONTRACTOR shall supply all materials, equipment and labor to perform excavation, filling and grading to install the process skid and flare. Payment for this work will be on a lump sum basis.

34. The CONTRACTOR shall supply and install one (1) Ingersoll Rand Sierra Oil-free Rotary Screw Air Compressor, Model H50a, or approved equal. This bid

item includes factory Start-Up Service. Payment for this work will be on a lump sum basis.

35. Supply all materials and labor for the construction and installation of one 1,150 gallon condensate holding tank, seismic restraint, associated piping, fittings, GAC canister, and appurtenances. The Contractor shall provide all piping and connections to the flare skid. Payment for this work will be made on a lump sum basis.

36. Complete Electrical Installation: Supply and install all materials, equipment and labor to construct a complete electrical installation as shown on the Construction Drawings. This work will include, but not be limited to, the service entrance section, distribution panels, transformer, area lighting, telephone service, grounding, level element/transmitter, buried and above ground conduits, wiring, seal-offs and trenching ground grid system per sheets 21 & 22 of the Construction Drawings. Wiring that is internal to the flare/gas handling skid will be performed by the flare manufacturer. Payment for this item shall be on a lump sum basis.

37. Supply Condensate Sump #1 Assembly per Detail 1 on Sheet 12. Payment for this work will be made on a lump sum basis.

38. Supply pipe insulation and heat trace for all above grade pipe and the condensate tank. Payment for this work will be made on a lump sum basis.

39. Install site fencing and gates per Montana Department of Transportation specifications (Appendix A of the Specifications). Payment for this item shall be per lineal foot installed.

40. Install ½" black iron propane pipe and fittings (wrapped below grade). Payment for this item shall be per lineal foot installed.

41. Install ½" CS compressed air pipe and fittings (below and above grade). Payment for this item shall be per lineal foot installed.

42. Install 1" SDR 9 HDPE compressed air pipe and fittings (below grade). Payment for this item shall be per lineal foot installed.

43. Install 2" SDR 9 HDPE compressed air pipe and fittings (below grade). Payment for this item shall be per lineal foot installed.

44. Install 2" SDR 11 HDPE condensate conveyance pipe and fittings (above and below grade). Payment for this item shall be per lineal foot installed.

45. Install 4" SDR 17 HDPE pipe and fittings (connection to KO vessel). Payment for this item shall be per lineal foot installed.

46. Install 8" SDR 17 HDPE pipe and fittings (above and below grade). Payment for

this item shall be per lineal foot installed.

47. Install pipe supports per Detail 6 on Sheet 19. Payment for this item shall be per each pipe support installed.

48. Install pipe supports per Detail 1 on Sheet 19. Payment for this item shall be per each pipe support installed.

49. Install pipe supports per Detail 3 on Sheet 19. Payment for this item shall be per each pipe support installed.

50. Install pipe supports per Detail 5 on Sheet 19. Payment for this item shall be per each pipe support installed.

51. CONTRACTOR to remove and dispose of the existing blower and flare equipment. The CONTRACTOR shall coordinate with the ENGINEER to salvage any portions of the existing equipment. Payment for this item shall be on a lump sum basis.

1.02 Non Pay Items

A. No separate payment will be made for items not specifically set forth in the bid proposal. Include costs for such items in prices named in the bid proposal for identified items of work. Items of work described in Contract Documents, but not listed in the Schedule of Work items of the bid form are, in general, applicable to more than one listed work item. Therefore, no separate work item is provided. Include costs of work not listed but necessary to complete the project per the Contract Document in listed Work items of the bid form.

1.03 Total Cost

A. Bids for Work are intended to establish a total cost for the work in its entirety. Should the CONTRACTOR feel that the cost for the Work has not been completely established by specific items in the bid form, he shall include the cost for that work in some related bid item so that his bid proposal reflects the total cost for completing the Work in its entirety.

1.04 Quantity Overruns

A. No payment will be made for quantity overruns unless work is expressly required by the Contract Documents or authorized in writing by the OWNER or OWNER'S Representative in advance of the work.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

SECTION 01030
SPECIAL INSTRUCTIONS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

These instructions are site specific for the Story Mill Road Landfill (Landfill). The CONTRACTOR shall comply with, but is not limited to; all Special Instructions listed in this Section.

1.02 SMOKING POLICY

Smoking is not allowed on the Landfill. The smoking prohibition will be strictly enforced on this project due to the explosive nature of landfill gas.

1.03 SPECIAL CLEAN-UP

Any trash generated on the project site by the CONTRACTOR, or his employees, will be cleaned up daily by the CONTRACTOR for disposal offsite. Mud and dirt tracked off-site by the CONTRACTOR, his equipment, or his employees will be cleaned up daily by the CONTRACTOR. Facility access roads and any other off-site roads will be scraped clean daily and washed down at least once per week.

1.04 LIMITING PUBLIC ACCESS

All necessary precautions including barricades and/or traffic cones will be used to prevent the public from entering the working area. The CONTRACTOR is reminded that the landfill gas processing equipment area is a hazardous area containing explosive gases.

1.05 BIOHAZARDS

The CONTRACTOR may encounter waste during construction of the System. Waste may contain biohazards such as medical waste or dead animals. The CONTRACTOR's Health and Safety Plan shall address the potential for contact with biohazards and the specific measures to be taken to protect the CONTRACTOR's workers, facility staff, and the public.

1.06 MATERIALS DELIVERY

The CONTRACTOR is to have all materials delivered to the work site and/or staging area. The OWNER or ENGINEER will not accept delivery of materials.

1.07 EMERGENCIES

The CONTRACTOR will provide the ENGINEER with the phone numbers of at least two individuals who may be contacted in an emergency on a 24-hour, 7-day per week basis, including holidays. To prepare for emergencies, the CONTRACTOR will insure that his employees know the location of the nearest hospital, appropriate fire and first aid equipment and emergency phone numbers. In the event of an emergency, such as damage or rupture of an existing gas pipeline, the CONTRACTOR shall immediately notify the ENGINEER and/or the Operator. Should such an emergency occur after hours, the CONTRACTOR shall notify the ENGINEER. This is in addition to the CONTRACTOR taking any appropriate immediate emergency response to correct the problem.

1.08 GENERAL SAFETY

The CONTRACTOR shall be responsible for maintaining safety on the project site in accordance with the provisions of the contract and including OSHA and NFPA regulations. In addition, the CONTRACTOR shall supply all necessary safety equipment for his employees and any site visitors. Tool box safety meetings shall be performed and documented a minimum of once per week for all site personnel.

1.09 STORM DAMAGE

The CONTRACTOR shall be responsible for the repair of any storm damage to the Work prior to the Final Acceptance by the ENGINEER and OWNER. Storm damage of stockpiled materials will also be responsibility of the CONTRACTOR. Prompt repair of any Storm damage shall be the responsibility of the CONTRACTOR, at no cost to the OWNER.

1.10 EQUIPMENT FUELING AND MAINTENANCE

The CONTRACTOR shall fuel and maintain equipment in designated areas of the site as directed by the ENGINEER. The CONTRACTOR shall furnish and use drip pans for the fueling of vehicles or equipment. Any fuel spills will be immediately cleaned up, and the contaminated soil removed from the site by the CONTRACTOR at the CONTRACTOR's expense. The CONTRACTOR will not be allowed to place a temporary fuel tank on site.

1.11 SOIL FOR BACKFILL

The CONTRACTOR may be required to obtain backfill soil complete the project. The cost to obtain and transport the soil shall be included in the project costs.

1.12 HEALTH AND SAFETY PLAN

Prior to proceeding with the construction activities, the CONTRACTOR shall submit (for the ENGINEER's approval), a site Health & Safety Plan. The CONTRACTOR shall also allow a period of two weeks for the ENGINEER's review time. During the entire construction activity, the CONTRACTOR shall maintain at least one readily available copy of the Health & Safety Plan at the site at all times.

END OF SECTION

SECTION 01041

PROJECT COORDINATION

PART 1: GENERAL

1.1 DESCRIPTION

A. This section specifies the requirements for coordinating and sequencing the work under the Contract documents, and requirements regarding existing site conditions.

1.2 COORDINATION WITH PUBLIC AND PRIVATE AGENCIES

A. Comply with Article 7, General Conditions. Permit utility companies to repair or replace their lines in the project limits.

B. Contact the Montana one-call system for utility locations before starting work.

C. Comply with paragraph 6.20, General Conditions.

PART 2: PRODUCT — NOT USED

PART 3: EXECUTION — NOT USED

PART 4: MEASUREMENT AND PAYMENT — NOT USED

END OF SECTION

SECTION 01050
FIELD ENGINEERING

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. The CONTRACTOR shall provide field layout (lines and grades) of the work and maintain and preserve all stakes and other markers as required to complete the Work as requested by the ENGINEER.

B. The CONTRACTOR shall provide As-Built Record Drawings, as defined in the information for bidders and as specified in this Section.

1.02 QUALIFICATIONS OF SURVEYOR

A. CONTRACTOR shall employ and retain, as needed, at the site of the Work a surveyor with the experience and capability of performing all surveyor and layout tasks required of CONTRACTOR. The surveyor shall be a land surveyor registered in the State of Montana. Tasks included are:

1. Provide all surveying equipment required including transit, level, stakes, and required surveying accessories.

2. Furnish all required lines and grades for construction of all facilities, structures, pipelines, and site improvements.

3. Keep professional, accurate, well organized, and legible notes of all measurements and calculations made while surveying and laying out the Work.

B. Field layout shall be performed by or under the supervision of a land surveyor registered in Arizona, acceptable to the ENGINEER.

1.03 SUBMITTALS

A. The CONTRACTOR shall, at the request of the ENGINEER, submit documentation to verify accuracy of field engineering work.

PART 2 – PRODUCTS

Not Applicable.

PART 3 – EXECUTION

3.01 SURVEY REFERENCE POINTS

A. CONTRACTOR shall:

1. Provide civil, structural, and other professional engineering services specified, or required to execute CONTRACTOR's construction methods.

2. Develop and make all detail surveys and measurements needed for construction including slope stakes, batter boards, and all other working lines, elevations, and cut sheets.

3. Provide all material required for benchmarks, control points, batter boards, grade stakes, structure and pipeline elevation stakes, and other items.

4. Be solely responsible for all locations, dimensions and levels. No data other than written orders of the ENGINEER shall justify departure from the dimensions and levels required by the Contract Documents.

5. Safeguard all points, stakes, grade marks, monuments, and benchmarks made or established on the Work. Re-establish same with the exception of primary control monuments if disturbed and rectify all Work improperly installed because of not maintaining, not protecting or removing without authorization established points, stakes, marks, and monuments.

6. Provide such facilities as may be necessary for the ENGINEER to check line and grade points placed by CONTRACTOR.

7. CONTRACTOR shall give notices and comply with all laws, ordinances, rules, and regulations bearing on the conduct of the Work. If CONTRACTOR observes that the Contract Documents are at variance therewith, he shall promptly notify the ENGINEER, in writing.

B. Existing horizontal and vertical control points for the Project are shown on the Drawings.

C. The CONTRACTOR shall locate and protect control points prior to starting site work, and preserve all permanent reference points during construction.

D. The CONTRACTOR shall make no changes or relocations to control points without prior written approval from the ENGINEER.

E. The CONTRACTOR shall report to the ENGINEER when any control point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.

F. The CONTRACTOR shall replace Project control points that may be lost or destroyed at no additional cost to the OWNER. Replacements shall be re-established based on original survey control.

G. CONTRACTOR shall establish and maintain a minimum of two permanent benchmarks at locations approved by the ENGINEER. Horizontal and vertical locations of the benchmarks shall be recorded on the As-Built Record Drawings.

3.02 PROJECT SURVEY REQUIREMENTS

A. Establishment of lines and levels, located and laid out, by instrumentation and similar appropriate means for all Work indicated by the Drawings and in accordance with the Specifications.

B. As construction proceeds, check every element for line, level, and plumb.

C. Locations of existing pipelines, sewers, culverts, and other utilities shown on the Drawings are approximate and shall be field-verified by the CONTRACTOR prior to construction as required to complete the Work. As-Built Drawings of discovered utilities shall be submitted to the ENGINEER.

D. The CONTRACTOR shall maintain a complete, accurate log of all control and survey work as it progresses.

E. At the request of the ENGINEER, the Surveyor shall submit documentation to verify accuracy of field engineering work.

F. As-built Drawings shall be at a scale used in the Project Drawings, unless otherwise approved by the ENGINEER.

G. As-built Drawings shall be certified by the Surveyor and shall show dimensions, locations, angles, and elevations of all construction and site Work.

H. The Surveyor shall submit As-built dimensions, locations, angles, and elevations of construction and site Work in electronic format. Electronic files shall be AutoCAD compatible (i.e. dxf format)

END OF SECTION

SECTION 01052
LAYOUT OF WORK AND SURVEYS

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes general requirements for survey work to be performed by the CONTRACTOR.

1. Set offset stakes, slope stakes, and grade stakes for field layout of features of the Work.

2. Perform surveys for interim measurement of pay quantities if in disagreement with ENGINEER's estimates.

3. Perform surveys to record as-built conditions of the project.

1.02 DESCRIPTION

A. Reference Points: Prior to construction, verify with the ENGINEER the locations of site reference points and survey control points as specified in Section 01050. Notify the ENGINEER if survey control points are damaged upon discovery. Also notify the ENGINEER of any damage caused by the CONTRACTOR, then repair or replace control points at no additional cost to the OWNER.

B. The ENGINEER reserves the right to perform any desired checking and correction of the CONTRACTOR's surveys but this does not relieve the CONTRACTOR of the responsibility for adequate performance of the Work.

C. Equipment and Personnel: Provide instruments and other survey equipment that is accurate, suitable for the surveys required in accordance with recognized professional standards, and in proper condition and adjustment at all times. Perform Work under the direct supervision of a licensed surveyor registered in the State of Arizona. Provide the ENGINEER with calibration certificates for all equipment utilized during construction. Submit certificates under provisions of Section 01300.

D. Field Notes and Records: Record surveys in field notebooks and provide copies of such records to the ENGINEER at intervals required by the OWNER. Furnish each field notebook to the ENGINEER when filled or completed. Electronic notes may be used if printouts are furnished to the ENGINEER and if the format of the printed information is approved by the ENGINEER.

E. Use by the ENGINEER: The ENGINEER may at any time use line and grade points and markers established by the CONTRACTOR. The CONTRACTOR's surveys are a part of the Work and may be checked by the OWNER or representatives of the OWNER at any time. The CONTRACTOR is responsible for (1) any lines, grades, or measurements that do not comply with specified design criteria or proper tolerances, or which are otherwise defective, and (2) for any resultant defects in the Work. The CONTRACTOR will be required to conduct re-surveys or check surveys to correct errors indicated by review of the field notebooks or otherwise detected at no additional cost to the OWNER.

F. The written dimensions on the Drawings are presumed correct, but the CONTRACTOR shall be required to check all dimensions carefully before beginning the work. If any errors or omissions are discovered, the ENGINEER shall be so advised in writing and shall make the proper corrections.

1.03 SURVEYS FOR LAYOUT AND PERFORMANCE OF WORK

A. Perform surveys for layout and performance of the Work, reduce the field notes, make necessary calculations, and prepare drawings necessary to carry out such work.

1.04 SURVEYS FOR RECORD DRAWINGS

A. When the Specifications require items of Work to be measured by surveying methods, the CONTRACTOR will perform the surveys and perform necessary calculations to determine payment quantities. The ENGINEER reserves the right to perform independent checks.

B. Provide As-Built Record Drawings to the ENGINEER upon completion of each major construction element of the project:

C. CONTRACTOR shall maintain a current copy of As-Built Record Drawings on-site at all times as defined in the information for bidders.

1.05 SURVEYING ACCURACY AND TOLERANCES IN SETTING OF SURVEY STAKES

A. Perform control traverse field surveys and computations to an accuracy of at least 1:10,000.

B. The tolerances applicable in setting survey stakes are set forth below. Such tolerances do not supersede stricter tolerances required by the Drawings or Specifications, and do not otherwise relieve the CONTRACTOR of responsibility for measurements in compliance therewith.

Type of Mark	Horizontal Position	Elevation
Permanent reference points	1 in 10,000	±0.01 ft
General excavation and earthwork	1 in 2,000	±0.10 ft

C. Tolerances for designed thickness, elevations and design locations shown on the Drawings are ±0.04 foot.

1.06 MONITORING DEVICE AND LANDSCAPE PROTECTION

A. Prior to beginning of any site Work, locate all monitoring wells, gas extraction wells, piezometers, utility boxes, valve boxes, irrigation network components, or other utilities. All landscaping shall be protected during construction.

B. Install markers identifying the location of these devices.

C. The purpose of the Work is to protect these items during construction.

D. The CONTRACTOR, at no additional cost to the OWNER, will replace any items damaged during construction by the CONTRACTOR.

E. An example replacement cost for a groundwater monitoring well is approximately $85,000; a gas monitoring well is approximately $8,000.

1.07 COORDINATION WITH CITY OF PHOENIX

A. Keep the ENGINEER informed on progress of survey Work to allow the ENGINEER sufficient time and ample opportunity to verify survey work without inconvenience or delay to CONTRACTOR.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

Not used.

END OF SECTION

SECTION 01095
DEFINITIONS AND STANDARDS

PART 1 – GENERAL

1.01 DESCRIPTION

A. Basic definitions are provided in the MAG Section 101.

B. OWNER definitions are provided in the appropriate sections of these Specifications.

C. Abbreviations and acronyms are sometimes used in the Specifications to identify reference standards. Implied words and meanings shall be interpreted as appropriate.

D. When a standard is specified by reference, the CONTRACTOR shall comply with requirements and recommendations stated in that standard, except when requirements are modified by the Contract Documents, or when applicable codes established more strict standards.

E. When published standards are referenced, the publication in effect on the date of issue of Contract Documents shall apply unless specified otherwise.

1.02 ABBREVIATIONS, NAMES, AND ADDRESSES OF ORGANIZATIONS

The CONTRACTOR shall obtain copies of referenced standard direct from the publication source, when needed for proper performance of Work, or when required for submittal by Contract Documents.

A. <u>ABBREVIATIONS AND REFERENCES</u>

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
AFBMA	Anti-Friction Bearings Manufacturer's Association
AGA	American Gas Association
AISC	American Institute of Steel Constructors
ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning ENGINEERs
ASME	American Society of Mechanical ENGINEERs
ASCE	American Society of Civil Engineers
ASTM	American Society for Testing and Materials
AWG	American Wire Gauge
AWS	American Welding Society
AWWA	American Water Works Association
BTU	British Thermal Unit
CGA	Compressed Gas Association
CI	Cast Iron
CPM	Critical Path Method
CSA	Canadian Standards Association
CSP	Corrugated Steel Pipe

FM	Factory Mutual Research Corporation
FRP	Fiberglass Reinforced Plastic
HDPE	High Density Polyethylene
IEEE	Institute of Electrical and Electronics Engineers
IPS	Iron Pipe Size
LFG	Landfill Gas
MAG	Maricopa Association of Governments' Uniform Standard Specifications and Uniform Standard Details
NBS	National Bureau of Standards
NEC	National Electrical Code
NEMA	National Electrical Manufacturers' Association
NFPA	National Fire Protection Association
NLGI	National Lubricating Grease Institute
O&M	Operations and Maintenance
OSHA	Occupational Safety and Health Administration
P&ID	Piping and Instrumentation Diagram
PVC	Polyvinyl Chloride
ROW	Right of Way
SAE	Society of Automotive Engineers
SS, SST	Stainless Steel
UL	Underwriters' Laboratories, Inc.
USASI	USA Standards Institute
USEPA	United States Environmental Protection Agency

1.03 REFERENCES

A. Latest version of American Society for Testing and Materials (ASTM) standards:

1. ASTM A 351, Standard Specifications for Castings, Austenitic, Austenitic-Ferritic (Duplex), for Pressure-Containing Parts.

2. ASTM 421, Standard for Dry Prep of Soil Samples for Particle-Size Analysis and Determination of Soil Constants.

3. ASTM D 422, Standard Test Method for Particle-Size Analysis of Soils.

4. ASTM D 638, Standard Test Method for Tensile Properties of Plastics.

5. ASTM D 698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft^3 [600 kN-m/m^3]).

6. ASTM D792, Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.

7. ASTM D1004, Standard Test Method of Initial Tear Resistance of Plastic Film and Sheeting.

8. ASTM D1140, Standard Test Method for Amount of Material in Soils Finer than the No. 200 (75-um) Sieve.

9. ASTM D1238, Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer.

10. ASTM D1248, Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable.

11. ASTM D1505, Standard Test Method for Density of Plastics by the Density-Gradient Technique.

12. ASTM D 1556, Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.

13. ASTM D 1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb/ft^3 [2,700 kN-m/m^3]).

14. ASTM D 1587, Standard Practice for Thin-Walled Tube Sampling of Soils for Geotechnical Purposes.

15. ASTM D 1603, Standard Test Method for Carbon Black in Olefin Plastics.

16. ASTM D 1693, Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics.

17. ASTM D 1777, Standard Method for Measuring Thickness of Textile Materials.

18. ASTM D 1785, Standard Specification for Polyvinyl Chloride (PVC) Plastic Pipe, Schedule 80.

19. ASTM D 2216, Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock.

20. ASTM D 2434, Standard Test Method for Permeability of Granular Soils (Constant Head).

21. ASTM 2466, Standard Specification for Polyvinyl Chloride and D-2467 (PVC) Plastic Pipe Fittings, Schedule 80.

22. ASTM D 2487, Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

23. ASTM D 2488, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).

24. ASTM D 2564, Standard Specification for Solvent Cement for Polyvinyl Chloride (PVC) Plastic Pipe and Fittings.

25. ASTM D 2657, Standard Practice for Heat-Joining for Polyolefin Pipe and Fillings.

26. ASTM D 2837, Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials.

27. ASTM D 2855, Standard Practice for Making Solvent-Cemented Joints with Polyvinyl Chloride (PVC) Pipe and Fittings.

28. ASTM D 2922, Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

29. ASTM D 2937, Standard Test Method for Density of Soil in Place by the Drive-Cylinder Method.

30. ASTM D 3017, Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

31. ASTM D 3042, Test Method for Insoluble Residue in Carbonate Aggregates.

32. ASTM D 3350, Standard Specification for Polyethylene Plastics Pipe and Fitting Materials.

33. ASTM D 3776, Standard Test Method for Measuring Mass Per Unit Area (Weight) of Woven Fabric.

34. ASTM D 3786, Standard Test Method for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabric-Diaphragm Bursting Strength Tester Method.

35. ASTM D 4218, Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds By the Muffle-Furnace Technique.

36. ASTM D 4220, Standard Practices for Preserving and Transporting Soil Samples.

37. ASTM D 4318, Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

38. ASTM D 4354, Standard Practice for Sampling of Geosynthetics for Testing.

39. ASTM D 4355, Standard Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus).

40. ASTM D 4491, Standard Test Method for Water Permeability of Geotextiles by Permittivity.

41. ASTM D 4533, Standard Test Method for Trapezoidal Tearing Strength of Geotextiles.

42. ASTM D 4632, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.

43. ASTM D 4716, Standard Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.

44. ASTM D 4718, Standard Practice for Correction of Unit Weight and Water Content for Soils Containing Oversize Particles.

45. ASTM D 4751, Standard Test Method for Determining Apparent Opening Size of a Geotextile.

46. ASTM D 4833, Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.

47. ASTM D 5080, Standard Test Method for Rapid Determination of Percent Compaction.

48. ASTM D 5093, Standard Test Method for Field Measurement of Infiltration Rate Using a Double-Ring Infiltrometer with a Sealed-Inner Ring.

49. ASMT D 5199, Standard Test Method for Measuring Nominal Thickness of Geosynthetics.

50. ASTM D 5261, Standard Test Method for Measuring Mass Per Unit Area of Geotextiles.

51. ASTM D 5321, Standard Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method.

52. ASTM D 5397, Standard Test Method for Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test.

53. ASTM D 5596, Standard Test Method for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics.

54. ASTM D 5890, Standard Test Method for Swell Index of Clay Mineral Component of Geosynthetic Clay Liners.

55. ASTM D 5891, Standard Test Method for Fluid Loss of Clay Component of Geosynthetic Clay Liners.

56. ASTM D5887, Standard Test Method For Measurement of Index Flux Through Saturated Geosynthetic Clay Liner Specimens Using a Flexible Wall Permeameter.

57. ASTM D 5993, Standard Test Method for Measuring Mass Per Unit of Geosynthetic Clay Liners.

58. ASTM D5994, Standard Test Method for Measuring Core Thickness of Textured Geomembrane.

59. ASTM D 6243, Standard Test Method for Determining the Internal and Interface Shear Resistance of Geosynthetic Clay Liner by the Direct Shear Method.

60. ASTM D 6392, Standard Test Method for Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods.

61. ASTM D 6693, Standard Test Method for Determining Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembranes.

62. ASTM F656, Standard Specification for Primers for Use in Solvent Cement Joints at Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.

63. ASTM F714, Standard Specification for Polyethylene (PE) Plastics Pipe (SDR-PR) Based on Outside Diameter.

64. ASTM F904, Standard Test Method for Comparison of Bond Strength or Ply Adhesion of Similar Laminates Made from Flexible Materials.

B. Daniel, D.E. and R.M. Koerner, (1993), Technical Guidance Document: Quality Assurance and Quality Control for Waste Containment Facilities, EPA/600/R-93/182.

C. USEPA, (1991), *Technical Guidance Document: Inspection Techniques for the Fabrication of Geomembrane Field Seams*, EPQ/530/SW-91/051.

D. Geosynthetic Research Institute Test Method GM6, "Pressurized Air Channel Test for Dual Seamed Geomembranes."

E. Geosynthetic Research Institute Test Method GC7, "Determination of Adhesion and Bond Strength of Geocomposites."

1.04 OTHER DEFINITIONS

A. Base Course: The upper course of the granular base of a pavement or the lower course of an asphalt concrete pavement structure.

B. Batch: A quantity of resin, usually the capacity of one railcar, used in the fabrication of high density polyethylene (HDPE) geomembrane or geonet rolls. Each finished roll will be identified by a number corresponding to the resin batch.

C. Bridging: Refers to either an incomplete compaction of material that leaves void pockets beneath a granular material or where geosynthetic material is not in complete contact with the underlying materials.

D. Contractor: The individual, firm, partnership, corporation or combination thereof entering into a contract with the Contracting Agency to perform the advertised work.

E. Culvert: Any structure not classified as a bridge, which provides an opening under or adjacent to the roadway.

F. Full Depth Pavement: An asphalt concrete pavement structure in which the granular base and subbase are replaced by proportionate thicknesses of asphalt concrete.

G. Furnish: Purchase, supply and deliver to the Project Site, ready for unloading, unpacking, assembly, installation, and similar operations.

H. Install: Operations at the Project Site including unloading, unpacking, assembly, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

I. Pavement: Any surfacing of streets, alleys, sidewalks, courts, driveways, etc., consisting of mineral aggregate bound into a rigid or semi-rigid mass by a suitable binder such as, but not limited to, Portland cement or asphalt cement.

J. Pavement Structure: The combination of subbase, base course, and surface course placed on a subgrade to support the traffic load and distribute it to the roadbed.

K. Plans: All approved drawings or reproductions thereof pertaining to the work and details therefore, which are made a part of the Contract Documents.

L. Profile Grade: The trace of a vertical plan intersecting the top surface of the proposed wearing surface, usually along the longitudinal centerline of the roadbed. Profile grade means either elevation or gradient of such trace according to the context.

M. Right-of-way: A general term denoting land, property, or interest therein, usually in a strip, acquired for or devoted to a street, highway, or other public improvement.

N. Road: A general term denoting a public way for purposes of vehicular travel, including the entire area within the Right-of-way.

O. Roadway: The proportion of the Right-of-way intended primarily for vehicular traffic, and including all appurtenant structures and other features necessary for proper drainage and protection. Where curbs exist, it is that portion of roadway between the faces of the curbs.

P. Shoulder: The portion of the Roadway contiguous with the traveled way for accommodation of stopped vehicles, for emergency use, and for lateral support of base and surface courses.

Q. Storm Drain: Any conduit and appurtenance intended for the reception and transfer of storm water.

R. Subbase: The lower course of the base of a roadway, immediately above the Subgrade.

S. Subgrade: The supporting structures on which the pavement and its special undercourses rest.

T. Surface Course: The finished or wearing course of an asphalt concrete pavement structure.

U. Traveled Way: The portion of the Roadway for the movement of vehicles, exclusive of Shoulders and auxiliary lanes.

V. Utility: Pipe lines, conduits, ducts, transmission lines, overhead or underground wires, railroads, storm drains, sanitary sewers, irrigation facilities, street lighting, traffic signals, and fire alarm systems, and appurtenances of public utilities and those of private industry, businesses or individuals solely for their own use or use of their customers which are operated or maintained in, on, under, over or across public Right-of-way or public or private easement.

W. Provide: To furnish and install, complete and ready for the intended use.

X. Installer: The CONTRACTOR or another entity engaged by the CONTRACTOR, either as an employee, Subcontractor, or CONTRACTOR of lower tier, to perform a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

Y. Experienced: The term experienced, when used with the term Installer, means having a minimum of 5 previous projects similar in size and scope to this Project, being familiar with the special requirements indicated, and having complied with requirements of the authorities having jurisdiction.

Z. Project Site: Is the space available for performing construction activities, either exclusively or in conjunction with others performing work as part of the Project. The extent of the Project Site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.

AA. Specifications: This refers to this document or parts thereof or to a second document source.

BB. Obstructions: Shall mean existing features, utilities, canals, power lines, buried pipelines, gas lines, water lines, buried communications, public roads, etc.

CC. Compaction: Shall mean the process of increasing the density or unit weight of soil by rolling, tamping, vibrating, or other mechanical means.

DD. Unit Weight: Shall mean the weight of a soil weight per unit volume, usually expressed in lb/ft^3 or kN/m^3.

EE. Extrusion Weld: Shall mean a bond between two high density polyethylene (HDPE) materials which is achieved by extruding a bead of HDPE over the leading edge of the seam between the upper and lower sheet using a hand held apparatus.

FF. Fusion Weld: Shall mean a bond between two high density polyethylene (HDPE) materials which is achieved by fusing both HDPE surfaces in a homogenous bond of the two surfaces using a power driven apparatus capable of heating and compressing the overlapped portions of the Geomembrane sheets.

GG. HDPE Geomembrane or Geomembrane: Shall mean a relatively impermeable thin sheet of high density polyethylene used as a barrier liner or cover to prevent liquid or vapor migration into or from liquid or solid storage facilities.

HH. In Situ: Shall mean in-place naturally.

II. Moisture Content: Shall mean the ratio of weight of water in the soil to the weight of the soil solids (dry soil), expressed in percentage; also referred to as water content.

JJ. Textured Geomembrane: Shall mean Geomembrane with roughened, high-friction surfaces created by co-extrusion, impingement, lamination or other methods approved by the ENGINEER.

KK. Owner: The City of Bozeman.

LL. Geomembrane: A very low permeability synthetic liner or barrier used to minimize fluid migration in civil engineering works.

MM. Record Drawings: Drawing recording the dimensions, details, and coordinates of the facility after construction is completed.

NN. Engineer: The individual who is lawfully licensed to practice engineering, and is under contract to the OWNER to provide professional services as defined in the Contract Documents, under the direction of the City Project Manager, and in making recommendations to the City Project Manager. The term Engineer means the engineer or his or her authorized representative.

OO. Operations Layer: See Protective Layer.

PP. Protective Layer: The operation layer placed on top of the lining system to protect the liners from protruding objects or to protect liner from damage done by operations equipment during placement and compaction of waste. Also known as Operations Layer, Protective Soil, Protective Materials.

QQ. Protective Soil: See Protective Layer.

RR. Protective Material: See Protective Layer.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION

SECTION 01300
SUBMITTALS

PART 1 – GENERAL

1.01 SUMMARY

A. General:

1. Section includes:

a. Requirements and procedures of the submittal process for Shop Drawings, operation and maintenance manuals, and miscellaneous submittal items.

B. Related Sections include but are not necessarily limited to:

1. Division 1 – General Requirements.

2. Sections in Divisions 2 through 16 identifying required submittals.

1.02 DEFINITIONS

A. Shop Drawings:

1. See General Conditions.

2. Product data and samples are Shop Drawing information.

B. Miscellaneous Submittals:

1. Submittals other than Shop Drawings:

2. Representative types of miscellaneous submittal items may include but are not limited to:

a. Construction schedule.

b. Concrete, soil compaction and pressure test reports.

c. Installed equipment and systems performance test reports.

d. Manufacturer's installation certification letters.

e. Instrumentation and control commissioning reports.

f. Warranties.

g. Service agreements.

h. Cost breakdown (Schedule of Values).

i. Traffic Control Plan

j. Proposed Products List and Product Data.

k. Soil Samples.

l. Survey Equipment Certification.

m. Health & Safety Plan

n. Pipe Testing Protocol

o. Schedule of Submittals

1.03 TRANSMITTALS

A. Shop Drawings and Operation and Maintenance Manuals:

1. Transmit each submittal with a transmittal form. Provide three (3) copies of each submittal.

2. All transmittals must be from CONTRACTOR and bear his approval stamp and signed or initialed.

a. Shop Drawing transmittal stamp shall read "(Contractor's Name) has satisfied Contractor's obligation under the Contract Documents with respect to Contractor's review and approval. This review will include, but is not limited to, verification of products required, field dimensions, adjacent construction work, and coordination of information with all trades.

b. Operation and Maintenance Manual transmittal stamp may be CONTRACTOR's standard approval stamp.

3. Provide submittal information defining CONTRACTOR supplied equipment or materials utilized on the project. Generalized product information not clearly defining specific equipment or materials to be provided will be rejected.

4. Calculations required in individual specification sections will be received for information purposes only and will be returned stamped "E. Engineer's Review Not Required" to acknowledge receipt.

5. Submittal schedule:

a. Schedule of Shop Drawings for CONTRACTOR supplied equipment:

1) Submitted and approved within 20 days of receipt of Notice to Proceed.

2) Account for multiple transmittals under any specification section where partial submittals will be transmitted.

b. Shop Drawings:

1) Submittal and approval prior to 50 percent completion.

c. Operation and Maintenance Manuals and Equipment Record Sheets:

1) Initial submittal within 60 days after date Shop Drawings are approved.

d. Schedule submittals to expedite the Project and deliver in the time frame specified. Coordinate submission of related items.

B. Miscellaneous Submittals:

1. Transmit under CONTRACTOR's standard letter of transmittal or letterhead.

2. Submit in triplicate or as specified in individual specification section.

1.04 PREPARATION OF SUBMITTALS

A. Shop Drawings:

1. Scope of any letter of transmittal:

a. Limited to one Specification Section.

b. Do not submit under any Specification Section entitled (in part) "Basic Requirements."

2. Numbering letter of transmittal:

a. Include as prefix the specification section number followed by "-xx" beginning with "01."

b. If more than one submittal under any specification section, number transmittals consecutively.

3. Describing transmittal contents:

a. Provide listing of each component or item in submittal capable of receiving an independent review action.

b. Identify for each item:

1) Manufacturer and Manufacturer's drawing or data number.

2) Contract Document tag number(s).

3) Contract Drawings Section or detail number if appropriate.

4) Specification Article/Paragraph number if appropriate.

4. Resubmittals:

   a. Number with original root number and a suffix letter starting with "A" on a (new) duplicate transmittal form.

   b. Do not increase the scope of any prior transmittal.

   c. Account for all components of prior transmittal.

      1) If items in prior transmittal received "A" or "B" Action code, list them and indicate "A" or "B" as appropriate.

         a) Do not include submittal information for items with prior "A" or "B" Action in transmittal.

      2) Indicate "Outstanding-To Be Resubmitted At a Later Date" for any prior "C" or "D" Action item not included in resubmittal.

         a) Obtain ENGINEER's prior approval to exclude items.

5. For 8-1/2 x 11 inch size sheets, provide four copies of each page for ENGINEER plus the number required by the CONTRACTOR. The number of copies required by the CONTRACTOR will be defined at the Preconstruction Conference, but shall not exceed 10.

6. For items not covered in Paragraph 1.04-A.5 submit one reproducible transparency and one print of each Drawing until approval is obtained. Utilize mailing tube; do not fold. The ENGINEER will mark and return the reproducible to the CONTRACTOR for his reproduction and distribution.

7. Provide clear space (3 inch square) for ENGINEER stamping of each component defined in 1.04-A.4.

8. CONTRACTOR shall not use red color for marks on transmittals. Duplicate all marks on all copies transmitted, and ensure marks are photocopy reproducible. Outline CONTRACTOR marks on reproducible transparencies with a rectangular box.

9. Provide space on all submittals for CONTRACTOR and ENGINEER review stamps.

10. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.

11. Copies of reviewed submittals will be distributed by General Contractor as appropriate. Parties receiving reviewed submittals to be instructed to report any inability to comply with provisions.

12. Transmittal contents:

a. Coordinate and identify Shop Drawing contents so that all items can be easily verified by the ENGINEER.

b. Identify equipment or material use, tag number, Drawing detail reference, weight, and other project specific information.

c. Provide sufficient information together with technical cuts and technical data to allow an evaluation to be made to determine that the item submitted is in compliance with the Contract Documents.

d. Submit items like equipment brochures, cuts of fixtures, product data sheets or catalog sheets on 8-1/2 x 11 inch pages. Indicate exact items or model and all options proposed.

e. Include legible scale details, sizes, dimensions, performance characteristics, capacities, test data, anchoring details, installation instructions, storage and handling instructions, color charts, layout drawings, parts catalogs, rough-in diagrams, writing diagrams, controls, weights, and other pertinent data. Arrange data and performance information in format similar to that provided in Contract Documents. Provide, at minimum, the detail provided in the Contract Documents.

f. If proposed equipment or materials deviate from the Contract Drawings or Specifications in any way, clearly note the deviation and justify the said deviation in detail in a separate letter immediately following transmittal sheet.

B. Samples:

1. Identification:

a. Identify sample as to transmittal number, manufacturer, item, use, type, project designation, tag number, Standard Specification section or Drawing detail reference, color, range, texture, finish, and other pertinent data.

b. If identifying information cannot be marked directly on sample without defacing or adversely altering samples, provide a durable tag with identifying information securely attached to the sample.

2. Include application specific brochures and installation instructions.

3. Provide Contractor's stamp of approval on samples or transmittal form as indication of CONTRACTOR's checking and verification of dimensions and coordination with interrelated work.

4. Resubmit samples of rejected items.

C. Operation and Maintenance Manuals:

1. The CONTRACTOR shall submit Operation & Maintenance Manuals for all CONTRACTOR supplied equipment.

2. Number transmittals for Operation and Maintenance Manual with original root number of the approved Shop Drawing for the item.

3. Submit two copies until approval is received.

4. Identify resubmittals with the original number plus a suffix letter starting with "A".

5. Submit Operations and Maintenance Manuals printed on 8-1/2 x 11 inch size heavy first quality paper with standard three-hole punching and bound in stiff metal hinged binder constructed as a three-ring style. Provide binders with titles on front and on spine of binder. Tab each section of manuals for easy reference with plastic-coated dividers. Provide index for each manual. Provide plastic sheet lifters prior to first page and following last page.

6. Reduce Drawings or diagrams bound in manuals to an 8-1/2 x 11 inch or 11 x 17 inch size. However, where reduction is not practical to ensure readability, fold larger Drawings separately and place in vinyl envelopes which are bound into the binder. Identify vinyl envelopes with Drawing numbers.

7. Transmittal Content:

   a. Submission of Operation and Maintenance Manuals is applicable but not necessarily limited to:

      1) Major equipment.

      2) Equipment used with electrical motor loads of 1/6 HP nameplate or greater.

      3) Specialized equipment including instrumentation and control system components.

   b. Operation and maintenance manuals shall include, but not necessarily be limited to, the following detailed information, as applicable:

      1) Equipment function, normal operating characteristics, limiting operations.

      2) Assembly, disassembly, installation, alignment, adjustment, and checking instructions.

      3) Operating instructions for start-up, routine and normal operation, regulation and control, shutdown, and emergency conditions.

      4) Lubrication and maintenance instructions.

      5) Guide to "troubleshooting."

      6) Parts list and predicted life of parts subject to wear.

      7) Outline, cross-section, and assembly Drawings; engineering data; and electrical diagrams, including elementary diagrams, wiring

diagrams, connection diagrams, word description of wiring diagrams, and interconnection diagrams.

8) Test data and performance curves.

9) A list of recommended spare parts with a price list and a list of spare parts provided under these specifications.

10) Copies of installation instructions, parts lists or other documents packed with equipment when delivered.

11) Instrumentation or tag numbers relating the equipment back to the Contract Documents.

12) Complete maintenance requirements in detail. Simple reference to the Manual is not acceptable.

1.05 ENGINEER'S REVIEW ACTION

A. Shop Drawings and Samples:

1. Items within transmittals will be reviewed for overall design intent and will receive one of the following actions:

a. A – FURNISH AS SUBMITTED.

b. B – FURNISH AS NOTED (BY ENGINEER).

c. C – REVISE AND RESUBMIT.

d. D – REJECTED.

e. E – ENGINEER'S REVIEW NOT REQUIRED.

2. ENGINEER will review and process all submittals promptly. Allow 14 calendar days review time for each submittal excluding delivery time to and from the CONTRACTOR.

3. Transmittals received will be initially reviewed to ascertain inclusion of CONTRACTOR's approval stamp. Drawings not stamped by the CONTRACTOR or stamped with a stamp containing language other than that specified in Paragraph 1.03-A.2.a will not be reviewed for technical content and will be returned without any action.

4. Transmittals returned with Action "A" or "B" are considered ready for fabrication and installation. If for any reason a transmittal that has an "A" or "B" Action is resubmitted, it must be accompanied by a letter defining the changes that have been made and the reason for the resubmittal. Destroy or conspicuously mark "SUPERSEDED" all documents having previously received "A" or "B" Action that are superseded by a resubmittal.

5. Transmittals with Action "A" or "B" combined with Action "C" (Revise and Resubmit) or "D" (Rejected) will be individually analyzed giving consideration as follows:

   a. The portion of the transmittal given "C" or "D" will not be distributed (unless previously agreed to otherwise at the Preconstruction Conference). One copy or the one transparency of the "C" or "D" Drawings will be marked up and returned to the Contractor. Correct and resubmit items so marked.

   b. Items marked "A" or "B" will be fully distributed.

   c. If a portion of the items or system proposed are acceptable, however, the major part of the individual Drawings or documents are incomplete or require revision, the entire submittal may be given "C" or "D" Action. This is at the sole discretion of the ENGINEER. In this case, some Drawings may contain relatively few or no comments or the statement, "Resubmit to maintain a complete package." Distribution to the OWNER and field will not be made (unless previously agree to otherwise).

6. Failure to include any specific information specified under the submittal paragraphs of the specifications will result in the transmittal being returned to the CONTRACTOR with "C" or "D" Action.

7. Transmittals such as submittals which the ENGINEER considers as "Not Required," submittal information which is supplemental to but not essential to prior submitted information, or items of information in a transmittal which have been reviewed and received "A" or "B" Action in a prior transmittal, will be returned with Action "E. Engineer's Review Not Required."

8. Samples may be retained for comparison purposes. Remove samples when directed. Include in bid all costs of furnishing and removing samples.

9. Approved samples submitted or constructed, constitute criteria for judging completed work. Finished work or items not equal to samples will be rejected.

B. Operation and Maintenance Manuals:

1. Engineer will review and indicate one of the following review actions:

   a. ACCEPTABLE.

   b. FURNISH AS NOTED.

   c. REVIEW AND RESUBMIT.

   d. REJECTED.

2. Acceptable submittals will be retained with the transmittal form returned with a request for five additional copies.

3. Deficient submittals will be returned along with the transmittal form which will be marked to indicate deficient areas.

PART 2 – PRODUCTS

2.01 CONSTRUCTION PROGRESS SCHEDULES

A. Submit initial critical path method (CPM) schedule in duplicate at the Pre-construction meeting after date of execution of Agreement. The critical path construction tasks shall be clearly identified.

B. Construction operations will be scheduled to allow uninterrupted operation of existing adjacent facilities.

1. Coordinate connections with existing work to ensure timely completion of interfaced items.

C. At no time shall CONTRACTOR or his employees modify operation of the existing facilities or start construction modifications without approval of the OWNER except in emergency to prevent or minimize damage.

D. Within 10 days prior to construction startup, CONTRACTOR to submit for approval a CPM schedule with the critical path tasks clearly identified.

1. Schedule to include any information discussed in preconstruction meeting.

2. Account for schedule of Subcontracts.

a. Include proper sequence of construction, various crafts, purchasing time, Shop Drawing approval, material delivery, equipment fabrication, startup, demonstration, and similar time consuming factors.

3. Show on schedule as a minimum, earliest starting, earliest completion, latest starting, latest finish, and free and total float for each task or item.

E. Evaluate schedule as necessary to reflect changes in Scope of Work, but no less than bi-weekly.

1. Show changes since previous submittal including major scope changes, activities modified since previous submittal and other identifiable changes.

2. Update, correct, and rerun schedule and submit to ENGINEER in triplicate with pay application to show rescheduling necessary to reflect true job conditions.

3. When shortening of various time intervals is necessary to correct for behind schedule conditions, indicate actions to implement to accomplish work in shorter duration.

4. Information shall be submitted to ENGINEER in writing with revised schedule.

a. Review progress schedules during progress meetings.

b. Submit a computer-generated graphic type schedule with separate line for each item of Work or operation identifying first work day of each week.

c. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities.

1) Indicate the early and late start, early and late finish, float dates, and duration, and critical items.

d. Indicate estimated percentage of completion for each item of Work at each submission.

e. Indicate submittal dates and review periods required for Shop Drawings, product data, samples, and product delivery dates, including those furnished by the OWNER.

f. Coordinate schedule with ENGINEER for Engineer supplied information.

g. Coordinate schedule with Work Plan.

F. If CONTRACTOR does not take necessary action to accomplish work according to schedule, CONTRACTOR may be ordered by OWNER in writing to take necessary and timely action to improve work progress at CONTRACTOR's expense.

1. OWNER may require increased work forces, extra equipment, extra shifts or other action as necessary at CONTRACTOR's expense.

2. Should CONTRACTOR refuse or neglect to take such action authorized, under provisions of this contract, OWNER may take necessary actions including, but not necessarily limited to, withholding of payment and termination of Contract.

G. Indicate submittal dates and review periods required for shop drawings, product data, samples, and product delivery dates, including those furnished by the OWNER.

H. Indicate surveys for layout, as-builts, and measurement for payment.

2.02 PROPOSED PRODUCTS LIST

A. At the Pre-construction meeting after date of Notice to Proceed, submit list of major products, if any, proposed for use, with name of manufacturer, trade name, and model number of each product.

B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

2.03 SHOP DRAWINGS

A. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

2.04 PRODUCT DATA, IF REQUIRED

A. Submit five copies to the ENGINEER for review and approval.

B. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to this Project.

2.05 SURVEY EQUIPMENT CALIBRATIONS

A. Provide certification of calibration for all survey equipment used during the project.

B. Submit calibrations to the ENGINEER 5 days prior to putting equipment into use.

C. Re-calibration as recommended by equipment manufacturer, then re-submit.

2.06 CORRESPONDENCE

A. The OWNER will provide a correspondence matrix identifying requirements for submitting and sharing correspondence among the parties involved in the project.

2.07 CONTRACTOR'S WORK PLAN

A. Submit a preliminary Work Plan in accordance with Section 01310.

2.08 AS-BUILT DRAWINGS

A. When any fabrication deviates from the Contract Documents, the CONTRACTOR shall prepare complete as-built drawings of the actual fabrication. This will include detailed specifications, dimensions, material used, parts, devices and other accessories used in the fabrications. Two complete sets of As-Builts shall be submitted to the ENGINEER.

B. The CONTRACTOR shall maintain a neat and accurately marked set of As-Built drawings showing the final locations and layout of all civil, mechanical, electrical, instrumentation equipment, piping and conduit, structures, and other improvements. Drawings shall be updated daily, with all work instructions and change orders, accommodations and adjustments shown. As-built drawings shall be kept in the job site trailer, or other location as approved by the ENGINEER, and shall be subject to inspection by the ENGINEER at all times. Progress payments, or portions thereof, may be withheld if as-built drawings are not accurate and current. As-built drawings shall be separate, clean blueprints reserved for the purpose of showing the complete picture of the components and assemblies actually installed.

C. Upon completion of the work, these as-Built drawings shall be transferred to the ENGINEER. Completed as-built drawings will be signed by the CONTRACTOR, dated, and returned to the ENGINEER for approval. Hand drawn sketches will not be accepted as completed As-Built Drawings.

D. As-Built coordinates will be provided for all significant system features, including existing and new gas extraction wells, extraction well control valves, extraction well tie-ins to the main header, header sample ports, flanges, and valves, etc. The ENGINEER shall determine what System features will require as-built coordinates. As-built coordinates shall be referenced to known benchmarks or survey monuments. **The Surveyor shall submit as-built drawings in electronic format. Electronic files shall be AutoCAD compatible (i.e., .dxf format).**

PART 3 – EXECUTION (Not Applicable)

END OF SECTION

SECTION 01310
CONSTRUCTION WORK PLAN AND SCHEDULE

PART 1 – GENERAL

1.01 PRELIMINARY WORK PLAN AND SCHEDULE

A. Prepare and submit at the pre-construction meeting, a Work Plan and construction schedule.

B. The ENGINEER will review the preliminary Work Plan and construction schedule prior to the commencement of construction activities.

C. The CONTRACTOR may be interviewed by the ENGINEER to determine the CONTRACTOR'S understanding of the project, and ability to complete the work in a timely and efficient manner.

1.02 CONTRACTOR'S WORK PLAN CONTENTS

A. Include with Work Plan the CONTRACTOR'S utilities, phasing of work, excavation, testing, and any other information related to proposed operations.

B. Describe personnel, equipment, and procedures required to accomplish specific items of work, including:

1. Method of coordinating Subcontractors, if any, and maintaining project schedule.

2. Methods and routes for moving and stockpiling materials on site. Include detailed drawings showing haul routes and logistics.

3. Methods for reducing or increasing the moisture content of wet or dry soils prior to using them for constructing engineered fills during construction.

4. Methods and equipment for excavating, hauling, and placing materials.

5. Dewatering methods, equipment and schedules.

6. Site drainage during construction.

7. Methods and equipment for site clearing.

8. Methods for erosion prevention and sediment control.

9. Plans for maintaining as-built information.

10. Health and Safety Plan.

11. Project Schedule.

12. List of Personnel and equipment.

13. List of Subcontractors and Subconsultants.

14. List and organizational chart of project personnel responsibility.

15. Other information required in technical specifications.

16. Emergency action plan and contacts' telephone numbers.

17. Spill Prevention Control and Countermeasures (SPCC) Plan, if required based on quantity of petroleum products stored.

1.03 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Prepare a schedule as described in Section 01300, paragraph 2.01.

B. Coordinate schedule with the OWNER for the OWNER supplied materials.

C. Coordinate schedule with Work Plan.

1.04 PROJECT MEETINGS

A. Construction Meetings:

1. The ENGINEER will conduct construction meetings involving:
   a. CONTRACTOR's Project Manager.
   b. CONTRACTOR's Project Superintendent.
   c. OWNER's designated representative(s).
   d. ENGINEER's designated representative(s).
   e. CONTRACTOR's subcontractors as appropriate to the work in progress.
   f. OWNER's Construction Quality Control Consultant.

2. Meetings will be conducted weekly when there are construction activities in progress at the site.

3. The ENGINEER will take meeting minutes and submit copies of meeting minutes to participants and designated recipients identified at the Preconstruction Conference.
   a. Corrections, additions, or deletions to the minutes shall be noted and addressed at the following meeting.

4. The ENGINEER will schedule meetings for most convenient time frame.

5. The ENGINEER will have available at each meeting full chronological files of all previous meeting minutes.

6. The CONTRACTOR shall have available at each meeting up-to-date record drawings.

B. Pre-Installation Conferences:

1. Coordinate and schedule with ENGINEER for each material, product, or system specified. Conferences to be held prior to initiating installation, but not more than two (2) weeks before scheduled initiation of construction.

   a. Conferences may be combined if installation schedule of multiple components occurs with the same two (2) week interval.

   b. Review manufacturers' recommendations and Contract Documents Specifications.

2. CONTRACTOR's Superintendent and individual who will actually act as foreman of the installation crew (installer), if other than the Superintendent, shall attend.

1.05 VIDEO RECORDING

A. Provide full access to OWNER or OWNER's authorized representative to perform video recording of construction activities, construction meetings, training sessions, start-up, trouble shooting, etc.

1.06 CORRESPONDENCE

A. The CONTRACTOR will provide a correspondence matrix identifying requirements for submitting and sharing correspondence among the parties involved in the Project.

1.07 SPECIAL CONSIDERATIONS

A. CONTRACTOR shall be responsible for negotiations of any waivers or alternate arrangements required to enable transportation of materials to the site.

B. Maintain conditions of access road to site such that access is not hindered as the result of construction-related deterioration.

1.08 PROJECT PHOTOGRAPHS

A. ENGINEER shall provide digital photographs of construction process.

   1. Photographs shall be provided with nomenclature and description for easy identification of photo location and subject matter.

   2. Submit photographs weekly in hard copy (2 copies) and electronic format.

1.09 FINAL WORK PLAN

A. Resubmit the Work Plan to incorporate the information discussed during the pre-construction meeting.

B. Work Plan and Schedule Revisions.

   1. Revise Work Plan as necessary to reflect changes in scope of work, but no less than once per month.

   2. Show changes occurring since previous submittal.

      a. Major changes in scope.

b. Activities modified since previous submittal.

c. Other identifiable changes.

3. Submit to the ENGINEER.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION

SECTION 01410
QUALITY ASSURANCE TESTING, QUALITY CONTROL TESTING

Note: In addition to Section 01410, the CONTRACTOR must comply with all other requirements in the Project CQC Manual.

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Construction Quality Assurance (CQA) testing by the ENGINEER.

B. Construction Quality Control (CQC) testing by CONTRACTOR.

C. Certificates of Compliance.

1.02 RELATED SECTIONS

A. Section 01300 – Submittals.

1.03 SOURCE OF MATERIALS

A. CONTRACTOR must notify the ENGINEER in writing of the sources from which it proposes to obtain material if different from Drawings and requiring the ENGINEER approval, certification, or quality assurance testing. Such notification must be made as soon as possible after award of Contract but no later than 5 days after receipt of the Notice to Proceed. Samples of the proposed material must be provided to the ENGINEER upon request.

1.04 CONSTRUCTION QUALITY ASSURANCE TESTING

A. CQA testing is the testing of materials, before their inclusion in the work, and materials and workmanship, after their inclusion in the work.

B. CQA testing will be performed by the ENGINEER contracted by the OWNER as a basis for acceptance of the completed work.

C. The ENGINEER will perform CQA testing in accordance with the Specifications. However, the ENGINEER reserves the option to perform additional CQA testing at any time to determine conformance of the materials and workmanship in accordance with the Contract Documents.

D. CQA testing performed by the ENGINEER does not relieve the CONTRACTOR of the obligation to perform and document quality control testing of materials and workmanship.

1.05 CONSTRUCTION QUALITY CONTROL TESTING

A. CQC testing is the testing of materials performed by the material supplier before their delivery or by the CONTRACTOR during construction, such as geosynthetic materials manufacturing, geosynthetic seam testing, and such other tests as are specified in the various sections of the Specifications to ensure compliance with the Contract Documents. CONTRACTOR must assume full responsibility for quality control testing and give sufficient notice to the ENGINEER to permit the ENGINEER to witness the tests. CQC testing will be at the expense of CONTRACTOR and where specifically required, must be performed by an independent testing firm.

B. Submit the name, address, and qualifications, together with the scope of proposed services, of the proposed testing firm(s) to the OWNER and ENGINEER for approval at least 14 days prior to the scheduled commencement of any work involving such testing.

C. Within five days of completion of testing performed by or for CONTRACTOR, the CONTRACTOR will be required to submit test results to the ENGINEER. Identify test reports with the information specified for samples in Section 01300 and, additionally, the name and address of the organization performing the test, and the date test was performed.

1.06 CERTIFICATES OF COMPLIANCE

A. CONTRACTOR may use certificates of compliance for certain materials and products in lieu of the specified sampling and testing procedures. Submit certificates required to demonstrate proof of compliance of materials with specification requirements in duplicate with each lot of material delivered to the Work or prior to delivery as required by the Contract. The lots so certified must be clearly identified by the certificate. Certificates must be signed by an authorized representative of the producer or manufacturer and state that the material complies in all respects with the requirements of the Contract Documents. In the case of multiple shipments, each shipment must be accompanied or preceded by a Certificate of Compliance.

B. The Certificate of Compliance must be accompanied by a certified copy of test results or state that such test results are on file with the producer or manufacture and must be furnished to the ENGINEER. The certificate must give the information specified for samples in Section 01300, the name and address of the organization performing the tests, the date of the tests, and the quality of material shipped.

C. Materials used on the basis of a Certificate of Compliance may be sampled and tested at any time. The fact that material is used on the basis of a Certificate of Compliance does not relieve CONTRACTOR of responsibility for incorporating material in the Work which conforms to the requirements of the Contract and any

such material not conforming to such requirements will be subject to rejection by the OWNER or ENGINEER, whether in place or not.

D. The ENGINEER reserves the right to refuse the use of certain materials on the basis of a Certificate of Compliance.

PART 2 – PRODUCTS

A. All materials and equipment provided by the CONTRACTOR shall be new and of the specified quality and equal to the samples found to be accepted by the OWNER, if samples have been submitted. The Work shall be completed in thorough, workmanlike manner, notwithstanding any omission in the Contract Documents.

PART 3 – EXECUTION

3.01 TABLES FOR WORK PERFORMED BY EITHER THE ENGINEER OR CONTRACTOR

TABLE 01410-1
FREQUENCY AND TYPE OF FIELD AND LAB
SOILS CONFORMANCE TESTING

Test		Frequency of Test			
Reference	Description	Operations Layer	General Fill and ENGINEERED Fill	Trench Backfill/Pipe Bedding Material	Riprap
ASTM D3017	Moisture Content (nuclear)	N/A	1 per 2,500 CY (minimum 1 per lift)	1 per 200 lineal feet of trench	N/A
ASTM D698	Laboratory Compaction-Standard Proctor	N/A	1 per 10,000 cy	1 per 2,000 lineal feet of trench	N/A
ASTM D1556	In-place density by sand cone method	N/A	1/25 nuclear density testing	1 per every 25 nuclear gage tests	N/A
ASTM D2922 or ASTM D2937	In-place density by nuclear method	N/A	1 per 2,500 cy (minimum 1 per lift)	1 per 200 lineal feet of trench	N/A
ASTM D422	Particle Size Analysis	1/200,000 sf	1 per 5,000 cy (minimum 1 per material type)	1/10,000 LF of trench	1/10,000 tons
ASTM D4318	Atterberg Limits	N/A	1 per 10,000 cy	1/10,000 LF of trench	N/A

The samples will be secured in order to minimize disturbance and loss of moisture during transportation and storage. The samples shall also be appropriately marked for identification. The location of samples shall be documented, and it is recommended that a grid pattern be used by the ENGINEER to select sample locations. The grids shall be staggered in successive lifts.

END OF SECTION

SECTION 01500

CONSTRUCTION AND TEMPORARY FACILITIES

PART 1: GENERAL

1.1 CONSTRUCTION FACILITIES

A. Furnish temporary services and utilities, including use fees and operation costs for: potable and non-potable water; lighting and power; and, materials storage.

B. Furnish personnel support facilities including: sanitary facilities; drinking water; first aid supplies and facilities; and, trash removal.

C. Do not park vehicles or equipment or store materials on private property without written permission from the property owner under Section 01010.1.4.B.

1.2 SECURITY

A. Provide fencing, barricades, warning signs, and lights to secure all work areas, equipment, and materials.

1.3 DUST CONTROL

1.4 Be responsible for dust control, providing all equipment and personnel for the work. Furnish Engineer name(s) and telephone number(s) of the person(s) responsible for dust control during evenings and weekends. If this person cannot be contacted, Owner may at Contractor expense, perform the work or contract the work out.

1.5 HAUL ROUTES

A. Obtain Owner approval of haul routes.

PART 2: PRODUCTS — NOT USED

PART 3: EXECUTION — NOT USED

PART 4: MEASUREMENT AND PAYMENT

4.1 PAYMENT

A. All items in Part 1 are incidental to the work and no separate payment is made for these items.

END OF SECTION

SECTION 01570

CONSTRUCTION TRAFFIC CONTROL

PART 1: GENERAL

1.1 DESCRIPTION

A. This work is the furnishing of labor, materials and equipment for installing, maintaining and operating traffic control devices to insure the safety of the general public and project personnel.

1.2 REQUIREMENTS

A. Perform work under this section meeting Manual of Uniform Traffic Control Services (MUTCD) and contract requirements.

1.3 NOTIFICATIONS

A. Coordinate all construction activities to reduce traffic conflicts at the work site, off-site events or other construction projects.

B. Furnish the Engineer, for Owner review, the construction traffic control plan at least one week before construction begins or before changes in segments or phases of the work on the project. The Owner will review and approve the Traffic Control Plan considering known off-site activities and may require modification to the plan or construction timing to coordinate events. Work shall not commence until said plan is approved.

C. For project sites involving a through street, provide the Engineer with a news release. Include in the news release, as a minimum, the work activity and duration. Once approved, furnish the news release to the local media at least three days before starting work. Notify all landowners or residents adjacent to the work of the type and duration of the construction.

PART 2: PRODUCT

2.1 TRAFFIC CONTROL DEVICES

A. Assure all signs and barricades are reflectorized. Assure all night time traffic control devices meet MUTCD lighting requirements.

B. Use traffic control devices meeting the "Manual of Uniform Traffic Control Devices" and the "Traffic Control Devices Handbook" requirements, available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20492.

C. Assure all traffic control devices are clean, legible, reflective for night-time use, and operable.

PART 3 EXECUTION

3.1 WORK METHODS:

A. Place all traffic control devices as planned before permitting men or equipment on the traveled way. Install signs, cones and barricades in that order.

B. Inspect the work area at least twice each day during construction and maintain records of traffic control devices used and their location.

C. Assure traffic control is appropriate to the work. Assure traffic control devices are appropriate and clean before suspending work for the day.

D. Remove traffic control devices in reverse order of installation at the end of each shift.

E. Remove and store all unnecessary traffic control devices away from traffic's view.

3.2 NONCOMPLIANCE

A. Remove, repair or replace any traffic control device not providing its intended function.

B. Do not begin work until all required traffic control devices are placed.

C. The Engineer will periodically inspect the traffic control and inform the Contractor of any deficiencies.

D. Contractor failure to correct any deficiency in the traffic control within 4 hours of notification is cause to deduct monies from the contract payment on the next progress payment.

E. The Engineer may direct correcting traffic control deficiencies immediately. Failure to immediately correct the deficiency is cause for the Engineer to correct the deficiency at Contractor expense.

3.3 FLAGGING

A. Furnish competent and properly equipped flag persons as described in the booklet "Instructions for Flag persons" furnished by the Montana Department of Transportation.

PART 4: MEASUREMENT AND PAYMENT

4.1 PAYMENT

A. Separate measurement for each traffic control device is not made unless the on-site field traffic plan requirements differ materially from the original traffic control plan in the contract. Measurement and payment for the Contractor's off-site traffic control plan and the designed on-site traffic control plan is on a lump sum basis. The lump sum payment is full reimbursement for all costs of furnishing, installing, maintaining, replacing and operating the construction traffic control systems throughout the work period. The construction traffic control system includes but is not limited to, signs, barricades, pavement markings, watering, flag persons and pilot cars.

B. Progress payments are in proportion to total construction completed.

C. If changes in the approved Traffic Control Plan are directed by the Engineer, additional payment or reduction in payment is made for the additional or deleted items as agreed to between the Contractor and the Engineer.

END OF SECTION

SECTION 01620
TRANSPORTATION, HANDLING, AND STORAGE

PART 1 – GENERAL

1.01 DESCRIPTION

A. CONTRACTOR shall make all arrangements for transportation, delivery, handling, and storage of equipment and materials required for prosecution and completion of the Work.

B. Shipments of materials to CONTRACTOR or Subcontractors shall be delivered to the site only during regular working hours. Shipments shall be addressed and consigned to the proper party giving name of Project, street number and city. Shipments shall not be delivered to OWNER, except where otherwise directed.

C. Store and protect materials in accordance with manufacturer's recommendations and requirements of Specifications.

D. Areas available on the construction site for storage of materials and equipment shall be as shown or approved by the ENGINEER.

E. If necessary to move stored materials and equipment during construction, CONTRACTOR shall move materials and equipment without any additional compensation.

F. CONTRACTOR shall be fully responsible for loss or damage to stored materials and equipment.

1.02 DELIVERY

A. CONTRACTOR shall arrange for all material and equipment deliveries to be in the CONTRACTOR'S name. The OWNER and ENGINEER will not sign for the CONTRACTOR'S deliveries.

B. Arrange deliveries of products in accord with construction schedules and in ample time to facilitate inspection prior to installation.

C. Coordinate deliveries to avoid conflict with Work and conditions at site and to accommodate the following:

1. Work of other contractors, or OWNER.

2. Limitations of storage space.

3. Availability of equipment and personnel for handling products.

4. OWNER's use of premises.

D. Do not have products delivered to project site until related Shop Drawings have been approved by the ENGINEER.

E. Do not have products delivered to site until required storage facilities have been provided.

F. Have products delivered to site in manufacturer's original, unopened, labeled containers. Keep ENGINEER informed of delivery of all equipment to be incorporated in the Work.

G. Partial deliveries of component parts of equipment shall be clearly marked to identify the equipment, to permit easy accumulation of parts and to facilitate assembly.

H. Immediately on delivery, inspect shipment to ensure:

1. Product complies with requirements of Contract Documents and reviewed submittal.

2. Quantities are correct.

3. Containers and packages are intact, and labels are legible.

4. Products are properly protected and undamaged.

1.03 PRODUCT HANDLING

A. Provide equipment and personnel necessary to handle products, including those provided by OWNER, by methods to prevent soiling or damage to products or packaging.

B. Provide additional protection during handling as necessary to prevent scraping, marring or otherwise damaging products or surrounding surfaces.

C. Handle products by methods to prevent bending or overstressing.

D. Lift heavy components only at designated lifting points.

E. Materials and equipment shall at all times be handled in a safe manner and as recommended by manufacturer or supplier so that no damage will occur to them. Do not drop, roll or skid products off delivery vehicles. Hand carry or use suitable materials handling equipment.

F. Do not open manufacturer's containers until time of installation, unless recommended by the manufacturer or otherwise specified.

1.04 STORAGE

A. CONTRACTOR shall make all arrangements and provisions necessary for the storage of materials and equipment. All excavated materials, construction equipment, and materials and equipment to be incorporated into the Work shall be placed so as not to injure any part of the Work or existing facilities and so that free access can be maintained at all times to all parts of the Work and to all public utility installations in the vicinity of the Work. Materials and equipment shall be kept neatly and compactly stored in locations that will cause a minimum of inconvenience to other contractors, public travel, adjoining owners, tenants, and occupants. Arrange storage in a manner to provide easy access for inspection.

B. Do not store products in the structures being constructed, unless approved in writing by the ENGINEER.

1.05 PROTECTION

A. Equipment shall be boxed, crated, or otherwise completely enclosed and protected during shipment, handling, and storage.

B. Painted surfaces shall be protected against impact, abrasion, discoloration, and other damage. Painted equipment surfaces, which are damaged prior to acceptance, shall be repainted in entirety to the satisfaction of the ENGINEER.

C. Electrical equipment, controls, and instrumentation shall be protected against moisture, water damage, heat or dust. Space heaters provided in the equipment shall be connected and operating at all times until equipment is placed in operation.

1.06 UNCOVERED STORAGE

A. The following types of materials may be stored outdoors without cover:

1. Masonry units
2. Reinforcing steel
3. Structural steel
4. Piping, except PVC
5. Precast concrete items
6. Castings

B. Store the above materials on wood blocking so there is no contact with the ground.

1.07 COVERED STORAGE

A. The following types of materials may be stored outdoors if covered with material impervious to water:

1. Rough lumber
2. Hand railing
3. Piping, PVC
4. Mechanical valves and equipment designated to be installed outdoors and not under cover.

B. Tie down covers with rope and slope to prevent accumulation of water on covers.

C. Store materials on wood blocking.

1.08 FULLY PROTECTED STORAGE

A. Pumps, motors, drives, other equipment having anti-friction or sleeve bearings, and electrical equipment (except control panels and electronic equipment) shall be stored in buildings or trailers that have a concrete or wood floor, a roof, and fully closed walls on all sides.

B. Provide heated storage space for materials that could be damaged by freezing and provide air conditioned storage space for materials that could be damaged by Arizona's severe high temperatures.

C. Protect mechanical and electrical equipment from being contaminated by dust, dirt, and moisture.

D. Protect all high value items.

1.09 MAINTENANCE OF ON-SITE STORAGE

A. Maintain periodic system of inspection of stored products on a scheduled basis to assure that:

1. State of storage facilities is adequate to provide required conditions.

2. Required environmental conditions are maintained on a continuing basis.

3. Products exposed to elements are not adversely affected.

B. Mechanical and electrical equipment which require long-term storage shall have complete manufacturer's instructions for servicing each item with notice of enclosed instructions shown on exterior of package.

1. Comply with manufacturer's instructions on a scheduled basis.

2. Space heaters that are part of electrical equipment shall be connected and operated continuously until equipment is placed in service.

1.10 OFF-SITE STORAGE

A. Control panels, microprocessor-based equipment and other electronic devices shall not be stored on site.

B. Storage shall be in an insured, climate-controlled warehouse within Maricopa County. The OWNER shall have the right to inspect the equipment during normal working hours. Placed inside each panel or device shall be a desiccant, volatile corrosion inhibitor blocks (VCI), a moisture indicator and maximum-minimum indicating thermometer. The panels and equipment shall be checked once per month. The desiccant, VCI, and moisture indicator shall be replaced as often as required or every six (6) months, whichever occurs first. A certified record of the daily maximum and minimum temperature and humidity in the warehouse shall be available for inspection by the OWNER. A certified record of the monthly inspection, noting maximum and minimum temperature for the month, condition

of desiccant, VCI and moisture indicator, shall also be available for inspection by the OWNER.

C. Off-site storage shall be at no additional cost to the OWNER. Any panel or device which has been damaged by any cause or for which the storage temperature or humidity range has been exceeded shall be replaced at no additional cost to the OWNER and shall not be cause for a delay in Contract completion.

D. The panels and equipment shall not be shipped to the site until field conditions are ready for installation, including all slabs, walls, roofs, and environmental controls. The failure to have the plant site ready for installation shall not relieve CONTRACTOR from meeting all Contract conditions.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 PROTECTION

A. Protect finished surfaces, including subgrade and asphalt.

3.02 REPAIRS AND REPLACEMENTS

A. In event of damage, promptly make replacements and repairs to the approval of the ENGINEER and at no additional cost to the OWNER.

B. Additional time required to secure replacements and to make repairs would not be considered by the ENGINEER to justify an extension in the Contract Time of Completion.

END OF SECTION

SECTION 01630
PRODUCT OPTIONS AND SUBSTITUTIONS

PART 1 – GENERAL

1.01 DESCRIPTION

A. Refer to the Instructions to Bidders, General Conditions and the Supplementary Conditions regarding materials or equipment substitutions.

1.02 PRODUCT OPTIONS

A. For materials or equipment (hereinafter products) specified only by reference standard, select products meeting that standard, by any manufacturer, fabricator, supplier or distributor (hereinafter manufacturer). To the maximum extent possible, provide products of the same generic kind from a single source.

B. For products specified by naming several products or manufacturers, select any one of the products or manufacturers named which complies with Specifications.

C. For products specified by naming one or more products or manufacturers and stating "or equal," submit a request for a substitution to ENGINEER for any product or manufacturer, which is not specifically named.

D. For products specified by naming only one (1) product or manufacturer and followed by words indicating that no substitution is permitted, there is no option and no substitution will be allowed.

E. Where more than one (1) choice is available as a product option, CONTRACTOR will select product that is compatible with other products already selected or specified.

1.03 SUBSTITIONS

A. During a period of seven (7) days after the effective date of the Agreement, OWNER and ENGINEER will consider written requests from CONTRACTOR for substitution of products or manufacturers, and construction methods (if specified).

1. After end of specified period, requests will be considered only in case of unavailability of product or other conditions beyond control of CONTRACTOR.

B. Submit five (5) copies of request for substitution. Submit separate request for each substitution. In addition to requirements set forth in the General Conditions, include in request the following:

1. For products or manufacturers:

a. Product identification, including manufacturer's name and address.

b. Manufacturer's literature with product description, performance and test data, and reference standards.

c. Samples, if appropriate.

d. Name and address of similar projects, on which product was used, and date of installation.

2. For construction methods (if specified):

a. Detailed description of proposed method.

b. Drawings illustrating method.

3. Such other data, as the ENGINEER may require, to establish that the proposed substitution is equal to the product, manufacturer, or method specified.

C. In making request for substitution, CONTRACTOR represents that:

1. CONTRACTOR has investigated proposed substitution and determined that it is equal to or superior in all respects to the product, manufacturer, or method specified.

2. CONTRACTOR will provide the same or better guarantees or warranties for proposed substitution as for product, manufacturer, or method specified.

3. CONTRACTOR waives all claims for additional costs or extension of time related to proposed substitution that subsequently may become apparent.

D. A proposed substitution will not be accepted if:

1. Acceptance will require changes in the design concept or a substantial revision of the Contract Documents.

2. It will delay completion of the Work or the work of other contractors.

3. It is indicated or implied on a Shop Drawing and is not accompanied by a formal request for substitution from CONTRACTOR.

E. If the ENGINEER determines that a proposed substitute is not equal to that specified, CONTRACTOR shall furnish the specified product, manufacturer, or method specified, at no additional cost to OWNER.

F. Approval of a substitution will not relieve CONTRACTOR from the requirement for submission of Shop Drawings as set forth in the Contract Documents.

1.04 DELAYS

A. Delays in construction arising by virtue of the non-availability of a specified material and/or method will not be considered by the OWNER as justifying an extension of the agreed Time of Completion.

1.05 APPROVAL OR REJECTION

A. The CONTRACTOR must receive written approval from the ENGINEER of any substitution granted.

B. ENGINEER reserves the right to require proposed product to comply with color and pattern of specified product if necessary to secure design intent.

C. Substitutions will be rejected if:

1. Submittal is not through the CONTRACTOR with his stamp of approval.

2. Requests are not made in accordance with this Section.

3. In the ENGINEER's opinion, acceptance will require substantial revision of the original design.

4. In the ENGINEER's opinion, substitution is not equal to original product specified or may not perform adequately the function for which it was intended.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1: GENERAL

1.1 CLEANUP

A. Before Final inspection (as outlined in Section 14.06 of the General Conditions) execute the following.

1. Where applicable, clean interior and exterior glass and surfaces exposed to view. Remove temporary labels.

2. Where applicable, clean equipment and fixtures to a sanitary condition.

3. Where applicable, clean debris from roof, gutters, and downspouts.

4. Remove debris, waste, surplus materials, and rubbish from right-of-way, easements (construction or permanent) and private property.

5. Where applicable, remove debris, dirt, and silt from storm drain basins, sanitary sewer and storm drain manholes, and water valve boxes.

6. Rake landscaped surfaces clean of debris.

7. Where applicable, remove temporary coverings from traffic control devices.

8. Clean traffic control devices and signs.

9. Where applicable, remove temporary traffic striping.

10. Sweep dirt and debris from all paved areas affected by the work.

1.2 RECORD DOCUMENTS

A. Submit record documents as outlined in the General Conditions. Final payment will not be processed until the documents are submitted to and approved by the Engineer.

1.3 OPERATION AND MAINTENANCE DATA

A. Where applicable, submit two sets, before final inspection, bound in three ring binders. Prepare a table of contents for each volume with each product or system identified.

B. Where applicable, prepare the following:

1. Directory, listing names, addresses and telephone numbers of Engineer, Contractor, Subcontractor, and Equipment Suppliers.

2. Operations and maintenance instructions, arranged by system. For each category, identify the applicable Contractor(s) or Subcontractor(s) and suppliers. Identify the following:

    1. Significant design criteria
    2. List of equipment
    3. Parts list for each component
    4. Operating instructions
    5. Maintenance instructions

1.4 WARRANTIES AND BONDS

A. Submit, with final payment request, all warranty certificates, lien releases, and consent of security forms.

PART 2: PRODUCTS — NOT USED

PART 3: EXECUTION — NOT USED

PART 4: MEASUREMENT AND PAYMENT — NOT USED

END OF SECTION

SECTION 01710
FINAL CLEANING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section Includes:

1. Intermediate and final cleaning of Work not including special cleaning of closed systems specified elsewhere.

B. Related Sections include but are not necessarily limited to:

1. Division 1 – General Requirements.

1.02 SCHEDULING

A. Schedule cleaning operations so that dust and other contaminants disturbed buy cleaning process will not fall on newly painted surfaces.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Cleaning Agents:

1. Compatible with surface being cleaned.
2. New and uncontaminated.
3. For Manufactured Surfaces: Material recommended by manufacturer.

PART 3 – EXECUTION

3.01 CLEANING – GENERAL

A. Prevent accumulation of wastes that create hazardous conditions.

B. Conduct cleaning and disposal operations to comply with laws and safety orders of governing authorities.

C. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains or sewers.

D. Dispose of degradable debris at an approved solid waste disposal site.

E. Dispose of non-degradable debris at an approved solid waste disposal site or in an alternate manner approved by ENGINEER and regulatory agencies.

F. Handle materials in a controlled manner with as few handlings as possible.

G. Do not drop or throw material from heights greater than four (4) feet or less than four (4) feet if conditions warrant greater care.

H. On completion of work, leave area in a clean, natural looking condition. Remove all signs of temporary construction and activities incidental to construction of required permanent Work.

I. Do not burn on-site

3.02 INTERIOR CLEANING

A. Cleaning during construction:

1. Keep work areas clean so as not to hinder health, safety or convenience of personnel in existing facility operations.

2. At maximum weekly intervals, dispose of waste materials, debris, and rubbish.

3. Vacuum clean interior areas when ready to receive finish painting. Continue vacuum cleaning on an as-needed basis, until substantial completion.

4. Remove all HDPE pipe shavings from the interior of the pipe before fusing.

B. Final Cleaning:

1. Complete immediately prior to Demonstration Period

2. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from sight-exposed surfaces.

3. Wipe all lighting fixture reflectors, lenses, lamps and trims clean.

4. Wash and shine glazing and mirrors.

5. Polish glossy surfaces to a clear shine.

6. Ventilating systems:

a. Clean permanent filters and replace disposable filters if units were operated during construction.

b. Clean ducts, blowers and coils if units were operated without filters during construction.

7. Replace all burned –out lamps.

8. Broom clean process area floors.

9. Mop office and control room floors.

3.03 EXTERIOR (SITE) CLEANING

A. Cleaning during construction:

1. Construction Debris:

a. Confine in strategically located container(s).

1) Cover to prevent blowing by wind.

2) Haul from site minimum once a week

b. Remove from work area to container daily.

2. Vegetation:

a. Keep weeds and other vegetation that is not part of plant salvage program trimmed to three (3) inches maximum height.

3. Soils, sand, and gravel deposited on paved areas and walks:

a. Remove as required to prevent muddy or dusty conditions.

b. Do not flush into storm sewer system.

B. Final Cleaning:

1. Remove trash and debris containers from site:

a. Re-seed areas disturbed by location of trash and debris containers.

2. Clean paved roadways

3.04 FIELD QUALITY CONTROL

A. Immediately prior to Demonstration Period, conduct an inspection with ENGINEER to verify condition of all work areas.

END OF SECTION

SECTION 01750
STARTUP AND SYSTEM TESTING

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

The CONTRACTOR shall provide system startup and field adjustments after receiving written notice from the Engineer that these services are desired.

1.02 EQUIPMENT STARTUP

A. The CONTRACTOR shall provide the services of experienced factory-trained service representatives for up to forty (40) hours as necessary to provide startup services and assistance. After the new system components have been installed, factory-trained service representatives shall perform final adjustments and inspection, lubricate, check oil levels, and ensure that the equipment is in proper condition for operation.

B. The test operation of each piece of mechanical and control equipment shall continue for not less than seven days without interruption. All parts shall operate satisfactorily in all respects, under continuous maximum achievable load and in accordance with the specified requirements for the full duration of the seven day test period. If any part of a unit shows evidence of unsatisfactorily or improper operation during the seven day test period, correction or repairs shall be made by the CONTRACTOR at the CONTRACTOR's expense, and the full seven day operation, as specified above, shall be performed again until all parts operate satisfactory.

C. The CONTRACTOR is responsible for supplying all necessary temporary power for the system's startup, testing and operation if permanent power is not available.

1.03 FINAL TEST OPERATION

A. After the equipment is installed, and start-up services are performed, and ready to be placed into full-time operation, the ENGINEER will test all equipment for a period not to exceed two (2) weeks by operating either under actual or simulated operating conditions prior to conducting the stack emission source test. All defects of material or workmanship which appear during this test period shall be corrected by the CONTRACTOR. After such corrections are made, the two (2) week test may be run again and another stack emission test may be conducted before substantial completion, as determined by the CITY, if deemed advisable by the ENGINEER.

B. The CONTRACTOR shall supply all power, water, oil, grease, auxiliaries, and operating personnel required for this final test operation.

1.04 TRAINING

A. The CONTRACTOR shall provide the services of experienced factory-trained manufacturer's representatives, fluent in the English language, for hands-on training of the equipment provided under this Contract. The training shall include instructions in the operation and maintenance of the equipment provided. Training shall be at a time convenient to the OWNER. The following lists the minimum required training time to be provided by each equipment representative:

- Flare & Blower manufacturer 1 - 8 hour day
- Compressor manufacturer 1 - 8 hour day

B. The CONTRACTOR shall develop and submit the training course agenda for approval prior to arranging training. Training must be provided separately from the start-up services.

C. One clean, reproducible copy shall be provided of all instructional materials. The City shall have the right to make a videotape of all training sessions for their future training use.

1.05 SOURCE TESTING

Deleted.

END OF SECTION

DIVISION 2 – SITE WORK

SECTION 02221

TRENCH EXCAVATION AND BACKFILL FOR PIPELINES & APPURTENANT STRUCTURES

PART 1: GENERAL

1.1 DESCRIPTION

A. This work is the excavation, trenching and backfilling for pipelines and appurtenances. It includes all clearing, grubbing, site preparation, removal and disposal of debris from the excavation, handling and storing materials for fill and backfill, all bracing, shoring and trench protection, construction dewatering, all backfill, subgrade preparation , final grading, site dressing and cleanup.

1.2 REFERENCES

A. The current publications listed below form a part of this specification.

AASHTO T99	Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5-lb (2.5kg) Rammer and 12-inch (305mm) Drop
ASTM D698	Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5-lb (2.5kg) Rammer and 12-inch (305mm) Drop
AASHTO T191 (ASTM D1556)	Density of Soil In-Place by the Sand-Cone Method
AASHTO T310 (ASTM D6938)	In-Place density and water content of the soil and soil aggregate by Nuclear Method (Shallow Depth)
AASHTO T11 (ASTM C117)	Materials Finer Than 0.075mm (No. 200) Sieve in Mineral Aggregates by Washing
AASHTO T27 (ASTM C136)	Sieve Analysis of Fine and Coarse Aggregate
AASHTO T89	Determining the Liquid Limit of Soils
AASHTO T90	Determining the Plastic Limit and Plasticity Index of Soils
ASTM D4318	Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils

1.3 STANDARD DRAWINGS

A. Standard Drawings applicable to this section are as follows:

1. Standard Drawing No. 02221-1 - Typical Utility Trench Detail

1.4 TESTING

A. Field Density Testing

1. Meet the quality control and quality assurance testing requirements in Section 01400, Contractor Quality Control and Owner Quality Assurance.

2. In-place field density tests for quality assurance are at Owner expense meeting AASHTO T191 (ASTM D1556), Sand Cone Method; or by AASHTO T310 (ASTM D6938) Nuclear Densometer Methods. Quality assurance field density testing frequency is at the Engineer's discretion.

3. Re-testing failing areas is at the expense of the Contractor.

4. At the direction of the Engineer, provide necessary equipment and labor to excavate and replace materials for test holes up to 5 feet deep into the compacted backfill to allow testing below the surface of any layers covered without inspection and approval by the Engineer.

B. Laboratory Maximum Density and Optimum Moisture

1. Quality assurance tests will be made by the Engineer for each on-site natural soil or each source of off-site material, including borrow material, to determine the laboratory maximum density values and optimum compaction moisture content according to AASHTO T-99 or ASTM D698.

C. Material Submittals

1. Submit to the Engineer material quality test results including Type 1 Bedding gradation and plasticity index; and Type 2 Bedding gradation.

2. Submit to the Engineer samples of on-site and off-site borrow soils for laboratory moisture-density relationship testing by the Engineer.

3. If applicable, submit a blasting plan to the Engineer.

PART 2: PRODUCTS

2.1 PIPE BEDDING MATERIALS

A. TYPE 1 PIPE BEDDING

1. Type 1 Pipe Bedding includes the material placed from 4 inches (100mm) below the bottom of the pipe, around the pipe, and up to the springline of the pipe.

2. Provide Type 1 Bedding consisting of sand, sandy gravel, or gravel having a maximum 3/4 inch size (19mm) and a maximum plasticity index of 6, determined by AASHTO T89 and T90 or by ASTM D4318.

3. Where trench excavation encounters wet or unstable material, Type 1 Pipe Bedding must be free draining and non-plastic

4. Refer to Standard Drawing 02221-1 and Special Provisions for other requirements.

B. SELECT TYPE 1 BEDDING

1. Select Type 1 Bedding includes the material placed from the springline of the pipe to 6 inches (15cm) over the pipe.

2. Select Type I Bedding shall consist of soil, sand or fine gravel, free from clods, lumps of frozen material, or rock exceeding 1-1/2 inches (38mm) in its greatest dimension.

3. Excavated trench material may be screened or sorted for use as backfill subject to approval of the Engineer.

4. Where trench excavation encounters wet or unstable material, Select Type 1 Bedding must be free draining and non-plastic.

C. TYPE 2 PIPE BEDDING

1. Type 2 Pipe Bedding is used as directed by the Engineer to replace unsuitable material encountered in the trench bottom.

2. Place Type 2 Pipe Bedding from the bottom of the Type 1 Bedding material to the depth required to adequately support the pipe.

3. Type 2 Bedding shall consist of granular material meeting the following gradation.

Sieve Opening	% Passing
3 Inch	100
No. 4	0 - 25
No. 8	0 – 10

D. SEPARATION GEOTEXTILE

1. The plans may require, or the engineer may direct, the use of non-woven geo-textile fabric intended to provide materials separation. The fabric will wrap all or part of the Type 1 Pipe Bedding and Select Type 1 Pipe Bedding to prevent materials migrating into the trench bottom and trench walls as shown on the plans or as directed by the engineer. The fabric shall be AASHTO M288 Class 1, 2, or 3 as specified or determined by the Engineer and shall fully comply with MPW Section 2110.

2.2 TRENCH BACKFILL MATERIALS

A. Materials from Trench Excavation

1. Backfill material obtained from trench excavations must be free of cinders, ash, refuse, organic or frozen material, boulders, or other deleterious materials. Backfill materials and placement are further described in the Execution Section of this specification.

B. Imported Backfill Material

1. Imported backfill material is from borrow source(s) outside the project limits and is used when, in the opinion of the Engineer, an adequate volume of suitable backfill material is not available within the project limits. Imported Backfill Materials must comply with the requirements of Section 2.2.A, MATERIALS FROM TRENCH EXCAVATION.

2.3 FLOWABLE FILL

A. If used, Flowable Fill is to meet the requirements of Section 2225, Flowable Fill.

2.4 DETECTABLE BURIED WARNING TAPE

A. Detectable buried warning tape is to have a minimum 6 inch (15cm) width and 5 mil (0.12mm) thickness and a solid aluminum core running the full length and width of the tape enclosed in a color coded inert plastic jacket, impervious to alkalis, chemical reagents and solvents in the soil. The tape is to meet APWA/ULCC Color Code requirements and is to have a maximum 36 inch(90cm) imprint.

PART 3: EXECUTION

3.1 PROTECTION OF EXISTING PROPERTIES

A. General

1. Take precautions to protect all adjoining private and public property and facilities, including underground and overhead utilities, curbs, sidewalks, driveways, structures, and fences. Restore or replace all disturbed or damaged facilities to its original condition at Contractor's expense.

2. Contact utility owners using the Montana One Call System in accordance with Section 01041, PROJECT COORDINATION, Paragraph 1.2.B., for utility locates before starting work. Protect the utilities exposed during the work and prevent damaging underground utilities adjacent to excavations. Immediately notify the utility owner of any construction damage. Repairs of damage to marked utilities are at the expense of the Contractor.

3. Re-locate existing water mains, sanitary sewers and storm drains shown on the plans, that conflict with new pipelines or structures as indicated in the contract documents. No separate payment will be made for this work unless shown as a payment item. If the Owner authorizes the relocation of mains or sewers which are not indicated in the bid documents, and the Engineer determines the work was not included in the original contract, payment will be made under the applicable sections of the General Conditions.

4. Cut and replace existing service lines interfering with trenching operations only with the engineer's permission and at the contractor's expense. Show all repaired and/or adjusted water and sewer lines on the As-Built Plans.

5. Protect existing water and sewer mains and water and sewer services from freezing at all times during construction.

B. Privately Owned Utilities

1. If any existing private utility interferes with the work in either alignment or grade, and has to be moved, the work will be performed by the appropriate UTILITY Owner, unless otherwise specified in the contract documents. Such private utilities may include gas mains, underground electrical and telephone cables, telephone poles, light poles, etc.

2. If, however, such private utility relocation is performed by the Contractor, and the relocation is not a separate payment item, payment will be made under the Section 02221 conditions covering such changes.

3. Such payment will be made only if the work is determined by the Engineer to be a change from the original contract work scope.

C. Existing Structures

1. Prevent damage to existing buildings or structures in the work area. Repair all construction related damage to the satisfaction of the Owner.

D. Existing Overhead Utilities

1. Use extreme caution to avoid conflict, contact or damage to overhead utilities during the work.

E. Exploratory Excavation

1. The location of existing buried public utilities may need to be verified by exploratory excavation before construction.

2. Where authorized by the Engineer, the Contractor will be reimbursed for exploratory excavation work at the unit price bid per hour for a backhoe/excavator with operator and a laborer to assist. Use a backhoe/excavator having at least 60 horsepower (45kw), as rated by the manufacturer.

3. The unit price per hour includes the backhoe/excavator, operator and one laborer based upon the actual time, to the nearest one-half hour, that the equipment and personnel are used in actual excavating and backfilling operations including standby time between excavation and backfilling which allows the Engineer to make the necessary survey of the underground utilities.

4. Exercise care to prevent damaging all utilities and repair any utility damage caused by exploratory excavation.

F. Pavement Removal and Stripping

1. Where trench excavation or appurtenant structure excavation requires removing curb and gutter, concrete sidewalks, asphalt concrete pavement, or Portland cement concrete pavement, cut the concrete or pavement in a straight line parallel to the excavations edge using a spade-bitted air hammer, concrete saw or other suitable equipment to produce a straight, square and clean break. Re-cut edges broken during construction, before concrete or paving operations.

2. For trenches passing through existing pavement, cut the pavement along a neat vertical line at least 12 inches (30cm) from the trench edge. Where the neat line cut is less than 3 feet (0.9m) from the edge of the existing pavement, remove and replace the entire pavement section between trench and edge of pavement.

3. Dispose of the asphalt concrete and/or Portland cement concrete debris off-site according to applicable state and local regulations.

G. When excavating across existing gravel streets or other developed surfaces, remove the surfacing material full depth and stockpile for inclusion as trench backfill or legally dispose of the surfacing material.

H. When excavating across cultivated or sodded areas, remove topsoil full depth or to a maximum 12 inch (30cm) depth, whichever is less, and stockpile for possible project use.

I. Re-sod or reseed, as specified in the contract documents, all established lawn areas cut by trenching or damaged during the construction, in accordance with Section 2910, and/or 2920, to the satisfaction of the Engineer.

3.2 MAINTENANCE OF FLOWS

A. Maintain the flow of sewers, drains and water courses encountered during construction. Restore culverts, ditches, fences, crosswalks and structures disturbed by construction to their original condition upon completion of the work.

3.3 TRENCH EXCAVATION

A. General

1. Meet current OSHA Safety and Health Standards for all excavation, trenching, shoring, and related work.

2. Excavate at the specified locations for pipeline installations and appurtenant structures.

3. Crossings under sidewalks or curbs may be made by tunneling, if approved by the Engineer. If a portion of a sidewalk or curb is removed, use a concrete saw to make joints, compact the backfill as specified, and replace the removed section with new concrete sidewalk or curb.

4. During excavation, stockpile backfill materials away from the trench banks to assure trench wall stability. Stockpile excavated materials on only one side of the trench without obstructing existing fire hydrants,

valves, manholes and other appurtenances. Assure surface drainage of adjoining areas is unobstructed.

5. Remove and dispose of all excess or unsuitable excavated materials.

6. Prevent surface water from flowing into excavations. Promptly remove all water accumulating in trench excavations. Do not permit water to accumulate in any open trench. Remove and re-lay all pipe out of alignment or grade caused by trench flooding.

7. Grade the trench bottoms to the specified lines and grades. Assure bedding material provides uniform bearing and support for each pipe section along its entire length. Excavate for bell and joints after the trench bedding is graded, limiting the excavation to the required length, depth and width for making the particular type of joint used. Backfill over-excavations with Type 2 Bedding Material.

8. No differentiation between common and rock trench excavation is made, except when listed as separate bid items on the bid proposal or bid form. Excavation includes removing and subsequent handling of all earth, gravel, bedrock or other material encountered regardless of the type, character, composition or condition of the material.

9. The use of trench digging machinery is permitted, except in places where its operation is likely to cause damage to existing structures or features, in which case hand methods are to be employed.

B. Trench Dimensions

1. Excavate to the trench dimensions specified below.

2. Width

a. Excavate to provide room to install and join the pipe as specified. The minimum trench width is 3'-6" (1.1m), for outside pipe diameters of 18 inches (0.5m) or less. The minimum trench width is 2'-0" (0.6m) plus the outside pipe diameter, for pipe sizes exceeding 18 inches (0.5m). Maximum trench width may be specified in the contract documents.

3. Depth

a. Excavate the trench as required for the invert grade or pipe bury as specified in the contract documents, plus 4 inches (10cm) for the Type 1 Pipe Bedding. If bedrock, boulders or large stones are encountered at the bottom of the trench, excavate at least 6 inches

(15cm) below the bottom of the pipe for backfilling with Type 1 Pipe Bedding.

C. Soft or Unsuitable Trench Subgrade

1. When soft or unstable material is encountered at the trench subgrade which will not uniformly support the pipe, excavate the material to the depth directed by the Engineer and backfill to trench subgrade elevation with Type 2 Pipe Bedding.

D. Blasting

1. Obtain Engineer approval to blast for excavation. If approved, the Engineer will establish the time limits blasting will be permitted.

2. Use utmost care to protect life and property during blasting. Use only a licensed blaster with experience in the type of blasting required for the work.

3. Safely and securely store all blasting materials meeting local laws and ordinances and clearly mark all storage places "Dangerous Explosives". Do not leave any explosives where they could endanger persons or property.

4. Blasting Rock in Trenches

   a. When blasting rock in trenches, cover the blasting area with earth backfill or approved blasting mats. Before blasting, station workers and provide danger signals to warn people and stop vehicles.

   b. Assume responsibility for all damage to property and injury to persons resulting from blasting or accidental explosions during the work.

   c. Furnish the following information to the Owner and Engineer at least 48 hours before the commencement of blasting operations: Name of the contractor's powder man, powder man's experience, type of shot, type of explosives and detonator being used, proof of insurance covering liability for such operation, traffic control plans and planned procedures for protecting the public.

5. Assure blasting plan meets federal, state and local ordinances. Obtain all required permits before blasting starts.

E. Pavement Damage Cause by Equipment

1. Equip all track mounted equipment operated on pavement surfacing with pads to prevent pavement damage.

2. Restore all pavement damaged by construction to its original condition.

F. Shoring, Bracing and Sheeting

1. Provide all shoring, bracing and tight sheeting required to prevent caving and protect workers, meeting current Occupational Safety and Health Act Requirements, and to protect adjacent property and structures. The cost of this work is included in the cost for trench excavation.

G. Excavation for Appurtenances

1. Make excavations for manholes, hydrants, structures and other appurtenances of the size and depth to permit compacting of backfill on all sides to the specified density. The requirements for removing water and other applicable portions of these specifications apply to excavation for appurtenances.

3.4 DEWATERING

A. Remove all ground water encountered in trench excavations. Do not place pipe, bedding or backfill materials below the groundwater elevation established by dewatering operations. The cost of dewatering operations is considered a part of the excavation cost.

3.5 EXCAVATION STABILITY AND SAFETY

A. The stability of construction excavations and associated worker safety, including slope geometry and shoring/bracing considerations, are the responsibility of the Contractor. Meet current OSHA regulations. This may require design of temporary slopes and/or shoring by a licensed professional engineer.

3.6 TRENCH FILLING AND BACKFILLING

A. General

1. Backfill all trenches as specified immediately after grade, alignment and pipe jointing has been inspected and approved by the Engineer. Conduct any pipe testing as specified in the respective water distribution, sewerage/drainage sections. Correct all defects discovered by tests prior to backfilling.

B. Pipe Bedding Placement

1. Type 1 Bedding.

a. Place Type 1 Pipe Bedding material 4 inches (10cm) under the pipe, around the pipe, and up to the springline of the pipe. Place in maximum lifts of 6 inches (15cm), using hand operated or other compaction methods without damaging or disturbing the pipe. Thoroughly compact each layer. Use special care to assure compaction under the pipe haunches.

b. Place backfill material in equal lifts on both sides of the pipe for the full trench width. Take care to prevent migration of Type 1 Bedding into surrounding soils during placement and compaction

2. Select Type 1 Bedding.

a. Place Select Type 1 Bedding material from the springline to 6 inches (15cm) over the pipe. Where wet or unstable material exists, assure the material is free draining and non-plastic.

b. Place in maximum lifts of 6 inches (15cm) using hand or other compaction methods without damaging or disturbing the pipe. Thoroughly compact each layer.

c. Place backfill in equal lifts on both sides of the pipe for the full trench width. Take care to prevent migration of Select Type 1 Bedding into surrounding soils during placement and compaction.

3. Type 2 Pipe Bedding.

a. Use Type 2 Pipe Bedding described in PRODUCTS SECTION as specified or as directed by the Engineer to replace unsuitable material encountered in the trench bottom, placing it from the bottom of the Type 1 Bedding material to the depth required to adequately support the pipe.

4. SEPARATION GEOTEXTILE

a. Place Separation Geotextile where shown on the plans or where directed by the Engineer.

C. Trench Backfill

1. After the pipe bedding materials are placed and compacted as specified, backfill the trench. Use backfill material free of cinders, ash, refuse,

organic or frozen material, boulders, or other deleterious materials. From the top of the Select Type 1 Pipe Bedding to 6 inches (15cm) below the ground surface, or to the subgrade elevation, material containing rock up to 8 inches (20cm) in the greatest dimension may be used.

2. Trench backfill from the top of the pipe bedding to ground surface or to the street subgrade is separated into three classifications.

   a. Type A Trench Backfill is compacted backfill typically used in streets or paved areas.

   b. Type B Trench Backfill is typically used for unpaved alleys, cultivated areas, borrow pits, unimproved streets or other un-surfaced areas, and other areas where compaction is less critical.

   c. Type C Trench Backfill is typically used in open and unimproved areas outside of the public right-of-way.

3. Meet the backfill and compaction requirements for all of the backfill types described in the contract documents.

4. Watering

   a. Apply uncontaminated water, when required, at the locations and in the amounts required to compact the backfill material to the specified requirements. Maintain an adequate water supply during the work. Assure the equipment used for watering is of the capacity and design to provide uniform water application.

   b. Apply water during the work to control dust and to maintain all embankment and base courses in a damp condition in accordance with these contract documents.

   c. Water required for compacting trench backfill may be obtained from the municipal system if approved by the Owner, or from other sources.

5. Remove, replace, and re-compact backfill in trenches where settlement has occurred as directed by the Engineer at the contractor's expense.

6. Trench backfill types are designated as follows:

   a. Type A Trench Backfill. Place trench backfill in maximum 8 inch compacted lifts within 3 percent of optimum moisture content, and compact to at least 95 percent of maximum dry density determined by AASHTO T99 or by ASTM D698.

b. Type B Trench Backfill. Place backfill in maximum 8 inch (205mm) lifts, within 3 percent of optimum moisture content, and compact to at least 90 percent of maximum dry density, as determined by AASHTO T99 or by ASTM D698.

c. Type C Trench Backfill. Place and compact Type C Trench Backfill in maximum 12 inch lifts at densities equal to or greater than the densities of adjoining undisturbed soil. Mound earth over the trench top, if so directed by the Engineer.

d. Flowable Fill. Place flowable fill as trench backfill as shown in the contract documents or as directed by the Engineer. Flowable fill may also be used as a construction expedient, substituting for any type of trench backfill, subject to approval by the Engineer and at the expense of the Contractor.

D. Replacement of Unsuitable Backfill Material

1. Remove and dispose of excavated soils that are saturated, contain deleterious materials or have characteristics that, in the opinion of the Engineer, render the soils unsuitable as backfill.

2. Replace unsuitable soils with material obtained from trench excavations within the project limits at the expense of the Contractor. If suitable replacement material is not available within project limits, obtain material from an approved borrow source, to be paid for as Imported Backfill Material.

3. Place and compact all imported material according to the applicable backfill specification requirements.

E. Backfill of Appurtances

1. Place and compact backfill for appurtenances to finished grade around manholes, inlets, valve boxes and other underground items without disturbing appurtenance alignments.

2. Meet the backfill material, placement, and compaction requirements specified for the adjoining trench.

F. Detectable Buried Warning Tape

1. The use of warning tape is optional and if used must not be relied on as the primary locating device. Provide warning tape as described in PRODUCTS Section 2.3. Bury tape a maximum 18 inches (45cm) below finish surface grade.

3.7 SURVEY MARKERS AND MONUMENTS

A. Protect all survey markers and monuments. Protection includes marking with flagged high lath and supervising work near markers and monuments. Do not disturb monuments without prior approval from the Engineer.

B. Replace all Contractor disturbed or destroyed survey markers or monuments, not approved during construction, using a licensed land surveyor. See Section 01050 for details on survey marker protection/disturbance.

3.8 CLEANUP

A. As work progresses, remove debris and complete to finish grade each portion of the work. Once the work is complete, clear debris and finish the entire site to smooth, uniform slopes presenting a neat and workmanlike appearance. Remove and dispose of all rocks brought to the surface during excavation or backfilling.

3.9 TIME AND DISTANCE OF OPEN TRENCHES

A. Perform the work so that trenches will remain open the minimum time required to accomplish the work.

B. Do not begin trench excavating until appropriate compaction equipment is at the excavation site.

C. The maximum permissible distance between backfilling/ compaction operations and the end of newly installed pipe is 200 feet (60m) in existing streets (and/or alleys) and 500 feet (150m) in all other areas.

D. The maximum distance between the newly installed pipe and the excavator is to be 100 feet (30m) in existing streets (and/or alleys) and 200 feet (60m) in all other areas.

E. For each work group consisting of a trench excavator, a pipe laying crew, and a backfilling/compacting crew, the maximum allowable open ditch at any time is 300 feet (90m) in existing streets (and/or alleys) and 700 feet (210m) in all other areas.

F. The maximum distance behind the end of the new pipe is 1,500 feet (460m) for gravel surfacing replacement, base placement or pavement replacement.

PART 4: MEASUREMENT AND PAYMENT

4. 1 GENERAL

A. The following items constitute pay items for the work covered under this section. Payment for these items is full compensation for providing all materials, tools, labor and equipment necessary to complete the item and all incidental work related thereto, whether specifically mentioned herein or not.

4. 2 TRENCH EXCAVATION AND BACKFILL

A. No separate measurement and payment is made for TRENCH EXCAVATION AND BACKFILL. Include all costs for this item in the unit price bid for pipe, complete in-place.

B. The upper limit of the TRENCH EXCAVATION AND BACKFILL item is defined as the top of subgrade. Details of the various types of surface restoration are found in the contract documents.

4. 3 TYPE 1 AND SELECT TYPE 1 PIPE BEDDING

A. Include approved material for Type 1 and Select Type 1 Pipe Bedding in the pipe installation price. No measurement or additional payment is made for furnishing or placing Type 1 and Select Type 1 Pipe Bedding materials.

4. 4 TYPE 2 PIPE BEDDING

A. Approved material for Type 2 Pipe Bedding to replace soft or unsuitable material, is measured in cubic yards (cubic meters) of material furnished, in-place, for the depth directed.

B. Payment for Type 2 Pipe Bedding is made at the contract unit price bid per cubic yard (cubic meter), which includes furnishing, placing and compacting the Type 2 Bedding material as specified and all other work necessary or incidental for completion of the item.

C. Payment quantity is based upon an excavation width of 2.0 feet (0.6m) plus the outside pipe diameter with a minimum payment width of 3.5 feet (1.1m).

D. If Type 2 Bedding is placed without the engineer's authorization, the Type 2 Bedding is a construction expedient solely for the contractor's convenience and no payment for Type 2 Bedding is made.

E. Payment will be made under: Type 2 Pipe Bedding - Per Cubic Yard (Cubic Meter).

4. 5 IMPORTED BACKFILL MATERIAL

A. When satisfactory backfill material is not available within the project limits, backfill material imported from borrow sources outside the limits of the project site are measured in cubic yards of material furnished, in place (compacted), for the depth directed by the Engineer.

B. The trench width for measurement and payment is 2.0 feet (0.6m) plus the outside pipe diameter, with a minimum payment width of 3.5 feet (1.1m), measured between vertical planes for the depth required.

C. Payment for imported backfill material is made at the contract unit price bid per cubic yard, which includes furnishing, placing, and compacting the backfill material as specified and all other work necessary or incidental for completion of the item.

D. No separate measurement and payment is made for this item when, in the engineer's opinion, suitable surplus material is available within the project limits, in which case all costs for this item are to be included in the unit price bid for pipe, complete in-place.

E. Payment for Imported Backfill will be made only if the Engineer determines surplus material is not available within the project limits.

F. Payment is made under: Imported Backfill Material -Per Cubic Yard (Cubic Meter).

4. 6 EXPLORATORY EXCAVATION

A. Measurement of this item is made for the actual time, to the nearest one-half hour, for which the equipment and personnel are used and authorized by the Engineer for actual exploratory excavation and backfilling operations, including standby time between excavation and backfilling, to allow the Engineer to survey the underground utility.

B. Payment is made at the contract unit price bid per hour, which includes providing the equipment on-site, with operator and fuel. Where exploratory excavation is outside of planned excavation limits, payment also includes any time required for compaction of the backfill, if necessary.

C. Surfacing repair will be paid separately, if required.

D. Payment will be made under: Exploratory Excavation - Per Hour.

4. 7 GEOTEXTILE FABRIC

A. Measurement and payment for geotextile fabric shall be by the linear foot of trench.

B. Payment for this item is full compensation for providing all materials, tools, labor and equipment necessary to complete the item and all incidental work related thereto, whether specifically mentioned herein or not.

END OF SECTION

SECTION 02700
LANDFILL GAS CONDENSATE MANAGEMENT SYSTEM

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

Work related to the condensate management system shall consist of furnishing, fabricating, and installing two condensate sumps, and all associated excavation, backfilling, compacting and disposal of excavated material. The CONTRACTOR shall be responsible for furnishing and installing all miscellaneous piping and appurtenances, including vaults, and appurtenant sump pipes and fittings, all in accordance with details as indicated on the Construction Drawings and as specified herein.

PART 2 - MATERIALS

2.01 CONDENSATE SUMP ASSEMBLY

A. Sump:

1. Condensate sump construction as shown on Sheet 12 of the Construction Drawings.

B. Vault:

1. The sump vault shall be as furnished by Real Environmental Products Series 7000.

2. Vault shall be raised above the surrounding grade to prevent stormwater from entering the vault, as shown on the Construction Drawings.

3. Sump vault cover shall also include a painted identification with the sump number (Sump 1) in 2-inch high white letter/numbers. Vaults shall be painted with outdoor industrial grade enamel paint, approved by the ENGINEER.

C. Bolts, nuts and washers:

1. All nuts and bolts in contact with LFG shall be grade 8 plated with yellow zinc dichromate. Washers in contact with LFG shall be Type 304 SS or plated with yellow zinc dichromate. Two washers shall be installed with each bolt.
2. Flange bolt hardware shall be Type 304 SS or plated with yellow zinc dichromate.

D. Backfill Material:

1. Soil backfill shall meet the engineering requirements for the site, Section 02221, and shall be approved by the ENGINEER. The material placed adjacent to the condensate sump shall be fine-graded and no objects shall be present that could cause damage to the sump. Backfill shall be hand tamped.

2.02 PIPING

A. All HDPE pipe fittings shall be of equal SDR rating to the adjoining pipe.

B. All piping shall conform with Section 15100 "High Density Polyethylene Piping".

PART 3 - EXECUTION

3.01 CONDENSATE MANAGEMENT SYSTEM

A. All work shall be performed in accordance with the Drawings.

B. The area around the condensate sump shall be free draining away from the vault, as shown on the Construction Drawings.

C. Prior to making connections, all lines shall be purged of debris and thoroughly cleaned. All pipe shall be connected using good engineering practice.

D. The excavation and disposal of excavated material, related to the construction of the condensate sumps, shall conform to all applicable requirements of these Specifications and be the responsibility of the CONTRACTOR.

E. The CONTRACTOR shall lay out the locations of the condensate sumps for the approval of the ENGINEER.

F. The hole drilled or excavation for the condensate sumps shall be approximately 12 feet deep, as shown on the Construction Drawings.

G. The pipes, fittings, valves, and all connections shall be as shown on the Construction Drawings.

H. The CONTRACTOR shall, prior to installation, protect stored valves and appurtenances from damage due to exposure to sunlight, heat, dirt, debris, freezing and thawing, vandalism, etc.

I. The CONTRACTOR shall clean all debris, dirt, gravel, etc., from inside of piping before installing valves.

J. The CONTRACTOR shall erect and support valves in respective positions free from distortion and strain on appurtenances during handling and installation. Inspect material for defects in workmanship and material. The CONTRACTOR shall clean out debris and foreign material from valve openings and seats, test operating mechanisms to check proper functioning, and check nuts and bolts for tightness. The CONTRACTOR shall repair valves and other equipment which do not operate easily or are otherwise defective.

K. During installation the CONTRACTOR shall set plumb and support valves adequately in conformance with instructions of manufacturer.

L. Pipe assembly for the sump pumps shall be in conformance with Section 15200 "PVC piping"

M. Prior to acceptance, the CONTRACTOR shall verify the following:

1. Verify the pipes and connections are clean and free of debris.

2. As-built depth of piping shall be recorded and submitted to the ENGINEER by the CONTRACTOR prior to project acceptance. Approximate depths are shown on the Drawings. Adjustments to the location of the sump, and pipe depths may be required. These adjustments will be made at no additional cost to the COP. Any adjustments made by the CONTRACTOR shall require as-built documentation.

3. Verify all connections have been pressure tested in accordance with Section 15900 (Pressure Testing of Pipe) of the specifications.

O. Condensate and air supply piping shall be installed as shown on the Construction Drawings.

N. At the pump station, condensate and air supply piping shall be routed and terminated within the sump's vault. Transition fittings (Poly-Cam or approved equal) from HDPE to stainless steel (304) shall be installed at the vault and connected as shown on the Construction Drawings. Transition fittings from HDPE to PVC shall also be stainless steel (304).

P. A pneumatically operated condensate pump shall be AP-4B Short Controllerless Autopump as manufactured by QED or approved equal as shown on the Construction Drawings. The pump will be ordered with a 3" stainless steel screen. A pump cycle counter (PCC) filter/regulator, and hoses shall be included in the installation. The pump will be ordered with internal modification #302255 and option #301193 for hose connections. This internal modification includes Desogrin O-rings and Kynar rod guides.

END OF SECTION

DIVISION 3 – CONCRETE

SECTION 03210

REINFORCING STEEL

PART 1: GENERAL

1.1 DESCRIPTION

A. This work is furnishing and placing reinforcing steel or wire fabric meeting the quality, type and size specified in the contract.

1.2 REFERENCES

ASTM A-615	
ASTM A-705	
AASHTO M 31	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
AASHTO M 32	Cold Drawn Steel Wire for Concrete Reinforcement
AASHTO M 55	Steel Welded Wire, Fabric, Plain, for Concrete Reinforcement
AASHTO M 54	Fabric Deformed Steel Bar or Rod Mats for Concrete Reinforcement

PART 2: PRODUCT

2.1 Furnish all new material meeting the following requirements.

A. Bar Reinforcement

1. Furnish deformed reinforcement steel meeting ASTM A 615, (AASHTO M3 1) or ASTM A705, Grade 40 or Grade 60.

a. Small quantities purchased from warehouses may, at the Engineer's direction, be accepted if bend tested under ASTM A615 or AASHTO M31. The test specimen must cold bend around a pin without cracking on the outside of the bent portion.

B. Wire and Wire Mesh

1. Furnish wire meeting cold-drawn steel wire AASHTO M32 (ASTM A82) requirements.

2. Furnish wire mesh for concrete reinforcement meeting AASHTO M 55 (ASTMA A 185).

3. Furnish bar mats meeting AASHTO M54 (ASTM A 184).

PART 3: EXECUTION

3.1 PROTECTION

A. Protect steel reinforcement from damage at all times. Place steel free from dirt, detrimental scale, paint, oil and other foreign substance. Clean steel reinforcement having easily removed rust, loose scale, and dust using an approved method.

3.2 FABRICATION

A. Furnish four copies of shop details and placing drawings for all reinforcing steel to the Engineer for approval. Once checked, the Engineer will return two marked-up sets of prints or drawings for correction. The Engineer's review is only for general conformity with the plans. Checking the detailed dimensions is the Contractor's responsibility. The Engineer's review does not relieve the Contractor's responsibility to furnish all material meeting the Contract requirements. Detail Reinforcing, steel meeting the ACI "Standard Details and Detailing of Concrete Structures" and the "Manual of Engineering and Placing Drawings for Reinforced Concrete Structures" published by the American Concrete Institute (ACI 315).

B. Assure all bars are bent cold. Do not field bend any bar partially imbedded in concrete except as specified on the plans.

C. Ship bar reinforcement in standard bundles, tagged and marked meeting the "Details and Detailing of Concrete Structures" (ACI 315) requirements.

D. Concrete reinforcement and accessory details, not covered herein or on the drawings, must meet "Details and Detailing of Concrete Structures" and the "Manual of Engineering and Placing Drawings for Reinforced Concrete Structures" (ACI 315 and 315R) requirements.

3.3 PLACING AND FASTENING

A. Accurately place and hold firm all steel reinforcement in the plan locations as concrete is being placed.

B. Support and fasten together all reinforcement to prevent displacement due to construction loads. It is permissible to use on ground, where necessary, concrete support blocks having a minimum 4 square inches (2580 MM2) bearing area and having a compressive strength equal to the concrete being placed. Use approved bar chairs and spacers over form work. For concrete surfaces exposed to the

weather in the finished structure, assure the portions of all accessories within ½-inch (12.7 mm) of the concrete surface are noncorrosive or protected against corrosion.

C. Overlap welded wire fabric for successive mats or rolls providing an overlap measured between outermost cross wires of each fabric sheet at least 2 inches (50.8 mm). Extend the fabric across supporting beams and walls to within 4 inches (101.6 mm) of concrete edges. It may extend through contraction joints. Adequately support the fabric during concrete placement to maintain its position in the slab using the methods previously described or by laying the fabric on a concrete layer of the required depth before placing the upper slab layer.

D. Offset vertical bars in columns at least one bar diameter at lap splices. Furnish templates for all column dowels.

E. Obtain Engineer approval for all splices not shown on the plans. Mechanical connectors for reinforcing bars may be used if approved.

F. Do not use pebbles, pieces of broken stone, concrete rubble, broken brick or building blocks, metal pipe, or wooden block to position the fabric.

G. Follow the minimum concrete protective covering for reinforcement below.

1.	Concrete deposited against ground:		76.2 mm (3 inches)
2.	Formed surfaces exposed to weather or in contact with the ground:		
	a.	#6 bars or larger	50.8 mm (2 inches)
	b.	Smaller than #6 bars	38.1 mm (1-1/2 inches)
3.	Interior Surfaces:		
	a.	Beams, girders and columns	38.1 mm (1-1/2 inches)
	b.	Slabs, walls and joists:	
		1) #11 bars or smaller	19.05 mm (3/4-inch)
		2) #14 and #18 bars	38.1 mm (1-1/2 inches)

H. For corrosive atmospheres or fire protection, see special provisions for minimum covering requirements.

I. Obtain Engineer approval of reinforcement placement before placing concrete. Remove and replace concrete placed without Engineer approval of reinforcing.

J. Straighten fabric reinforcement shipped in rolls into flat sheets before placing it.

3.4 WELDING

A. When specified or approved, weld reinforcing steel meeting "Reinforcing Steel Welding Code" (AWSD 1 –4). Do not weld at bends in bars. Do not tack weld crossbars without Engineer approval.

PART 4: MEASUREMENT AND PAYMENT

4.1 GENERAL

A. Reinforcing steel used in the work is not measured. The cost of furnishing and placing reinforcing steel is incidental and included in the unit price or lump sum price bid for various items of the work.

END OF SECTION

SECTION 03310

STRUCTURAL CONCRETE

PART 1: GENERAL

1.1 DESCRIPTION

A. Furnish structural concrete meeting all specified requirements that is composed of Portland cement, aggregates, water. Furnish Ready-mixed concrete meeting ASTM C94 unless otherwise specified.

1.2 REFERENCES

ASTM C-94	Standard Specification for Ready-Mixed Concrete
ASTM C-150	Specification for Portland Cement
ASTM C-618	Specification for Coal Flyash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
ASTM C-989	Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
ASTM C-595	Specification for Blended Hydraulic Cements
ASTM C-157	Performance Specification for Hydraulic Cements
ASTM C-33	Specification for Concrete Aggregates
ASTM C-260	Specification for Air-Entraining Admixtures for Concrete
ASTM C-494	Specification for Chemical Admixtures for Concrete
ASTM C-1017	Specification for Chemical Admixtures for Use in producing Flowing Concrete
ASTM D-98	
ASTM C-138	Test Method for Density(Unit Weight), Yield, and Air Content(Gravimetric) of Concrete
ASTM C-173	Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C-231	Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C-31	Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C-39	Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C-172	Practice for Sampling Freshly Mixed Concrete
ACI 301	Standard Specification for Structural Concrete for Buildings
ACI 305	Hot Weather Concrete
ACI 306	Cold Weather Concrete
ACI 318	Building Code Requirements for Reinforced Concrete

1.3 QUALITY ASSURANCE

A. Codes and Standards: The codes and standards referred to in this section are declared to be part of this specification as if fully set forth herein. In addition, the following ACI Standards are incorporated in their entirety, unless specifically required otherwise:

1. ACI Standard 301, "Specifications for Structural Concrete for Buildings," American Concrete Institute, Edition.

2. ACI Standard 318, "Building Code Requirements for Reinforced Concrete", American Concrete Institute, current edition.

3. Concrete Reinforcing Steel Institute, "Manual of Standard Practice".

4. International Building Code of I.C.B.O.

B. Concrete Testing: The Contractor shall employ at his expense a testing laboratory acceptable to the Engineer to perform material evaluation tests and/or perform the mix design prior to placing any concrete. The Engineer will perform all acceptance testing during the onsite placement of the concrete .. Retesting or additional testing of concrete or materials failing to meet the requirements of these specifications shall be done by the Contractor at no additional cost to the Owner.

PART 2: PRODUCT

2.1 CLASSIFICATION

A. Concrete is classified as set forth below. Place the specified class of concrete for each structure element as specified. Concrete with prefixes "C" contain 1-1/2 inch (38.1 mm) size aggregate and those with "M" contain 3/4 inch (19.05 mm) size aggregate.. Concrete with prefixes "M" may be substituted for concrete with prefixes "C."'

1. Use M-4000 concrete for curb and gutter, sidewalks, driveways, approaches, curb turn fillets and valley gutters and structural concrete.

2. Use M-3000 concrete for manholes, storm drain inlets and miscellaneous or C-3000 Concrete Construction class.

3. M-3000 is concrete with 3/4 inch (19-05 mm) maximum aggregate and a 28-day compressive strength of 3000 pounds per square inch (psi) (20.7 Mpa).

4. M-4000 is concrete with 3/4 inch (19-05 mm) maximum aggregate and a 28-day compressive strength of 4000 pounds per square inch (psi) (27.6 Mpa).

5. C-3000 is concrete with 1-1/2 inch (38.1 mm) maximum aggregate and a 28-day compressive strength of 3000 psi (20.7 Mpa).

B. If concrete strength or durability requirements established by design exceed the above strength classifications, the Engineer may specify additional concrete classifications to meet those requirements.

2.2 COMPOSITION OF CONCRETE

A. Upon receipt of the notice of award of the contract, furnish the Engineer with names of suppliers and locations of sources of materials proposed for use.

1. Materials

a. Cementitious Material: Cementitious material consists of Portland cement meeting ASTM C 150, with or without the addition of cementitious or pozzolanic mineral admixtures meeting, ASTM C618 or ASTM C989, or blended hydraulic cement meeting ASTM C595 or hydraulic cement meeting ASTM 1157. Unless otherwise specified, assure cementitious material meets ASTM C 150 Type I or Type II. Assure cementitious material used in concrete is the same brand and type and from the same plant of manufacture as the cementitious material used in the concrete represented by the submitted field test date or used in the trial mixtures.

b. Aggregates: Assure aggregates meet ASTM C33. When a single size or a combination of two or more sizes of coarse aggregates are used, assure the final gradation meets the grading requirements of ASTM C33. Obtain concrete aggregates from the same source and use the same size ranges as the aggregates used in the concrete represented by submitted historical data, or used in trial mixtures.

c. Water and Ice: Use concrete mixing water and water to make ice meeting requirements of ASTM C94.

d. Admixtures: Use admixtures meeting the following requirements:

1)	Air entraining, admixtures -	ASTM C260
2)	Chemical admixtures-	ASTM C494

3) Chemical admixtures for use in producing, flowing concrete- ASTM C1017
4) Calcium Chloride - ASTM D98
5) Use admixtures in the concrete that are the same as those used in the concrete represented by submitted field test data or in trial mixtures.

2. Change of materials

a. When brand, type, size, or source of cementitious materials, aggregates, water, ice or admixtures are requested to be changed, submit new field data or data from new trial mixtures or furnish evidence that indicates that the change will not adversely affect the relevant properties of the concrete for acceptance before using the concrete.

B. Performance and Design Requirements

1. Assure the cementitious material content is adequate to meet the specified requirements for strength, water-cement ratio and finishing requirements. For concrete used in floors, assure the cement content is at least that indicated in Table 2.1. For concrete exposed to freezing and thawing or concrete exposed to deicers, assure a maximum water-cement ration of 0.45.

TABLE 2.1
MINIMUM CEMENT CONTENT REQUIREMENTS

Nominal Maximum size of aggregate, in(mm)	Minimum cement content lb/yd3 (kg/m3)
1-1/2 (38-1)	470* (163.0)
1 (25.4)	520 (180.3)
3/4 (19-05)	540 (187-3)
3/8 (9-5)	641 (222.3)

* Minimum cement content is 520 lb/yd^3 (180.3 kc,/m^3) and maximum H2O/cement ratio of 0.45 if concrete will be exposed to freezing and thawing and/or in the presence of deicing chemicals.

2. Furnish concrete at the point of delivery having a slump of 4 inches (max) (100 mm) determined by ASTM C 143. Meet slump tolerances in ACI 117. When a plasticizing admixture is used meeting ASTM C 10 17 or when a Type F or G high range water reducing admixture meeting ASTM C494 is approved to increase the concrete slump, assure the concrete has a slump

of 2 to 4 inches (50-100mm) before the admixture is added and a maximum slump of 8 inches (200 mm) at the point of delivery after the admixture is added.

3. Assure the nominal maximum size of coarse aggregate does not exceed three fourths of the minimum clear spacing between reinforcing bars, one-fifth of the narrowest dimension between sided of forms or one-third of the thickness of slabs or toppings.

4. Concrete must be air entrained. Measure air content under ASTM C 138, C 173 or C231. Unless otherwise specified, ASTM C231 shall be used.

TABLE 2.2
TOTAL AIR CONTENT* OF CONCRETE
FOR VARIOUS SIZES OF COARSE AGGREGATE

Nominal maximum Size of aggregate mm, (in.)	Total air content, percent		
	Severe exposure	Moderate exposure	Mild exposure
Less than 9.53(3/8)	9	7	8
9.53 (3/8)	7.5	6	4.5
12.5(1/2)	7	5.5	4
19 (3/4)	6	5	3.5
25.4(l)	6	4.5	3
12.7(1-1/2)	5.5	4.5	3
50.8(2)	5	3.5	1.5
76.2(3)	4.5	3.5	1.5
152.4(6)	4	3	1

* Measure in accordance with ASTM C 138, C 173, or C 231.
Air content tolerance is +/- 1 1/2 percent

a. When admixtures are specified in the Contract documents for particular parts of the work, use types specified. Use of calcium chloride or other admixtures containing chloride ions is subject to the limitations in Table 2.3 Chloride Ion Concentration. When approved, use calcium chloride in solution form only, when introduced into the mixture.

1) Assure the maximum water soluble chloride ion concentrations in hardened concrete at ages from 28 to 42 days attributed to the ingredients including water, aggregates, cementitious materials and admixtures do not exceed the limits of Table 2.3. Use tests to determine water soluble chloride ion content meeting AASHTO T260. The

type of member described in Table 2.3 applies to the work as indicated in the Contract Documents.

TABLE 2.3
MAXIMUM ALLOWABLE CHLORIDE ION CONTENT

Type of Member	Maximum water soluble chloride (CI) Content in concrete, percent by weight of cement
Prestressed concrete	0.06
Reinforced concrete exposed to chloride in service	0.15
Reinforced concrete that will be dry or protected from moisture in service	1.00
Other reinforced concrete construction	.30

b. When the average of the highest and lowest temperature during the period from midnight to midnight is expected to drop below 40°F (40°C) for more than three successive days, deliver concrete in accordance with ASTM C-94.

c. Furnish the compressive strength and the water-cement or water cementitious, material ratio of concrete for each portion of the work as specified in the Contract documents.

1) If cementitious or pozzolanic mineral admixtures meeting, ASTM C618 or ASTM C989 are used, the cement portion of the water-cement ratio must be the total weight of cementitious material.

2) The maximum weight of fly ash, pozzolan or ground granulated blast-furnace slag included in the calculation of water-cementitious material ratio cannot exceed the following percentages of the total weight of portland cement plus fly ash, pozzolan and ground granulated blast-furnace slag:

3) The combined weight of fly ash and pozzolan meeting ASTM C618 cannot exceed limits in ACI 318.. The fly ash and pozzolan present in an ASTM Type IP or IPM blended cement meeting ASTM C595 must be included in the calculated percentage.

4) The weight of ground granulated blast-furnace slag meeting ASTM C989 cannot exceed 50 percent of the total weight

of cementitious material. The slag used in manufacture of a Type IS or ISM blended hydraulic cement meeting ASTM C595 must be included in the calculated percentage.

5) If fly ash or pozzolan is used in concrete with ground granulated blast-furnace slag, the portland cement constituent meeting ASTM C 150 cannot be less than 50 percent of the total weight of cementitious material. Fly ash or pozzolan must not constitute more than 25 percent of the total weight of cementitious material.

6) Strength requirements are based on the 28-day compressive strength determined on 6" x 12" (150mm x 300mm) cylindrical specimens made and tested under ASTM C31 and C39 respectively.

2.3 PROPORTIONING AND DESIGN OF MIXES

A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method used, use an independent testing facility acceptable to the Engineer for preparing and reporting proposed mix designs.

B. Submit written reports of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed and approved.

PART 3: EXECUTION

3.1 CONCRETE MIXES

A. Job-Site Mixing: Mix materials for concrete in appropriate drum type batch match mixer. For mixers of one cu. Yd., or small capacity, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released. For mixers of capacity larger than one cu. Yd., increase minimum 1-1/2 minutes of mixing time by 2.5 minutes for each additional cu. yd., or fraction thereof.

B. Provide batch ticket for each batch discharged and used in work, indicating project identification name and number, date, mix type, mix time, batch quantities, and amount of water introduced.

C. Ready-Mix Concrete: Comply with requirements of ASTM C94, and as herein specified.

D. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ANSI/ASTM C94 may be required.

E. When air temperature is between 85°F (30°C) and 90°F (32°C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90°F (32°C), reduce mixing and delivery time to 60 minutes.

3.2 CONSISTENCY

A. Assure concrete is of such consistency that it will flow around reinforcing steel, but individual particles of the coarse aggregate, when isolated, show a coating of mortar containing its proportionate quantity of sand. The consistency of the concrete will be gauged by the ability of the equipment to properly place the concrete in its final position and not by the difficulty in mixing or transporting. Use the minimum quantity of mixing water necessary to provide workability within the ranges of slump specified.

3.3 MIXING

A. Thoroughly mix concrete to assure a uniform distribution of the materials throughout the mass. Mix concrete only in quantities required for immediate use and place it within the time limits specified. Waste all concrete which initial set has begun. Retempering of concrete is prohibited. Aggregates, or bags of cement containing lumps or crusts of hardened material shall not be used. Mix concrete in an approved truck mixer meeting the requirements of ASTM C94 herein.

B. The capacity of the plant and the transportation equipment must ensure delivery at a rate that will permit proper handling, placement and finishing at the point of delivery. Maintain the concrete delivery rate to provide for the continuous operation of placing, handling and finishing concrete as is practical. Maintain the interval between delivery of loads so that layers or lifts of concrete in place do not harden before succeeding layers or lifts are placed. In general, no lift or layer of concrete can remain exposed for more than 20 minutes before being covered by fresh concrete.

C. The volume of mixed concrete in the mixing drum shall not exceed the manufacturer's rating, on the capacity plate.

D. During freezing weather, other approved methods of measuring water will be permitted.

E. A recording water metering device is always required at the primary point of the batching operation.

F. Do not add water to concrete in transit. Water may be introduced into the mixer at the job site under direction of the Engineer, if the specified water-cement ratio is not exceeded. Water must be added in accordance with ASTM C94, Assure the drum revolves continuously after the introduction of the cement and water until the concrete is discharged.

G. Begin mixing immediately after introduction of the cement and water and continue for at least 70 revolutions of the drum at mixing speed. This minimum revolution count will be waived when the concrete is produced at a central mixing plant. Not more than 100 drum revolutions can exceed 6 revolutions per minute. All other revolutions must be at agitating speed of not less than 2 or more than 6 revolutions per minute.

H. Discharge the concrete at the job and place in its final position within 1- 1/2 hours after the introduction of the mixing water and cement. When the air temperature is 90°F (30°C) or above, place the concrete in its final position within 1 hour after the introduction of the mixing, water and cement. Concrete mixes with an approved set retarding admixture may be held an additional ½ hour beyond limits specified above.

I. No mixed or agitated concrete that has remained in the drum of the truck mixer more than 10 minutes without agitation can be used. If the Engineer determines the concrete has not suffered any detrimental effects. It may be used, after remixing for a minimum of 20 revolutions of the drum at mixing speed, if it can still be placed in the forms within the specified time limits.

J. Provide a revolution counter on each truck that registers the number of revolutions of the drum.

K. Mount the counter so it can be easily read by both the operator and the Engineer.

3.4 PLACING CONCRETE

A. Thoroughly compact concrete into its final position. Assure it is thoroughly consolidated around fittings and embedded items. Assure all reinforcement and embedded items are accurately placed as shown on the plans and are clean and free from coatings of dried mortar, detrimental rust, scale, oil or foreign matter. Place concrete meeting the applicable requirements of Sections 02528 and 02529.

3.5 CURING CONCRETE

A. Thoroughly cure concrete surfaces subject to premature drying by covering as soon as possible with canvas, plastic sheets with sealed joints, burlap and sand or other satisfactory materials and keep concrete moist. If the concrete surfaces are not covered, keep them moist by flushing or sprinkling. Continue curing for at

least 7 days after placing the concrete. Concrete surfaces placed against forms may be cured by leaving the forms in place for at least 7 days, when approved.

B. Protect concrete against freezing or other conditions detrimental to strength development meeting the applicable requirements of this specification.

C. To aid finishing, side forms on ornamental work, curbs and sidewalks, railing and parapets may be removed after 12 hours, not to exceed 48 hours, depending on weather conditions. Continue moist curing during the concrete finishing operation.

D. Untreated forms and existing concrete must be kept continuously wet for at least 1 hour before any concrete is placed. Keep wet until covered with concrete except that adequately treated forms must be thoroughly washed with a water spray immediately before placing the concrete.

E. The curing of concrete, by either water curing or membrane curing, must be as follows unless otherwise approved by the Engineer.

1. Water Curing

a. Keep all concrete top surfaces continuously moist after finishing, with a fine water spray, until the concrete has set. Cover the moist concrete with water or an approved curing covering.

b. Cure concrete deck slabs and concrete floors for at least 7 days. Cure by placing burlap, cotton mats or other absorptive material as close behind the finishing operation as possible without marring the finished surface. Keep the absorptive material continuously moist for the full time it is used. The absorptive material may be kept in place for the entire curing period or it may be removed as soon as practical and the entire surface covered with approximately 1-1/2 inches (38.1 mm) of sand, kept continuously moist for the entire curing period.

c. Remove forms and repair surface irregularities without interfering with any of the curing requirements. As soon as the vertical forms have been removed and the surface irregularities repaired, cover the concrete with absorptive material, kept continuously wet for the balance of the curing a period.

2. Impervious Membrane Curing

a. Assure membrane curing compounds are delivered to the job in the manufacturer's original container, clearly labeled to show the name of the manufacturer and the contents. The clear curing

compound must be sufficiently transparent and free from permanent color that would change the color of the natural concrete. Use clear compound containing a fugitive dye having color sufficient to render the film visible on the concrete for at least 4 hours after application. The concrete surface must maintain its natural color after curing.

b. Use a compound ready for use as shipped by the manufacturer. Dilute following the manufacturer's recommendations. Use curing compound only with written approval. Sampling will not be required if manufacturer's certification is available. Apply the curing compound under pressure with a spray nozzle to cover the entire exposed surface thoroughly and completely with a uniform film not exceeding manufacturer's specifications. Maintain the required pressure in the spray machine to force the material to leave the nozzle in a fine mist. Keep all concrete surfaces moist with a fine water spray or with wetted burlap until the sealing compound is applied. Keep the curing compound application close to the finishers of the top surface of concrete at all times. Seal the concrete immediately after the finishing operations have been completed, to the satisfaction of the Engineer.

c. If it is necessary to allow workers or equipment on the surface before the 7 day curing period is completed, cover the top surface of sealed concrete with a protective cushion for runways. Use a cushion consisting of a moist, 1 –inch (25mm) minimum thick layer of fine sand, or layers of moist burlap that will prevent damage to the finished concrete. Cover the approved cushion with four by eight foot sheets of 3/4 inch(19mm) plywood laid over the cushion. Do not place the cushion material for at least 8 hours after the final application of the curing compound. Obtain the Engineer's written approval for any other proposed cushion material before use. Layers of plastic, visqueen or canvas are not an acceptable cushion material.

d. Keep concrete, which has not completed its curing period, continuously moist during the stripping and surface repair operations. Remove all surface irregularities, repair all depressions, voids or holes, including those formed by trapped air, to the satisfaction of the Engineer. Immediately apply the curing compound before the surface has had an opportunity to dry out. Keep concrete, from which forms have been stripped, continuously moist until surface repair and finishing are completed and the impervious membrane curing has been applied.

3.6 WEATHER AND NIGHT LIMITATIONS

A. General

1. Stop concreting operations when darkness prevents obtaining the specified placing, and finishing work. Night operations may be conducted with written approval and when approved artificial lighting is provided.

2. Cold weather concreting is governed by ACI 306 unless otherwise specified herein. Hot weather concreting methods is governed by ACI 305 unless otherwise specified herein. Except by specific written authorization, stop concreting operations when a descending air temperature in the shade and away from artificial heat falls below 40°F (4°C), or do not resume until an ascending air temperature in the shade and away from artificial heat reaches frozen foundation course or subgrade.

3. Assume all risk of placing concrete in cold weather. Placing concrete during cold weather does not relieve the Contractor of the responsibility for obtaining the specified results. Remove and replace all concrete injured by frost at Contractor expense.

4. Before any concrete is placed, remove all ice, snow and frost completely from the formwork receiving the concrete.

5. Heating and Placing Concrete

   a. When concreting is authorized during cold weather, assure concrete temperature meets ASTM C94.

6. Protection of Concrete

   a. During the curing period, if the air temperature is anticipated to fall below 32°F (0°C, provide an approved blanket type insulating material along the work for covering all concrete that has been in place for 7 days or less. If, at any time, the ambient temperature drops to 32°F(O°C) or less, protect the concrete using a method approved by the Engineer. The minimum method of protection under such conditions is as follows: between two layers of plastic sheeting, the insulating materials, with the exception of commercial blankets, must be spread loosely to a minimum depth of 6 inches (150mm), but in all cases, to the depth required to prevent freezing of, or frost damage to, the concrete. Maintain the blanketing material at least until the end of the regular specified curing, period which is not less than 7 days. The Engineer may direct leaving the blanketing material in place for an additional

period if the recorded temperatures indicate that additional curing may be necessary. If during the construction period the mean daily temperature is expected to fall below 40°F(4°C) for 3 consecutive days, furnish approved heating enclosures and devices capable of maintaining the surface temperature of the concrete in place between 55°F (13°C) and 80°F (26°C). The curing, period under these conditions is 7 days when Type I-II cement is used and 5 days when a pre-approved "high early strength" mix is used. At the close of the curing period, the heat may be reduced so that the temperature inside the housing does not decrease faster than 15° per hour until the temperature inside the housing is the same as outside.

b. A Contractor may, at their own expense, field cure concrete cylinders with their in-place concrete and discontinue protection when those field cylinders reach 70 percent of design strength as indicated by the 28 day requirement of these specifications.

c. Perform all concrete protection using methods consistent with ACI-306-1-87 and approved by the Engineer.

3.7 TESTING

A. All concrete must be tested by an ACI Grade I or equivalent certified testing technician. Unless otherwise specified, the engineer shall be responsible for all acceptance testing during the on-site placement of the concrete.

1. Materials

a. The Engineer or their representative must have access to the ready mix production facility for sampling constituent materials during production to assure the materials meet these specifications and represent those stated on the approved mix design.

2. Standard Slump Tests

a. The Engineer shall , during each day's placement, check the consistency of the concrete by slump test. A slump test will also be made each time that strength specimens are made . Slump tests are performed meeting ASTM C143"Method of Test for the Slump of Portland Cement Concrete".

3. Compression Tests

a. A minimum of three specimens, 6 inch (150 mm) in diameter or 4 inch(100 mm) , shall be made and tested for every concrete placement. Mold and test one set of test cylinders for every 100 yards (76.5 cubic meters) of concrete or fraction thereof placed each day. On a given project, if the total volume of concrete is such that frequency of testing required above would generate less than 5 strength tests for a given class of concrete, make tests from at least 5 randomly selected batches or from each batch if fewer than 5 batches are used. Cure these cylinders under laboratory conditions except that additional test cylinders cured entirely under field conditions may be required by the Engineer to check the adequacy of curing and protection of the concrete.

b. Take samples for strength tests in accordance with ASTM C172, entitled "_____.

c. Mold test cylinders and laboratory-cure in accordance with ASTM C31. Test cylinders in accordance with ASTM C39, entitled " "Method of Test for Compressive Strength of Cylindrical Concrete Specimens", ASTM C39, using an independent testing laboratory, as approved by the Engineer.

d. Of each of the 3 cylinders take for a pour, test 1 for information strength at 7 days and test 2 for acceptance strength at 28 days. To meet this specification, average strength of two cylinders from the same sample, tested at 28 days or the specified earlier age, is required for each strength test. Strength level of an individual class of concrete is considered satisfactory if both of the following requirements are met:

1) The average of all sets of 3 consecutive tests equal or exceed the specified strength.
2) No individual strength test (average of two cylinders) falls below specified strength by more than 500 psi (3400 kPa).

e. Cure field cured cylinders under field conditions meeting Section 7.4 of "Method of Making and Curing Concrete Test Specimens in the Field" (ASTM C31).

f. Mold field cured test cylinders at the same time and from the same samples as laboratory cured test cylinders. Improve procedures for protecting and curing concrete when strength of field cured cylinders at the test age designated for measuring specified

strength is less than 85 percent of that of companion laboratory cured cylinders. When laboratory cured cylinder strengths are appreciably higher than the specified strength, field cured cylinder strengths need not exceed the specified strength by more than 500 psi (3400 kPa) even though the 85 percent criterion is met.

g. The strengths of any specimens cured on the job are to indicate the adequacy of protection and curing of the concrete and may be used to determine when the forms may be stripped, shoring removed or the structure placed in service. When the strengths of the job cured specimens are below those specified above, the Contractor must improve the procedures for protecting and curing the concrete.

h. When concrete fails to meet the requirements above or when tests of field cured cylinders indicate deficiencies in protection and curing, the Owner's representative may order tests on the hardened concrete under Chapter 17.3 of ACI-301-84 or order load tests in Chapter 20 of the ACI Building Code (ACI 318-83) for that portion of the structure where the questionable concrete has been placed. In the event the load or core tests indicate that the structure is unsatisfactory, make all modifications as directed by the Engineer to make the structure sound. If the load or core tests indicate the concrete is satisfactory, all cost of testing shall be paid by Owner.

4. Air Content Tests

a. The Engineer shall during each strength test, check the air content by either the "Method of Test for Air Content of Freshly Mixed Concrete by the Pressure Method" (ASTM C23 1), "Method of Test for Air Content of Freshly Mixed Concrete by the Volumetric Method" (ASTM C173) or "Method of Test for Unit Weight, Yield and Air Content (Gravimetric) of Concrete" (ASTM C138)

5. Temperature

a. Test hourly when air temperature is 40°F (4°C) and below, and when 80°F (27°C) and above; and each time a set of compression test specimens is made.

PART 4: MEASUREMENT AND PAYMENT

4.1 GENERAL

A. The method of measurement and basis of payment is as outlined in the specifications for the various items of concrete work.

4.2 REQUIRED SUBMITTALS

A. The following are submittals required to become an approved source of supply for Portland Cement concrete placed in the City right-of-way:

1. Complete concrete mix design meeting all specification requirements. Meet the Mix proportions specified in ACI 301, Chapter 3. Submittals will include the following:

MIX PROPORTIONS	
-cement in lbs (kgs)	Type and source of supply
-coarse aggregate	Size and source of supply
-fine aggregate	Source of supply
-water, gallons(liters)	City or well
-admixtures,oz/yd3(g/M3)	Brand and description*

*description as retarder, accelerator, air entraining, etc.

B. MATERIALS INFORMATION

1. Specific gravity (bulk s.s.d. Basis) of coarse and fine aggregate and 1 percent absorption-coarse aggregate unit weight (dry-rodded)-ASTM C33 quality tests including the following:

a. Fine aggregate

1) gradation AASHTO, T27 and T11 deleterious substances soundness (AASHTO T104) organic impurities (AASHTO T21) mortar-making properties (AASHTO T71)

b. Coarse aggregate

1) deleterious substances gradation (AASHTO T27 and T11) soundness (AASHTO T104) percentage of wear (AASHTO T96)

c. Current chemical analysis of mixing water (if well)

d. Current cement mill analysis

2. CONCRETE MIX DATA

a. slump

b. % air

c. unit weight

d. 7 and 28 day compressive strength

3. VARIATIONS

a. The following variations will be cause for submittal of a new mix design.

1) Change of aggregate source
2) Change of cement content
3) Addition or exclusion of certain admixtures including, but not limited to, pozzolans, accelerators, retarders and water reducers
4) Change in aggregate size
5) Change in type of cement
6) Failure to attain strength requirements as outlined in ACI 214 or ASTM C94

b. A variation in any of the following will require 'Informing the City Engineer and possibly data indicating acceptability for use in existing mix designs.

1) Change of cement supplier
2) Change of admixture brands or dosages (not types)
3) Minor adjustments of aggregate proportions accompanying materials changes or to accommodate placement conditions (same w/c ratio)

C. Certification of Ready Mixed Concrete Production Facilities

1. Concrete producers are to allow access to their facilities by Engineeror their representatives for inspecting their facilities and/or sampling materials. All facilities should meet the requirements of the "National Ready-Mix Concrete Association" check list for concrete production facilities.

2. Items directly affecting a facility's ability to properly proportion, transport and deliver concrete may be reason for disqualifying that facility as a source of supply until such deficiencies are corrected. Examples would include cement and aggregate scales that will not accurately weight materials or mixer units that will not thoroughly mix concrete materials.

D. The following chart indicates the submittal frequency for each item required for approval as a source of supply.

TABLE 4.1
SUBMITTAL FREQUENCY

SUBMITTAL	FREQUENCY		
	Monthly	Twice Yearly	Other
1- Complete mix design			(See Item 1, No 4)
2. Aggregate gradations	X		With mix design
3. L.A. Abrasion			With mix design
4. Soundness			With mix design
5. Deleterious substances			With mix design
6. Water quality (if well)		X	
6a. Cube strengths and time of set			With mix design
7. Cement mill certificates	X		
8. Organic Impurities			With mix design
9. Inspection of facilities			As indicated

Note: The above chart applies to the first year of this program. Frequency of submittals may change as dictated by variations of test data.

END OF SECTION

DIVISION 12 – EQUIPMENT

SECTION 12600
GAS PROCESSING SKID AND FLARE ASSEMBLY

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

This section covers the requirements for procurement, installation, and start-up of the Story Mill Road Landfill Gas Processing Skid and Flare Assembly. The accompanying contract drawings, including the Piping and Instrumentation Diagram (P&ID) for the Flare Station, provide additional information regarding the components that are required to be included as part of this pre-packaged assembly. The entire assemblies shall be pre-assembled and skid mounted, with final connection of components by the Others.

The Flare Assembly shall be constructed and perform in accordance with the requirements herein, and as indicated on the contract drawings. For the Story Mill Road Landfill, the assembly consists of a ground flare (rated at 6MM BTU/Hr), and its associated equipment and controls which shall be mounted on their own skid, as shown on the Contract Drawings. It is the manufacturer's responsibility to furnish a flare that is capable of processing the required flow of LFG with a methane concentration range from 20 to 50 percent and soil vapor extraction (SVE) gas as makeup air. It is also the responsibility of the manufacturer to meet all the flare performance and emissions requirements as indicated on the Flare Performance Envelope (Appendix B of these specifications). The flare manufacturer shall guarantee in writing that the performance and emission requirements will be met. Emissions from flare shall not exceed the following: Oxides of Nitrogen (NOx) - 0.06lb/MM BTU measured as NO_2, Carbon Monoxide (CO) - 0.20 lb/MM BTU.

Each Flare Station shall include, but not be limited to, the following components:

A. The Flare System consisting of:

a. Flare stack
b. Burner unit rated at 0.6 MM to 6 MM BTU per hour of LFG and SVE gas;
c. Soil vapor gas flow of 500 scfm
d. Flame arrester
e. Pneumatically actuated main gas valve (shut down valve, SDV), with a spring loaded, fail close feature
f. Interconnecting stainless steel piping
g. Internal electrical wiring
h. Instrumentation and control devices
i. Main control panel
j. Sampling ports for both inlet and outlet gases
k. Supplemental fuel system port to operate flare at minimum operation
l. Pilot gas (propane) Ignition System including bottle and spare

B. Gas and Soil Vapor Processing System:

a. Gear operated main gas inlet butterfly valves as shown on P&ID
b. Isolation valves
c. Fuel filter/condensate knock out vessel (s)
d. Two centrifugal blowers (one for LFG and one for SVE gas)
e. All required meters, gauges, and safety devices necessary to monitor, operate and maintain the system. Vacuum gauges shall be capsuhelic type only.
f. Stainless steel or approved equal, piping
g. Flow monitoring and recording system operating simultaneously with flare exhaust temperature monitoring and recording system
h. 1" diameter sampling ports and plugs for pitot tube flow measuring.

C. Control System:

a. Enclosures, cabinets, and junction boxes
b. Control, recording and annunciation devices
c. Interconnecting conduit (rigid fittings and flexible conduit) and wiring
d. Alarm system auto dialer for the flare station assembly
e. Panel air conditioner
f. Two Variable frequency drives, one for each blower
g. Motor Control Cabinet
h. Surge suppressor for 120v circuit

D. All component items of equipment shall be the product of a manufacturer experienced in the design, construction, and operation of equipment for the purpose required. The manufacturer shall have an established record of successfully operating such equipment it has manufactured or produced.

E. The manufacturer shall furnish the flare system, gas processing system, and control system, all piping, valves, fittings, supports, controls and accessories, as shown on the Contract Drawings, to obtain a complete and operable gas flaring system. The contractor shall install the gas processing skid and flare assembly.

F. All electrical design of required electrical components (i.e., conduits, control panels), shall be the responsibility of the manufacturer.

G. All equipment shall be designed, fabricated and assembled in accordance with the best modern engineering and shop practice. Individual parts shall be manufactured to standard sizes and gauges so that repair parts, furnished at any time, can be installed in the field. Equipment shall not have been in service at any time prior to delivery, except as required by factory testing.

H. All mechanisms and parts of the flare assembly shall be engineered to withstand the stresses which may occur during operation or for any other stresses which may occur during fabrication, transportation, installation, operation, seismic and weather events.

I. Equipment shall include all production line improvements made by the delivery or contract date. All equipment shall comply with applicable requirements of the standards of AISC, AGA, ASME, AWS, NFPA, and UL as of the bid submittal date. The equipment shall be furnished factory assembled to the extent possible and ready for installation.

J. The flare and all appurtenances shall comply with the requirements of the International Building Code (IBC). The flare and all appurtenances shall be designed to withstand lateral forces for Seismic Zone 1 and a minimum basic wind speed of 100 miles per hour. Mechanical and electrical equipment, and their supports and connections, shall be designed to prevent sliding and overturning. Brackets and anchors shall be of ductile material so that they can absorb energy and continue to carry the load.

K. A permanent nameplate shall be attached to the flare assembly in a conspicuous place. The following information shall be plainly marked on the nameplate: name and address of the manufacturer, model number, serial number, date of manufacture, and any other information necessary for complete identification.

L. The manufacturer shall pay all royalty and license fees for the flare, unless otherwise specified. The manufacturer shall defend all suits or claims for the infringement of any patent rights, and shall hold the City harmless from loss on account thereof.

1.02 SUBMITTALS

A. Shop Drawings: The manufacturer shall provide submittal drawings (e.g., Mechanical, Electrical, and Structural), and receive written approval of the drawing submittal, prior to commencement of manufacturing. Drawings shall include all pertinent data necessary for complete construction and assembly including equipment dimensions, component parts, list of materials, installation and mounting details, electrical wiring diagram and details, and control panel front view.

B. If the proposed equipment requires an arrangement differing from that indicated on the Drawings and as specified, the CONTRACTOR shall be responsible for preparing and submitting for review detailed structural, mechanical, electrical and P&ID drawings, equipment lists, materials of construction, operating instructions, and written explanation for the new arrangement, showing all the necessary changes and all special features of proposed equipment. The CONTRACTOR shall make such changes, if approved by the ENGINEER, at no additional cost to the City.

C. Materials List: The manufacturer shall submit three (3) copies of a complete list of all materials and equipment proposed to be furnished and installed under this portion of the work, giving the manufacturer's name, catalog number, and catalog cut for each item.

D. Manufacturer's Recommendations: Accompanying the materials list, submit three (3) copies of the manufacturer's current recommended method of installation for materials provided.
   a. Equipment supplier's written report certifying that equipment (blowers, flare, motors, etc.):
   b. Has been properly installed and connected.
   c. Is in accurate alignment.
   d. Is free from undue stress imposed by piping or mounting bolts.

E. The flare manufacture shall provide blower performance curves showing blower operation with design composition for LFG and an elevation of 4,900 ft above mean sea level, over the entire range of operation.

1.03 WARRANTY OF WORK

A. All equipment, materials, and articles incorporated in the Work covered shall be new and subject to review and acceptance by the OWNER unless otherwise specifically provided for in the Specifications.

B. Where equipment, materials, and or articles are referred to in the Specifications or Drawings as "or equivalent", or "equal to", or "approved equal to", the ENGINEER shall decide the question of equality.

C. The CONTRACTOR shall guarantee the work against defective materials or workmanship for a minimum period of one (1) year from the date of its final acceptance under this Contract, except where longer warranty periods are specifically stated by the manufacturer of individual components.

D. Warranties for all equipment provided under this specification shall be assigned to the OWNER. Equipment warranties shall include one year (from date the equipment is first put into service) of repair of all equipment including but not limited to: blowers, electric motors, level sensors, electronic components, and air conditioners. These warranties shall be inclusive of all costs such as shipping, labor, per diem and taxes.

E. It is the CONTRACTOR's ultimate responsibility to deliver, at the time of final acceptance, a complete project that complies with these Specifications and Drawings. All items shall be 100% complete and ready to operate.

F. During the warranty period, should the CONTRACTOR fail to remedy defective material or workmanship, or to make the replacements within five (5) days after written notice by the OWNER or ENGINEER, it is agreed that the OWNER may make such repairs and replacements at 1.5 times the actual cost of the required labor, and materials shall be chargeable to and payable by the CONTRACTOR.

G. In the event it is necessary for the OWNER to file suit to enforce any liability of the CONTRACTOR pursuant to this article, Control of Work, the OWNER shall

be entitled to recover, from the CONTRACTOR, in addition to all other amounts found due and owing, costs of suit and reasonable expenses and fees, including reasonable attorney's fees incurred by the OWNER in successful enforcing the CONTRACTOR's obligations, all to be taxed as costs and included in any judgment rendered.

H. The warranty provided herein shall not be in lieu of, but shall be in addition to any warranty or other obligations otherwise imposed by law. The remedies provided herein shall not be exclusive and the OWNER shall be entitled to any and all remedies provided by law.

PART 2 - MATERIALS

The Flare Assembly shall utilize modular systems, including all components for a complete and operational system. The Flare Assembly shall be pre-piped and pre-wired to the extent possible, requiring minimal field assembly. The Flare Assembly shall include, but not be limited to the following equipment:

2.01 GAS HANDLING SYSTEM

A. The systems shall be pre-fabricated with identical blowers completely installed with all pipes, fittings, valves and electrical connections. Blower operation shall be accomplished by a selector switch located on the control panel and interlocked.

B. A flow meter/computer with compensation for temperature and pressure calibrated for a typical landfill gas composition shall be included. The gas flow shall be displayed and recorded in the control panel in SCFM. Location of the flow element is shown on the Construction Drawings. The flow meter and computer will be installed in a NEMA 3R enclosure as shown on the Construction Drawings. The flow meter shall be a Veris Verabar, or approved equal.

C. A stainless steel flow tube shall be included on the gas processing skid upstream of the flare. The flow tube shall include either flow straightening veins or a straight uninterrupted pipe a minimum of 10 diameters upstream and 5 pipe diameters downstream of the sampling ports, or as required to assure uninterrupted flow per the manufacturer's instructions. The flow tube will include a sampling ports for the installation of the flow meter as well as a 1" threaded port for manual flow measurement.

2.02 GAS BLOWERS

A. The blowers shall be equipped to operate outdoors and have a stainless steel nameplate which includes capacity and pressure, maximum RPM, direction of rotation, and manufacturer's name and model number.

B. The blower shall be a 4-stage centrifugal unit with a 20 HP, TEFC, 480 VAC, 3-phase electric motor, and capable of providing a differential pressure of at least 50-inches W.C. Each blower shall be capable of inducing up to 65-inches W.C. vacuum and 20-inch W.C. positive discharge pressure (corrected for LFG specific gravity, temperature, and altitude), as manufactured by Houston Service Industries, Inc., Model 5012, four stage, or approved equal. The blowers shall be factory assembled with direct drive capable of operating within a range of 35 SCFM to 500 SCFM. The motor shall be 480 VAC, 3 phase, 60Hz, with a service factor of 1.15 - TEFC Inverter Duty motors, rated for use with variable frequency drives (VFD), and shall comply with the requirements of Subsection 2.03 ELECTRIC MOTORS. A VFD shall be included with each motor.

C. The blowers shall be designed and manufactured for LFG service, which can be acidic. Proper internal coating shall be applied.

D. The blowers shall be spark proof.

E. The blowers shall be equipped with shaft seals such that no contact is made between shaft, motor, and the housing other than through the bearings, such as double carbon ring bearings or approved equal. Bearings shall be 100% flooded oil type or approved equal.

F. The impeller shall be precision balanced to minimize vibrations.

G. The blowers shall be installed with vibration sensors with both programmable alarm and shut down capabilities

H. The blowers shall be mounted on vibration isolation pads, and provided with flexible connectors on both the inlet and the outlet of the blower.

I. The systems shall be pre-fabricated with identical blowers completely installed with all pipes, fittings, valves and electrical connections. Blower operation shall be accomplished by a selector switch located on the control panel and interlocked. The interlock for the flare shall only allow one blower to operate at a time.

2.03 ELECTRIC MOTORS

A. Motors shall be squirrel cage induction motors designed and applied in compliance with NEMA, USASI, IEEE, ASA C50, and AFBMA standards and with the NEC for the specific duty imposed by the driven equipment.

B. Each motor shall be rated for continuous duty in a cold environment and shall have a horsepower output adequate for the requirements of the driven equipment, including all losses.

C. Polyphase integral horsepower motor shall have a service factor of 1.15. The service factor shall provide an additional continuous rated overload capacity of not less than 15 percent over the full nameplate horsepower rating. Motors may be loaded to the

full nameplate horsepower rating. The service factor shall not be used in determining a non-overloaded condition. Any motor which is to be used with a variable frequency drive shall be rated for that use.

D. Insulation materials shall be non-hygroscopic and meet or exceed Class B definition. Motor temperature rating shall not exceed Class B temperature limits when the motor is operated at full load continuously in a maximum ambient temperature of 120°F.

E. Bearings shall be of the antifriction type made from vacuum degassed steel and shall be permanently sealed or grease lubricated with readily accessible inlet and outlet grease fittings to allow for "in service" regreasing. Inner bearing protection shall consist of an internal shaft flinger or inner bearing cap. Bearings shall be designed to give 25,000 hours minimum life by B-10 calculations for the conditions specified for continuous operation at full load. The proportions, mountings, and adjustments shall be consistent with best modern practices for applied radial and thrust loads at the speeds specified.

F. Nameplates shall be stainless steel with embossed lettering and shall be fastened to the motor frame with corrosion-resistant pins. Each nameplate shall contain the manufacturer's name, serial number, and all the information required by the National Electrical Code.

G. Data submitted shall include:

a. Name of Manufacturer
b. Type, Model and Frame Size
c. Motor Horsepower
d. Full Load Speed
e. Design Letter
f. Enclosure Construction
g. Temperature Rise & Class of Insulation System
h. Service Factor
i. Voltage, Frequency, Phase
j. Full Load Current
k. Locked Rotor Current
l. Minimum (B-10) Bearing Life
m. Motor Efficiency at 1/2, 3/4 and Full Load

2.04 FLARE

A. The flare stack shall be fabricated of structural quality carbon steel. The stack shall have a self-supporting base with support gussets welded to the skid assembly. The top exterior 4' of the stack shall have a sheet of stainless steel attached. The entire interior and exterior surfaces of the stack shall be painted with high heat primer and paint coatings for corrosion protection. The interior surface shall then be lined with lightweight, 2300°F refractory material. The refractory shall not require warm-up or cool-down procedures to avoid refractory damage.

B. A ladder shall be provided on the flare for thermocouple access. The ladder shall have a protective cover, lock, and safety cage. The ladder shall be located to allow for safe thermocouple maintenance. The ladder shall be mounted in such a way that when the security cover is placed on it, it does not obstruct flare view ports.

C. The stack shall be equipped with four each 4-inch diameter test ports and placed three feet below the top edge and at 90° spacing around the periphery of the round stack. Each test port shall be flanged. Blind flange bolts shall be zinc dichromate and will be coated with high temp anti-seize coating.

D. Four temperature elements, type Chromel-Alumel (Type K), shall be included and installed at various elevations along the length of the flare stack. Multiple view ports shall also be provided to observe the pilot flame and main gas flame. It is desirable to have a view port next to each thermocouple and two additional view ports in the bottom section of each flare stack above the burner ports where the pilot, igniter, and burner pots can be viewed for tuning purposes.

E. Two separate electrically operated combustion and quenching air louvers shall be installed. The flares temperatures will be regulated by automatic adjustment of the quenching air by the flares temperature controller. Each louver motor shall be installed in a weatherproof box with dust tight seals such as weatherization kits obtained from the manufacturer.

F. The igniter assembly shall consist of pilot tip, spark plug igniter, 110/5,000V single pole transformer mounted in NEMA 4 enclosure. Two ultraviolet (UV) scanners shall be included to monitor the flare's propane pilot and main burner flame.

G. The flare station shall be equipped with a complete propane pilot assembly, including ignition transformer, electric igniter, pressure regulator, solenoid-operated valve, and two 5-gallon propane supply tanks and gauge.

H. The flare station shall be equipped with a RACO Verbatim auto-dialer, with 16 input/output channels, as manufactured by RACO or approved equal. The system shall be installed within a Double Deep NEMA 4X Box. The CONTRACTOR shall supply all necessary boosters, amplifiers, or repeaters as may be necessary. A battery backup shall be included for proper callout notification during power failure events.

I. The flare shall be equipped with a complete set of burner plugs.

J. The flare shall be equipped with a burner assembly for use with LFG with the following composition:

LFG COMPONENT	COMPOSITION RANGE % BY VOL.

Methane (CH_4)	20 To 50
Carbon Dioxide (CO_2)	10 To 50
Nitrogen (N_2)	0 To 45
Oxygen (O_2)	0 To 15
Water Vapor (H_2O)	0 To 11

NOTE: The LFG composition does not vary linearly in between the listed range extremes.

K. The flare shall have provisions for auxiliary fuel (in the event the methane concentration of LFG drops below 20% by Vol.), to maintain operations and meet performance requirements. This shall include all pre-constructed piping necessary for a single point connection. The auxiliary fuel system will not be operated at this time; however, the flare will have all necessary control logic within the PLC for operation with auxiliary fuel.

L. The maximum pressure drop across the flare inlet shall be less than 10" wc at a flow of 500 SCFM of LFG.

M. Flare Design Capacity:

a. The flare shall be designed to process 35 SCFM to 500 SCFM LFG and have a minimum heat rating of 6 MM BTU/HR. The required flare performance envelope is included as Appendix B.

b. The heat rating of the Flare shall be 0.6 Million (MM) to 6.0 MM British Thermal Units per hour (Btu/hr). The gas processing and flare assembly manufacturer shall certify that the required efficiency can be maintained throughout the heat rating range and provide a performance envelope describing the amount of auxiliary fuel, if any, required to meet the minimum heat rate.

c. The LFG processing and flare assembly skid will be installed at an altitude of approximately 4,900 feet above mean sea level. The flare shall be designed to continuously burn and oxidize LFG under the following conditions:

	MINIMUM	MAXIMUM
Flare flow rate (scfm)	35	500
LFG temperature	60°F	110°F
Ambient air temperature	0°F	105°F

N. Flare Combustion Efficiency:

a. The minimum destruction efficiency for non-methane organic compounds (NMOC) shall be ninety-eight (98) percent, or reduction of outlet concentration to less than 20 ppmv dry basis as hexane at 3% O_2. The

minimum destruction efficiency for methane shall be ninety-nine (99) percent.

b. The flare shall provide a minimum retention time of 0.6 second at a minimum temperature of 1,400°F at the design range of BTU heat rating. The flare shall provide the above minimum retention time and temperature for all other conditions using auxiliary fuel, as required.

c. The maximum oxides of nitrogen (NOx) emissions for the flare shall be 0.06 pounds of NOx as NO_2 per MMBtu.

d. The maximum carbon monoxide (CO) emissions for the flare shall be 0.20 pounds of CO per MMBtu.

O. External Primary Burner Combustion Air Control:

a. The flare shall be equipped with a primary burner combustion air control. This mechanism is intended to allow the operator to adjust the primary air/fuel ration while flare is in operation.

b. Piping internal to the Flare shall consist of welded fittings.

2.05 FLARE INLET SHUTDOWN VALVE

A. The flare inlet shutdown valve shall be a pneumatically operated butterfly valve equipped with a stainless steel disk, stainless steel stem, and an EPDM seat. The flare inlet shutdown valve shall be furnished complete. The operator shall be driven pneumatically by instrument air. The supply air will be controlled by the use of a 3-way solenoid valve, which when power is removed will automatically position to vent allowing the valve to spring close, and will not require any electrical power to maintain this position.

B. The flare inlet shutdown valve shall be activated, at a minimum, by:

a. Normal shut down selection at control panel
b. Flame failure (determined by ultraviolet scanner)
c. High liquid level in knockout vessel
d. Low or high flame temperature
e. Power failure
f. High blower motor bearing vibration.

2.06 FLAME ARRESTERS

The flare inlet flame arrester shall be horizontal type manufactured by Groth, or approved equal, equipped with inlet and discharge drain ports and a stainless steel nameplate which includes size and pressure rating along with the manufacturer's name and the model

number. The flame arrester flanges shall be 125 pound flat face. The flame arrester's body shall be aluminum and the flame cell shall be aluminum. The manufacturer shall supply a Capsuhelic differential pressure gauge to monitor the pressure loss across the flame arrester. The gauge shall be installed with manufacturer supplied stainless steel tubing.

2.07 FUEL GAS FILTER/KNOCKOUT VESSEL

A. The CONTRACTOR shall install a fuel gas filter/knockout vessel.

B. The vessel shall have a minimum removal efficiency of 99 percent for particles larger than 6 microns and shall remove all free liquids and shall be rated for up to 500 SCFM.

C. The vessel shall have a minimum condensate holding capacity of 10 gallons.

D. The vessel shall include vessel differential pressure indicator with taps, stainless steel tubing and valves, capacitance type level controls, level gauge, condensate drain valve, as indicated on the design drawings (P&ID).

E. Total pressure drop (clean stage) through the element shall not exceed two inches of water column at maximum flow rate conditions.

G. Material of construction shall be stainless steel or approved equal. (Note: LFG condensate may have a pH as low as 2).

H. The design pressure shall be 120 inches of water column vacuum. Design temperature shall be 200^0 F.

I. One spare demister pad identical to the one installed shall be supplied by the manufacturer.

J. The knockout vessel shall be mounted to the blower skid assembly.

K. The knock out vessel shall be equipped with two capacitance type level control sensors. The High and Low levels shall be used to shutdown the flare.

2.08 SOIL VAPOR EXTRACTION SYSTEM GAS

A. The CONTRACTOR shall install a secondary soil gas vapor burner below the main landfill gas burner.

B. The secondary soil gas vapor burner shall have its own flare arrestor and be capable of processing up to 500 SCFM.

2.09 CONTROL SYSTEM

The control panel assembly shall be NEMA 12/3R and shall be mounted on the gas handling system skid. The main control panel shall include a swing out panel. The panels shall be pre-mounted, installed and pre-wired to the greatest extent possible prior to shipment to the site. The Control System shall be a complete installation capable of controlling the two blower motors.

The panels shall include as a minimum, but not be limited to, the following components:

A. A load center for all the motors, outlets, fixtures, controls and devices, etc. included with the system. One spare two-pole breaker and two spare single-pole breakers shall be provided in the load center. All breakers shall be identified.

B. A KOYO, or approved equal, PLC to receive all the signals from the various safeties, controls and monitoring equipment, and to automatically control all the various components of the system. The manufacturer shall include, at no additional cost, a print out-copy and digital copy of the PLC program logic and all equipment and software necessary to modify and/or reprogram the PLC.

C. A control panel to allow either manual or automatic selection for the control of the various operation components of the system. The panel shall have an integrated set point display panel which will facilitate set point adjustments in the field.

D. An extended weather/heat shield with a minimum of three-foot overhang beyond the installed panels, shall be provided to protect the control panel against radiated heat (solar and/or flare), rain, protect the face of the control panel from direct sunlight and allow operations personnel adequate protection from adverse weather conditions. The control system shall be designed and manufactured as an outdoor system. Florescent lighting, rated for outdoor use shall be mounted underneath the weather shield with an on/off control switch mounted at the control panel.

E. The control panel shall be equipped with an air conditioner with an adjustable thermostat to reduce internal panel temperatures to within the equipment's rated operational temperatures.

F. The control panel shall be furnished complete with a digital recorder with a minimum of twelve channels. The recorder shall include a Compact Flash memory card slot, card, and spare card if recommended (CP+Adapter). The manufacturer shall supply the recorder with input signals to record the flares temperature, landfill gas flow and oxygen content. The recorder shall be as manufactured by Yokogawa DAXStation Model DX112or approved equal. The manufacturer shall supply a copy of the programming software and manuals.

G. Edging material shall be installed on all internal panel supports or edges which are exposed or free standing within the panel.

H. The manufacturer shall supply a surge suppressor to protect the 120v circuit.

2.10 WIRING & CONDUIT

A. Conduit shall be rigid galvanized steel. All conduit terminations shall be threaded. Threadless fittings are not acceptable. Exposed conduits shall be installed in a neat and workmanlike manner. They shall be level and parallel to adjacent surfaces or piping. The area within five feet of the blower seal is classified as Class 1, Division II, Group D. All wiring within this area shall be done in a manner approved for this classification. Minimum conduit size is to be 3/4-inch, except for final connection to individual devices.

B. 120-VAC wiring shall be Type THWN stranded. All wires shall be identified at both ends with wire markers to match the wiring diagrams.

C. Motors and field devices shall be connected by means of flexible conduit (Thomas & Betts Type ATX or approved equal) with approved connectors. The maximum length of flexible conduit shall be 18 inches. Wire connections shall be accomplished with solderless terminals, and bolted. Wire-nut type connections are not acceptable.

D. All seal-off fittings shall be properly packed with fiber material and poured with approved sealing compound after proper system operation has been verified.

E. All flexible conduit shall be Thomas & Betts high temperature metallic liquid-tight flexible conduit, Model ATX, with Thomas & Betts Series HT fittings, or approved equal.

2.11 ADDITIONAL DESIGN REQUIREMENTS

A. All electrical equipment and control instrumentation for the blower and flare operation shall be integral to the gas processing and flare skid assemblies.

B. The flare skid assembly shall include a lockable weatherproof enclosure for storage of O&M Manuals and operational data.

C. The gas processing skid and flare assembly shall be assembled at the factory. Any unavoidable on-site assembly shall be performed by the CONTRACTOR under the direction of the manufacturer.

D. Flare assembly shall be designed to withstand 100 MPH wind loading per ASCE 7-88, Exp. C.

E. The piping immediately leading to and from the flame arrester shall be equipped with two tapped 1/2-inch holes and hand operated valves, and shall be connected to a differential pressure indicator as described in the drawing to allow determination of inlet and outlet static pressures.

F. The flare control panel lighting (below the weather shield) shall be supplied by the flare manufacturer. An on/off light switch shall be provided at the control panel.

G. Area lightning for the flare station including poles, fixtures, footings, photo cells, and conduits shall be supplied by the CONTRACTOR, as shown on the construction Drawings.

H. The flare control panel shall have an externally mounted clearly identifiable E-Stop which shall shutdown the entire control panel process and equipment in the event of an emergency.

PART 3 - EXECUTION

3.01 GAS PROCESSING SKID, FLARE ASSEMBLY

The gas processing skid and flare assembly shall be delivered assembled to the fullest extent. However, the CONTRACTOR is responsible for providing final assembly and final tie-in of certain components. It is the CONTRACTOR's responsibility to connect the main LFG inlet piping onto the knockout vessel, install the propane supply line for the pilot gas, install the condensate drain piping, connect all electrical and mechanical connections and make operational the entire flare station as shown on the Construction Drawings. Electrical supply power wiring to the control panel will also be required.

3.02 PAINTING

A. The CONTRACTOR shall paint all equipment (except motor housings) furnished by the CONTRACTOR with three coats of paint. Where it is practical to apply a shop coat, two field coats in addition to the shop coat shall be required. Where a shop coat is not practical, one rust-prohibitive coat and two finish coats shall be applied.

B. All factory-furnished equipment shall be protected from damage during erection, thoroughly cleaned after erection, and touched up as required. If the factory finish has, in the opinion of the ENGINEER, been seriously damaged, the equipment shall be given two additional field coats.

C. The surfaces of all piping and structural steel shall be properly prepared and painted with one coat of rust prohibitive paint and two field coats of moisture and acid-resistant paint

D. The color of the finished paint shall be as determined by the City. Dry paint thickness shall be a minimum of 3.0 microns (5.5 microns wet).

3.03 INSPECTION

The City reserves the right to appoint an inspector or other authorized representative of the ENGINEER to inspect the gas flare prior to or after shipping, with full power to reject all materials and workmanship not conforming to the Drawings and Specifications. The manufacturer shall give the City a minimum notice of five (5) working days before the completion of the fabricating operations to permit ample time for the inspection of the gas processing and flare assembly skids.

3.04 TESTING

It is the intent of these specifications that the flare manufacturer supply the flare and process skid assemblies, assembled and tested at their facilities and supply complete and working assemblies to the Site. To this extent, the gas processing and flare assembly skid will be field tested (by the CONTRACTOR) to demonstrate that it meets performance, capacity, noise, flame height, combustion temperature, skin temperature, and automatic temperature control requirements. Final acceptance of the equipment is contingent upon a successful demonstration of the automatic operation of the gas processing and flare assembly skids through the complete range of its specified design capacity.

A. The manufacturer will be notified 30 days prior to testing and will be invited to observe the testing. Should the flare fail to meet the specified performance, the manufacture shall troubleshoot and correct the cause, and perform subsequent testing at their expense.

B. The CONTRACTOR shall be responsible for compliance with the emissions limits listed herein the Specifications. In addition, the CONTRACTOR shall provide any necessary logistical support in conjunction with this source test (manlift, etc.), if required.

C. In the event the source test results revealed non-compliance with the performance specifications, the CONTRACTOR shall perform any necessary hardware adjustments to the Flare stack required to meet all performance criteria. These adjustments shall be conducted at the CONTRACTOR's expense. The second and subsequent source tests will be performed at the CONTRACTORS's expense.

D. Source testing of each flare to demonstrate operation and performance shall be performed, if required. The Montana Bureau of Air Quality shall determine if the flare is source tested, after modification of the existing air permit.

3.05 START-UP SUPPORT

The manufacturer shall provide a minimum of three days of on-site start-up services by a factory field services technician or engineer. One of the three days shall consist of on-site training by a factory field services technician or engineer. Training shall include troubleshooting electrical components, input/output cards, etc. The manufacturer shall provide the cost of an additional optional 2 days, in addition to the three standard days, of on-site service.

3.06 SPARE PARTS

A. Prior to the completion of the work, the Contractor is required to supply a complete set of spare parts to be located at the site or as determined by the City, and a listing of local vendors where spare parts can be obtained. At a minimum the spare parts shall include the following for new flare station:

- Flare station control panel light bulbs for each installed type and size (4 EA)
- Flare thermocouple and thermowell (2)
- Honeywell UV flame sensor and amplifier card (1 EA)
- Spark plug
- Damper actuator
- Oxygen sensor

Note: (XX) indicates quantity. If no number is indicated, the quantity is one of each type installed or used in the system.

All spare equipment must be stored in a manner so that it is kept clean and in a like-new condition, and must not be exposed to weather or UV effects of the sun.

3.07 DRAWINGS AND DATA

Complete as-built fabrication, assembly, support, and installation drawings, showing fabrication details, detailed specifications, materials used, parts devices and other

accessories forming a part of the equipment furnished shall be submitted by the manufacturer for inclusion in the Operations and Maintenance Manual (O&M).

3.08 ELECTRICAL

A. All electrical work shall conform to the latest edition of the National Electrical Code, City of Bozeman and State of Montana Code and Regulations, and latest revisions of the Regulations of the State Fire Marshal.

B. All electrical work and equipment shall be in accordance with the National Electrical Code for the area classification given. The area within five feet from blower seal shall be Class 1, Division II, Group D. All other areas will be unclassified.

C. All conduits and small piping placed on the slab or the skid surface which are in traffic areas shall have aluminum non-skid floor bridges over them to reduce trip hazards.

D. Electrical work within the skid shall be constructed by an approved U.L. listed fabrication shop.

END OF SECTION

SECTION 12800
CONDENSATE HOLDING TANK

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

This section sets forth the requirements for furnishing and installing the condensate holding tanks, secondary containment tanks, and the seismic restraint systems.

PART 2 - MATERIALS

2.01 CONDENSATE HOLDING TANK FOR FLARE STATION

A. The condensate storage tank shall be a 1,150-gallon capacity HDPE upright tank with UV Inhibitors as manufactured by Poly Processing Inc.{Phone: (209) 982-4904}. The tank shall be Model No. 42002500; the secondary containment shall be Model No. 2103100 or approved equal. The secondary containment tank dimensions shall be 9 foot and 11inches tall and 8 foot in diameter and shall have a design capacity of 3,125 gallons.

B. The tank shall be supplied with four (4) 2-inch FNPT fittings on its top.

C. The tank shall come complete with a clear tubular type external PVC sight tube indicating the level of liquid in the primary tank or approved equal. This external sight tube shall be located for convenient monitoring and shall not be located within the secondary containment tank.

D. The tank assembly shall come complete with a vent line and a five (5) gallon granular activated carbon canister as manufactured by Barnebey and Sutcliffe, Model No. V-20 or approved equal. This vent line and activated carbon canister shall be installed as shown on the Construction Drawings.

2.02 ANCILLARY EQUIPMENT

A. The condensate storage tank shall receive liquids from the condensate sump, via the pneumatic pump, when the liquid level switch indicates high liquid level in the sump. The condensate storage tank may also receive liquids from condensate sumps in field via manual transfer.

B. Install all PVC piping, valves, fittings, and appurtenances, as identified in the Construction Drawings for the condensate line from the pump to the condensate holding tank and from condensate knock-out vessel to the pump.

C. The Contractor shall supply and install the seismic restraint system as manufactured by Poly Processing Inc, Model No. AC 14, or approved equal. Installation shall be as specified by the manufacturer.

D. A drain port shall be installed at the bottom of the tank and penetrate the secondary containment tank to allow for gravity draining of the tank. This drain assembly must be supplied by the tank manufacturer and allow a positive seal of the secondary tank. The Contractor shall install a 3" diameter ball valve with a Cam-Loc type quick disconnect coupling which shall be compatible with City equipment.

E. A drain port shall be installed at the bottom of the secondary containment tank in order to remove accumulated liquid between the primary and secondary tanks. This drain assembly shall be a 2" diameter ball valve.

PART 3 - EXECUTION

3.01 CONDENSATE HOLDING TANK

A. Tank anchoring shall be as specified by the manufacturer.

END OF SECTION

DIVISION 15 – MECHANICAL AND PLUMBING

SECTION 15010
GENERAL PIPING SPECIFICATIONS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

These General Piping Specifications apply, in general, to all piping. They shall supplement the detailed piping sections, standard specifications, and the equipment sections.

1.02 REFERENCE STANDARDS

Where ANSI, ASTM, AASHTO or other standards are referenced, applicable requirements of the last revision shall apply except as otherwise noted in these Special Provisions.

1.03 PIPE ITEMS NOT REQUIRING SUBMITTALS

Unless otherwise required, for piping which is installed in accordance with the specification and the Drawings, pipe submittals will not be required prior to fabrication and installation.

1.04 PIPE ITEMS REQUIRING SUBMITTALS

A. Items not specifically called for in the detailed pipe sections.

B. Any major relocations of piping from that detailed on the Drawings.

C. Any change of materials, jointing methods, or supports from that specified or detailed on the Drawings.

D. Details of additional supports not shown on the Drawings which are required to adequately support the piping.

1.05 AS-BUILT DRAWINGS

The CONTRACTOR shall prepare and submit two complete sets of As-Built Drawings as specified in Section 01300. They shall be separate, clean blueprints reserved for the purpose of showing a complete picture of the piping and valve work as actually installed. These Drawings shall be kept current with the construction. The CONTRACTOR shall include dimensions to adjacent landmarks such as fences and power poles. The ENGINEER shall have the right to inspect the As-Built Drawings as the work progresses.

Upon completion of the work, these As-Built Drawings shall be signed by the CONTRACTOR, dated, and returned to the ENGINEER for approval. Approved record drawings are a condition for final acceptance as discussed in Section 01300.

PART 2 - MATERIALS

2.01 GENERAL REQUIREMENTS

A. Pipe shall be standard weight pipe unless noted or specified otherwise herein or on the Drawings.

B. Suitable caps or blind flanges shall be furnished as indicated on the Construction Drawings on pipes, valves, or branches that are to be left unconnected. Below grade flanges hardware shall be prepared with nickel based anti-seize lubricant, and shall be wrapped securely in plastic after installation. A sufficient length of blank pipe shall be left where a cap is placed to enable cutting and installation of two or three fittings at a future date. Piping runs shown on the Construction Drawings shall be followed as closely as possible except for minor adjustments to avoid other piping or structural features. If major relocations are required, approval shall be obtained from the ENGINEER.

C. Materials shall be new and in perfect condition. Materials shall be of the same type and manufacture for similar use, unless otherwise approved. No item or material shall be installed for any purpose not recommended by the manufacturer. Workmanship shall be of the best standard practice of the trade.

PART 3 - EXECUTION

3.01 HANDLING

A. Pipe, fittings, valves and accessories shall be handled in a manner that will ensure installation in sound, undamaged condition. Equipment, tools, and methods used in unloading, reloading, hauling and laying pipe and fittings shall be such that they are not damaged. Hooks inserted in ends of pipe shall have broad, well padded contact surface.

B. The CONTRACTOR shall provide slings with protective sleeves in order to protect the pipe surface.

3.02 MANUFACTURER INSTRUCTIONS

Manufacturer instructions and recommendations shall apply to installation of piping unless otherwise specified. When requested by the ENGINEER, the CONTRACTOR shall furnish the manufacturer's printed installation instructions before pipe installation.

3.03 CLEANING

A. The interior of pipe and fittings shall be thoroughly cleaned of all foreign matter before being installed and shall be kept clean until the work has been accepted. Joint contact surfaces shall be kept clean until the jointing is completed.

B. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being installed. No debris, tools, clothing, or materials shall be placed in the pipe.

C. Gas piping headers and laterals will be under vacuum after installation. The CONTRACTOR, therefore, shall make special effort to prevent dirt, pipe shavings, or other materials from being drawn into these pipes.

D. After installation, all newly installed piping must be cleaned and flushed with water of all debris.

3.04 CUTTING

Cutting shall be done in a neat manner without damage to the pipe or lining. Pipe cuts shall be smooth, straight, and at right angles to the pipe axis.

3.05 TRENCH CONSTRUCTION

A. Where pipe grades or elevations are not definitely fixed by the Construction Drawings, trenches shall be excavated to allow a minimum 24" of cover over the pipe as shown on the Construction Drawings. Greater pipe cover depths may be necessary in order to provide clearance between other pipes, conduits, drains, drainage structures, or other obstructions encountered at normal pipe grades.

B. Trenches shall be excavated to a width which will provide adequate working space and pipe clearances for proper pipe installation, jointing and embedment. If the new pipe is to be installed in a fill or backfill area, the CONTRACTOR shall complete the fill or backfill to a minimum of two feet above the top of the pipe and then excavate the trench. See Section 02200.

3.06 PLUGGING OPEN END PIPES

Whenever pipe laying is stopped, the open end of the line shall be sealed with an approved mechanical watertight plug. Tape is not acceptable. Water that may have entered the trench shall be removed prior to removing the plug. It is essential that no mud, trench water, or other foreign matter be permitted to enter the pipeline at any time.

3.07 INSPECTION

Pipe and fittings shall be carefully examined for cracks and other defects while suspended, immediately before installation in final position. Spigot ends of pipe shall be

examined with particular care. Defective, damaged, or unsound pipe and fittings shall be rejected and removed from the work site.

END OF SECTION

SECTION 15050
FLEXIBLE CONNECTIONS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

Flexible connectors shall consist of flexible hoses located on the main header piping to allow for pipe expansion and contraction.

PART 2 - MATERIALS

2.01 ABOVE GROUND CONNECTORS

Above ground flexible hoses shall be equal to the adjacent nominal pipe size and made from a flexible material, and shall be reinforced with stainless steel (SS) or steel wire. The ends shall be capable of installation on standard IPS size PVC pipe.

For piping 12" and under, the flexible connectors shall withstand temperatures from -65°F to 325°F without any adverse effect. It shall be suitable for the following range of pressures: a minimum 80 inches water column vacuum and 20 inches water column pressure. The flexibility for contraction and expansion shall be a minimum of 50 and 20 percent, respectively, of its original size. The hose shall be capable of bend radius equal to 1.5 times the nominal pipe diameter. The flexible hose shall be Snook Landfill Gas Hose, LFG44, or approved equal. The minimum hose length shall be 24 inches.

For piping over 12", the flexible connectors shall withstand temperatures from -60°F to 200°F without any adverse effect. It shall be suitable for the following range of pressures: a minimum 80 inches water column vacuum and 20 inches water column pressure. The flexibility for contraction and expansion shall be a minimum of 50 and 20 percent, respectively, of its original size. The hose shall be capable of bend radius equal to 1.5 times the nominal pipe diameter. The flexible hose shall be Ultra Flex model UF-12-24 and UF-18-24 for 12" and 18" diameter pipes, respectively, as manufactured by LFG&E, Santee, CA or approved equal. The minimum hose length shall be 24 inches.

END OF SECTION

SECTION 15066
STAINLESS STEEL PIPE, TUBE, AND FITTINGS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. Stainless steel piping complete with fittings, jointing materials, hangers and appurtenances shall be furnished for the flare station and condensate sumps and installed as shown on the Construction Drawings.

B. Stainless steel tubing complete with fittings, joining materials hangers and appurtenances shall be furnished for the flare station as shown on the Construction Drawings.

PART 2 - MATERIALS

2.01 COMPONENTS

A. All stainless steel LFG conveyance piping and fittings shall conform to ANSI B36.19M-85. All stainless steel piping shall be schedule 10S. Steel type shall be 304 or 316 sheet and plate per ASTM 240. Fabrication shall be in accordance with ASTM A778 with dimensional tolerances in accordance with ASTM A 530. Welding procedures shall be in accordance with ANSI B31.1, paragraph 127.5.

B. Pipe supports, guides and anchors shall be located as required by MSS-SP69, and shall be fabricated in accordance with MSS-SP58.

C. All LFG condensate stainless steel piping 1-inch and smaller in size shall be 316 and shall conform to ANSI B36.19.

PART 3 - EXECUTION

3.01 STORAGE AND HANDLING

A. All pipes and fittings shall be handled carefully in loading and unloading. They shall be lifted by hoists and lowered on skid ways in such a manner to avoid shock. Pipe and fittings shall not be dropped or dumped. Ensure that piping has accurate alignments and grade adequate support pipes. Where temporary supports are used, ensure rigidity to prevent shifting or distortion of pipe. Pitch

pipes toward low points and provide for draining low points. Provide for expansion where necessary. Before assembly, remove dirt and chips from inside pipe and fittings

3.02 PIPE JOINING

A. Stainless steel pipes 1-inch in diameter and larger shall be flange joined or weld joined. Flange joints shall be with bolt studs and nuts and washers on each end or studs and nuts and washers with one tapped flange. Fittings shall be butt weld type manufactured in accordance with ASTM-A-774, bolts and nuts shall be grade 8 or yellow zinc dichromate. Welded joints shall be in accordance with ANSI B31.1, paragraph 127.5. Provide sworn certificates showing compliance with materials used and shop tests performed with appropriate standards. Submit reports for welding certification per ANSI B31.1 paragraph 127.6

B. Stainless steel lines less than 1 inch in diameter shall be tubing and utilize compression fittings for joining. Compression fittings shall be 316 stainless steel having pressure rating equal to or higher than the stainless steel tubing.

END OF SECTION

SECTION 15100
HIGH DENSITY POLYETHYLENE PIPING

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

High density polyethylene piping, complete with fittings, jointing materials, hangers and other accessories shall be furnished and installed where shown on the Construction Drawings, or are required for proper installation and functioning of the piping.

PART 2 - MATERIALS

2.01 COMPONENTS

A. All HDPE LFG header pipe and fittings shall be made from a polyethylene resin Type 3408, manufactured with ultraviolet inhibitors.

B. The standard dimension ratio (SDR) for the high density polyethylene (HDPE) pipe shall be 17 for 4-inch and greater pipe. SDR 11 shall be used for 2-inch condensate and well piping and SDR 9 shall be used for 2 inch compressed air piping.

C. The HDPE pipe fittings shall have the same specifications and pressure ratings of the HDPE. Fittings having a wall thickness different than the pipe shall not be used.

D. HDPE pipe elbows and tees shall be molded type for 12-inch and under. Fabricated type elbows and tees shall not be used.

PART 3 - EXECUTION

3.01 STORAGE AND HANDLING AND PLACEMENT

A. The Contractor shall exercise care when transporting, handling, and placing HDPE pipe and fittings, such that they shall not be cut, kinked, twisted, or otherwise damaged.

B. Ropes, fabric or rubber-protected slings and straps shall be used when handling HDPE pipe. Slings, straps, etc. shall not be positioned at butt-fused joints. Chains, cables or hooks shall not be inserted into the pipe ends as a means of handling pipe.

C. Pipe or fittings shall not be dropped onto rocky or unprepared ground. Under no circumstances shall pipe or fittings be dropped into trenches, or dragged over sharp and cutting objects.

D. HDPE pipe shall be stored on clean level ground, preferably turf or sand, free of sharp objects, which could damage the pipe. Stacking shall be limited to a height that shall not cause excessive deformation of the bottom layers of pipes under anticipated temperature conditions. Where necessary, due to ground conditions, the pipe shall be stored on wooden sleepers, spaced suitably and of such width as not to allow deformation of the pipe at the point of contact with the sleeper or between supports. The pipes should be stored out of direct sunlight.

E. The maximum allowable depth of cuts, gouges or scratches on the exterior surface of HDPE pipe or fittings is 10% of the wall thickness. The interior of the pipe and fittings shall be free of cuts, gouges, and scratches. Sections of pipe with excessive cuts, gouges or scratches shall be removed and the ends of the pipe rejoined at no cost to the Owner.

F. Whenever pipe laying is not actively in progress, the open end of pipe that has been placed shall be closed using a mechanical watertight plug.

3.02 PIPE JOINING

A. The HDPE pipe and pipe fittings shall be joined by the thermal butt fusion method.

B. Mechanical joining to other piping materials, fittings, and valves shall be accomplished with a HDPE flange adapter and cast steel backup flanges. The cast steel backup flanges shall be compatible for joining with ANSI-B 16.5, 150-pound bolt circle flanges, and shall be epoxy coated.

C. The bolts and nuts and washers used for mechanical joining shall be grade 8 zinc dichromate-plated steel. Each bolt shall be installed with two (2) nuts and two (2) washers.

D. Butt fusion and saddle fusion of HDPE pipe shall be performed by qualified personnel. All personnel used by the Contractor for pipe installation shall have a HDPE welding certificate. The Contractor shall submit copies of these certificates for verification by the Engineer. No HDPE pipe shall be installed prior to submittal of this verification.

E. HDPE to PVC transitions for small diameter piping shall be performed with HDPE to PVC transition fittings, or with HDPE to stainless steel transition fittings. A threaded PVC coupling shall be utilized when transitioning from the threaded portion of the transition fitting to the PVC pipe.

END OF SECTION

SECTION 15200
PVC PIPING

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

PVC piping, complete with fittings, jointing material and other accessories shall be furnished and installed where shown on the Construction Drawings, or are required for proper installation and functioning of the piping.

PART 2 - MATERIALS

2.01 GENERAL

PVC pipe shall be Schedule 40 unless noted or specified otherwise herein or on the Construction Drawings and shall conform to ASTM D 1785, PVC 1120.

2.02 PLASTIC PIPE COMPOUNDS

The rigid unplasticized compound from which PVC pipe, fittings, and appurtenances shall conform to ASTM D 1784, Class 12454B - for polyvinyl chloride.

2.03 FITTINGS

Schedule 80 fittings shall conform to the requirements of ASTM-D-2467 for socket type joints and shall have a minimum pressure rating of 100 psi at 73°F. Large diameter fittings may be fabricated conforming to the above pressure rating.

2.04 FLANGE GASKETS

Neoprene full-face gaskets 1/8-inch thick of 45 to 60 durometer (shore "A") hardness are required for flanged joints.

2.05 FLANGE BOLTING

The bolts and nuts and washers used for mechanical joining shall be grade 8 zinc dichromate-plated steel. Each bolt shall be installed with a nut and two (2) washers

2.06 SOLVENT PRIMER

Socket type connections shall be primed with primer furnished by the supplier of the PVC pipe and fittings.

2.07 SOLVENT CEMENT

Socket type connections shall only be joined by heavy duty solvent cement furnished by the supplier of the PVC pipe and fittings, and shall conform to ASTM D 2564.

PART 3 - EXECUTION

3.01 STORAGE

Plastic pipe, fittings and appurtenances shall be stored in a flat, horizontal position until ready for installation and protected from direct sunlight for extended periods of time.

3.02 JOINTS

A. PVC pipe fittings and appurtenance shall be provided with solvent joints, except where otherwise shown.

B. Solvent welded joints shall be made in accordance with ASTM D 2855. The ends of the plastic pipe shall be cut square and smooth, beveled and wiped clean.

C. Primer shall first be applied to the outside of the pipe and the inside of the fitting socket with a small paint brush or other approved applicator.

D. After priming, solvent cement shall be applied to the outside of the pipe and the inside of the fitting socket with a small paint brush or roller applicator. Solvent shall be applied in such a manner that no material is deposited on the interior surface of the pipe or extruded into the interior of the pipe during joining. The coated surfaces shall be immediately pushed snugly together and the pipe rotated approximately 1/4 turn to ensure uniform distribution of cement. Excess cement on the exterior of the joint shall be wiped clean immediately after assembly.

E. Care shall be exercised in assembling a pipeline with solvent welded joints so that stress on previously made joints is avoided. Handling of the pipe following jointing, such as lowering the assembled pipeline into the trench, shall not occur prior to set times specified in ASTM D 2855.

3.03 PAINTING AND PROTECTION

PVC piping installed above ground shall be protected against the effects of ultra violet (UV) light by the application of a heavily pigmented, two part, self priming, epoxy paint formulated for exterior use, and shall be manufactured with UV inhibitors. Paint shall be Tnemec Series 66 Hi-Build Epoxoline, or approved equal. Paint coating shall have a minimum dry thickness of 4 microns (7 microns wet). Paint color to be determined by the OWNER.

END OF SECTION

SECTION 15800
VALVES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

This section covers all valves, operators and appurtenances except where specific requirements are given in other sections. The CONTRACTOR shall furnish and install all valves complete with all operators, specialty items and appurtenances as shown on the Construction Drawings and specified herein. Pipe and valve purchase orders shall be coordinated to ensure proper installation of the valves and piping in conformance with the specified requirements.

PART 2 - EQUIPMENT

2.01 BUTTERFLY VALVES

Shall conform to AWWA Standard C504 for rubber seated butterfly valves, except as seats shall be mounted securely for complete immobility under all operating conditions.

2.02 CONSTRUCTION

A. Valve seat shall be mounted on the body only. Mounting on the disk will not be acceptable.

B. Manufacturers: Muessco, Keystone, Flow-Seal, Asahi, Demco or acceptable equivalent.

C. Body of butterfly valve to be of lug design, cast iron, and bolt pattern compatible with 150 lb. ANSI flanges. Lug body shall be drilled and tapped for mounting bolts.

D. Disk shall be type 304 or 316 stainless steel.

E. Seats and seals shall be EPDM.

F. Shaft shall be type 304 or 316 stainless steel. Either one-piece unit extending completely through the valve disk or stub shaft comprising two separate shafts inserted into valve disk hubs shall be utilized.

2.03 BALL VALVES

Ball valves used on the condensate sump assemblies, condensate drain and vent lines shall be manufactured by Asahi or approved equal.

A. Ball valves shall be True Union Type unless noted otherwise on the Drawings.

B. Full port design.

C. Pressure rated at 150 psi at 73 degrees F.

D. Body shall be constructed of PVC plastic.

E. Seals and seats shall be Teflon or EPDM.

2.04 GATE VALVES

A. Gate valves shall be used for well flow modulation and installed at well to header connections as shown on the Construction Drawings. Valves must be within easy reach of the operator and shall not be installed at a depth greater then 18 inches to the valve handle. Valves shall be screw gate valve type, or approved equal, and shall have the following characteristics:

B. 2" diameter SOC connections.

C. Valve body shall be of one single mold (Unibody) and shall be fabricated from PVC.

D. Valve stem shall be stainless steel.

E. Straight through flow design.

F. Replaceable internal components.

G. Seals shall be EPDM.

H. Paddle shall be Acetal.

2.05 MANUAL OPERATORS

A. All valves shall be provided with a manual operator unless otherwise noted on the Construction Drawings or specified. The direction of rotation of the wheel, wrench nut, or lever to open each valve shall be to the left (counterclockwise). Each valve body or operator shall have cast thereon the word OPEN and an arrow indicating the direction to open and shall be visible to the operator when the valve is in its final position.

B. Operator mounting arrangements and hand wheel positions shall be as shown on the Construction Drawings or as directed by the ENGINEER.

C. Unless otherwise shown on the Construction Drawings or specified herein, above grade 6-inch diameter and smaller butterfly valves shall have position locking lever, and below grade valves 6-inch and smaller shall be provided with a square nut type operator and valve stem extension. This allows buried gear operated valves to be actuated from ground level. A gear operator with hand wheel shall be mounted on the extension. The valve extension shall extend to greatest height possible without interference of valve box. Eight-inch and larger butterfly valves shall be provided with a weatherproof, enclosed worm gear operator. Gear operators shall be sized for the hydrostatic test pressure in the line or the pressure rating of the valve. All valves shall be equipped with a visual position indicator.

D. Wrench nuts shall be provided on all buried valves where shown on the Construction Drawings. Not less than two operating keys shall be furnished for operation of the square nut operated valves.

E. Buried valves, shall be supplied with a valve stem extension. This allows buried gear operated valves to be actuated from ground level. A gear operator with hand wheel shall be mounted on the extension and installed in a concrete vault. The valve extension shall extend to the greatest height possible without interference of the vault.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

A. Each valve which is installed with any portion below grade shall be provided with a valve box of the type and design shown on the Construction Drawings.

B. Valves and valve boxes shall be set plumb. Each valve box shall be placed directly over the valve it serves, with the top of the box brought three inches above the finished grade. After being placed in proper position, earth shall be filled in around each valve box and thoroughly tamped for a distance on each side of the box of four feet at the top of the pipe and two feet measured at the top of the trench.

C. Each valve shall be inspected before installation to ensure that all foreign substances have been removed from within the valve body; and they shall be opened and closed to see that all parts are in first-class working condition. Geared valves shall be inspected to see that all gears are properly lubricated.

D. All valves of the same type shall be of the same make unless otherwise approved by the ENGINEER. Equals may be substituted for the manufacturers listed with the approval of the ENGINEER.

E. Valves shall be line size except as shown otherwise on the Construction Drawings. Ratings specified are minimum unless noted otherwise.

F. All automatic operated valves shall be tagged by the manufacturer in accordance with the instrument tag numbers shown on the Construction Drawings.

G. When installing butterfly valves on HDPE piping and fittings, it is the CONTRACTOR's responsibility to assure proper operation of the valve. At all times the valve shall be capable of opening and closing 100% without any interference from the adjoining pipe and/or fittings. Should interference occur between a butterfly valve and the pipe due to the wall thickness of the pipe and/or fittings, the CONTRACTOR shall furnish valve spacers or consult with the valve manufacturer to allow free movement without any interference. All modifications are subject to the ENGINEER's approval.

H. In order to protect flange hardware, butterfly valves installed below grade shall be securely wrapped in plastic. Flange hardware for below grade valves will be coated with nickel based anti-seize lubricant prior to installation.

END OF SECTION

SECTION 15900
PRESSURE TESTING OF PIPE

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. Leak testing shall be conducted by the Contractor on the following lines:

a. All LFG extraction piping installed by the Contractor.
b. All propane gas piping.
c. All condensate discharge piping.
d. All compressed air supply lines.

B. The procedure and equipment to be used shall be approved by the Engineer prior to testing any line. Leakage tests shall be performed on all piping after installation and before backfilling where pipe is buried or encased. The entire gas extraction system should be tested after all pipes are cleaned and buried.

PART 2 - TESTING EQUIPMENT

2.01 GENERAL

The Contractor shall provide necessary piping connections between the section of line being tested and the nearest available source of air, or test fluid, together with test pumping equipment, pressure gauge and other equipment, materials and facilities necessary to make the specified tests. The Contractor shall provide temporary sectionalizing devices and vents as required for testing. Vents are to be left plugged if not required for the permanent installation.

PART 3 - EXECUTION

3.01 TESTING PROCEDURE

A. The specified test pressures shall be as measured at the horizontal centerline of the lowest point of the piping under test.

B. Each pipeline shall be adequately braced and supported before tests are made. Partial backfilling between joints of pipelines in trenches is permissible to prevent movement under test pressure, subject to approval by the Engineer.

C. Pipelines that have no valves may be closed with blind flanges or caps on the ends of the section to be tested. Discrete sections of the system can be pressure tested

separately in order to isolate leaks, however the final pressure test may be performed on large sections of the system.

D. Tests shall be made before the piping has been enclosed in any manner that will prevent inspection during the test.

E. Leakage testing for the LFG extraction system piping shall be performed by pressurizing piping to 2 psig and holding for one hour with no more than 0.5 psig pressure drop within that time frame. Allowable pressure drop will be revised for pipe sections longer than 500'. A soap and water solution (leak detection fluid) must be applied to all joints and the joints inspected for leakage by the formation of bubbles at the point of leakage. Any leaks detected must be repaired even if the test meets the set requirements. All of these lines, either individually or in common, are to be pressurized to 2 psig. All joints and connections shall be visually inspected for leaks after applying the leakage detecting fluid. Because PVC is shock sensitive and brittle at low temperatures, the Contractor shall regulate the test pressure or vacuum such that when pressurizing or evacuating any PVC or PE line with air, the test pressure shall never exceed 2 psig. The Contractor is cautioned that high test pressures, when using air or gas to pressurize, can shatter a considerable length of PVC pipe and pieces of the pipe can be propelled for long distances.

F. Leakage testing for the propane, compressed air, and condensate system piping shall be performed by pressurizing piping to 135 psig and holding for one hour with no drop in pressure. A soap and water solution (leak detection fluid) must be applied to all joints and the joints inspected for leakage by the formation of bubbles at the point of leakage. Any leaks detected must be repaired even if the test meets the set requirements. All of these lines, either individually or in common, are to be pressurized to 135 psig. All joints and connections shall be visually inspected for leaks after applying the leakage detecting fluid.

G. The Contractor, at his own expense, shall make necessary repairs or replacements in accordance with the Specifications. Repairing and testing shall be repeated until the pipeline installation conforms to the specified requirements and is acceptable to the Engineer.

H. After the test has been concluded, the pipeline shall be restored to a condition satisfactory to the Engineer.

I. It is intended that piping, whether tested after installation or not, shall be air-tight and free from visible leaks. Each leak which is discovered within one year after final acceptance of the work by the COP shall be repaired by and at the expense of the Contractor.

J. Pumps, air compressors, instrumentation and similar equipment shall not be subjected to the pressure tests.

K. All pressure testing performed shall be witnessed by the Engineer. The Contractor shall maintain a record of all pressure tested components. Each line item of the record shall be accepted by the Engineer. Acceptance of the pressure test by the Engineer shall not release the Contractor from its warranties.

END OF SECTION

APPENDIX A

SECTION 607
FENCES

MDOT CON. SPEC. 2014

607.01 DESCRIPTION

This work is constructing, removing and resetting barbed wi[illegible] woven wire, chain link fences and gates.

607.02 MATERIALS

Furnish materials in accordance with the following section ar[illegible] requirements.

Chain Link Fence	712.01
Hydraulic Cement Concrete	551
Wire Fence	712.02

Fence material acceptance test samples will be taken from the materials delivered to the project.

607.02.1 Snow Fence

Furnish all timbers, lumber and hardware as specified.

1. Lumber used must meet the Western Wood Products Association requirements, or equivalent grading rules. Grade lumber with a nominal thickness of 2 inches (50 mm) as structural light framing #2 grading or better. Grade lumber with a nominal thickness of 1-inch (25 mm) as boards #3 common or better. All lumber must meet ASTM D245.
2. All treated material must meet the requirements of Subsection 706.04 or the special provisions.

607.03 CONSTRUCTION REQUIREMENTS

607.03.1 General

Construct fencing before any other work is performed on all parcels of land. This requirement may be waived where the Contractor has obtained a landowner written waiver. The waiver must state a completion date agreed to by the landowner and the Contractor for completing the fence work.

Maintain all existing fence enclosures. Close Contractor fence openings using new permanent fence, or use temporary fence, cattle guards, or watchman where new permanent fence cannot be constructed the same day.

Temporary fence may be used in place of new permanent fence if approved.

607.03.2 Fence Preparation

Fence preparation consists of removal of vegetative and ground surface obstacles prior to actual fence installation. For fence preparation, clear only those portions of brush, shrubs and vegetation interfering with the fence installation. Cut off, trim or mow interfering vegetation without exposing bare soil in, or adjacent to, streams, stream banks, natural drainages or wetlands. Dispose of the resulting debris, slash, branches, etc. in accordance with Subsection 201.03.5. Avoid or minimize injury or damage to remaining vegetation. Do not grub, excavate, grade, or disturb the soil surface, unless in direct conflict with fence wire.

Soil disturbance associated with fence preparation, both inside and outside the construction limits, may not be included in the SWPPP permit. If disturbance of soil is unavoidable, revise and update the SWPPP, and install appropriate erosion and sediment control features (i.e. BMPs) as required. Prior to fence installation, seed all exposed soil in accordance with the contract requirements. The seeding dates specified in the contract do not apply to this seeding.

Prior to commencing work that alters or disturbs the bed or banks of any stream or its tributaries, obtain authorization from FWP; commonly referred to as the SPA 124.

Prior to conducting any work that results in the placement, or discharge of soils into waters of the United States, including wetlands, obtain a COE Section 404 authorization.

Prior to conducting any work in State waters, including wetlands, that causes an increase in turbidity; obtain a 318 authorization from the DEQ.

Use equipment that minimizes disturbance to soil and vegetation (i.e. low pressure rubber tired equipment, wide tracked low-weight tractors, etc.) in fence preparation areas, for setting fence posts and installing fencing material. If it is necessary to operate equipment in wetlands, place and operate the equipment on mats, or utilize other measures as necessary to avoid or minimize soil and vegetation disturbance. When installing fence posts and fencing, utilize measures, including hand work, to avoid or minimize soil and vegetation disturbance in streams and natural drainages and on, or adjacent to, stream banks.

607.03.3 Constructing Chain Link Fence

Construct chain link fence as specified in the contract and in accordance with the following requirements:

A. Posts. Set posts vertically, spaced at maximum 10-foot (3 m) centers, measured parallel to the ground surface.

Set posts for 5, 6 and 8-foot (1.5, 1.8 and 2.4 m) fence in concrete. Set end, corner, and pull posts for 3 and 4-foot (0.9 and 1.2 m) fence and line posts connected by bracing to end, corner, or pull posts in concrete. Drive or set in concrete, line posts on 3 and 4-foot (0.9 and 1.2 m) fence as specified.

Use the footing dimensions and post embedment depths shown in the Detailed Drawings. Crown concrete footings to shed water.

Do not damage posts while driving them. Backfill and compact the voids around posts.

Set line posts placed in solid rock without soil overburden, at least 14 inches (355 mm) deep. When in solid rock, set end, corner, gate, and pull posts at least 20 inches (510 mm) deep. Excavate or drill holes to a minimum width or diameter 1-inch (25 mm) greater than the largest dimension of the post being set.

Cut posts to the required length before installing. The Contractor may use an even post length set deeper into the solid rock at Contractor expense.

For metal posts placed in bored rock holes or consolidated soils, set the post plumb and fill the holes with cement grout that meets the requirements of Subsection 713.04. Work the grout into the holes to eliminate voids. Concrete footings are not required where posts are set in bored holes.

Place posts, set in solid rock covered by soil or loose rock, to the specified depths or to the minimum solid rock depths specified above, whichever is less. When solid rock is encountered before reaching the specified depth, construct concrete footings from the solid rock to the top of the ground on 5, 6 and 8-foot (1.5, 1.8, and 2.4 m) fence and on end, corner, and pull posts for 3 and 4-foot (0.9 and 1.2 m) fence. Grout around that part of the post that is in solid rock.

Check that all posts are solid once they are driven, backfilled, or concrete is placed.

B. Top Rail or Cable. Pass the top rails through the line post tops, providing a continuous brace from end-to-end of each fence section. Join top rail sections using sleeve-type couplings. Fasten the top rails to the terminal posts using pressed steel fittings.

Replace the top rails with a ⅜-inch (9.5 mm) diameter galvanized steel cable when fences are placed within 50 feet (15.2 m) from the edge of the nearest driving lane.

C. Fence Fabric. Place chain link fabric for 6 and 8-foot (1.8 and 2.4 m) fence on tangents, on the post face away from the highway. On 3, 4, and 5-foot (0.9, 1.2, and 1.5 m) fence,

place the fabric as directed. On curves, place the fabric for all fence heights on the outside face of the posts on curves.

Place the chain link fabric on a straight grade between posts, leveling high points on the ground. Obtain the Project Manager's approval to fill in depressions along the fence line.

Stretch taut and securely fasten the fabric to the posts. Stretching by motor vehicle is prohibited. Use stretcher bars and fabric bands spaced at 1-foot intervals (305 mm) to fasten to end, gate, corner, and pull posts. Cut the fabric and attach each span independently at all pull and corner posts. Fasten fabric to line posts at 14-inch (355 mm) intervals with tie wire, metal bands, or other approved fasteners. Fasten the top edge of the fabric to the top rail or cable with tie wires spaced at 18-inch (455 mm) intervals.

Join rolls of wire fabric by weaving a single strand into the ends of the rolls forming a continuous mesh.

When a winged cattle guard is located in a chain link fence, extend the wire fabric beyond the post supporting the wing and securely fasten it to the wing.

D. **Tension Wire.** Attach a tension wire to the bottom of the chain link fabric using ring fasteners at 24-inch (610 mm) maximum intervals and secure at the terminal posts or pull posts using brace bands.

E. **Gates.** Fasten chain link fabric to the gate frame end bars using stretcher bars and fabric bands, and to the top and bottom of gate frame bars using tie wires for the chain link fence, or by other approved standard methods.

Clean welded connections on steel gate frames with burned spelter coating by wire brushing, to remove all traces of the welding flux and loose or cracked spelter. Paint the cleaned areas with two coats of zinc oxide-zinc dust paint mixed in a weight ratio of one part zinc oxide to four parts zinc dust.

Provide the drop-bar locking device for double metal gates with a 12 x 15-inch square (305 x 380 mm) deep Class General concrete footing crowned at the top. Provide a minimum 6-inch (150 mm) hole in the footing to receive the locking bar.

F. **Panels.** Install panels as shown in the Detailed Drawings.

Double panels at fence corners and angle points consist of one corner post, two line posts, two braces, two truss rods, two top rails, concrete, and other fixtures. Single panels at gates and fence ends consist of one gate or end post, one line post, one brace, one truss rod, one top rail, concrete, and associated fixtures.

607.03.4 Constructing Barbed and Woven Wire Fence

Construct barbed, smooth and woven wire fences meeting the contract requirements and the following:

A. **Posts and Braces.** Excavate post holes, footing excavations, and anchors as shown in the Detailed Drawings.

Wood posts may be driven. Repair or replace all damaged posts at Contractor expense.

Treat cut or trimmed areas on posts and braces with 3 applications of a copper naphthenate solution containing a minimum of 2% copper metal or with chromated copper arsenate (CCA) in accordance with AWPA M4.

Securely nail braces to terminal and brace posts.

Metal posts not specified to be set in concrete may be driven. Place and grout metal posts placed in rock as specified.

Backfill and compact post hole material in 6-inch (150 mm) loose lifts.

Dampen holes before placing concrete. Ensure the concrete has set before placing and stretching the fence wire or attaching gates to the posts and braces.

B. **Placing Wire.** After the posts, braces, and footings are set, place the woven wire and/or barbed wire, stretch it tightly, and fasten to the posts.

Apply tension following the wire manufacturer's recommendations with a mechanical or other approved wire stretcher. Do not use motor vehicles to stretch fence.

Diagonally drive U-shaped staples across the wood grain so both points enter different grains. Where wire uplift occurs, drive staples with the points slightly upward. On level ground and over knolls, drive staples slightly downward. Staple the wire tightly at corner, end, and pull posts. The staples on line posts must allow wire movement without damaging the wire.

Place deadman as shown in the Detailed Drawings at grade depressions, alignment angles, and other places where stresses might pull posts from the ground or out of alignment.

Install one metal line post in each 500-foot (150 m) wood post fence run and in smaller runs between gate post ends for lightening protection.

Construct gates as shown in the Detailed Drawings and in accordance with Subsection 712.02.

C. **Fence Panels.** Install panels as shown in Detailed Drawings.

607.03.5 Temporary Fence

Erect temporary fence to keep livestock and traffic out of the work area. Temporary fence may remain in place only during the work or until the fence is directed to be removed.

Use Type F3M as temporary fence for livestock enclosures. Construct all temporary fence from metal posts and materials in accordance with Section 712. Use the minimum number of braces, panels, deadmen, and other accessories for constructing temporary fence.

Undamaged material used in the temporary fence that meets specifications may be used in the permanent fence. Material not used in permanent fencing remains the Contractor's property.

Remove temporary fence at Contractor expense.

607.03.6 Remove and Reset Fence

When removing and resetting a fence, furnish all required materials over and above the usable salvaged fence that are new materials in accordance with Section 712. Required new materials are listed in the contract. Use, to the extent practical, materials of the same type and quality as those of the old fence that meet of Section 712 requirements.

Replace rotten, damaged, or broken posts and rusty, unusable wire with new material. Do not use any galvanized materials with abraded or broken coating.

Furnish all additional fence wire required for depressions.

Carefully handle and stockpile, at designated locations, all removed fence determined to be salvageable.

607.04 METHOD OF MEASUREMENT

607.04.1 New Fence

New fence is measured by the foot (m). The measurements are made on the fence line along the top wire or rail or along a line parallel thereto, from end post to end post including wing fences to structures. Gates, cattle guards, or other openings are measured separately. Double sections of fence erected across depressions are measured for payment. All other temporary closures are included in the measurement of temporary fence. Temporary fence materials ordered by the Contractor but not used in the work will not be measured or paid for. Temporary fence removal is not measured separately.

607.04.2 Remove and Reset Fence

Remove and reset fence is measured by the foot (m). Measurement of reset fence in place is made in accordance with Subsection 607.04.1.

New posts and wire required to reset the removed fence is measured as follows:

1. Wood and metal posts are measured by the unit;
2. Barbed wire is measured by the foot (m); and
3. Woven wire is measured by the foot (m).

The post and wire quantity specified in the contract is an estimate only. The actual quantity required to complete the work will be paid for at the contract unit price.

Panels required for remove and reset fence are not measured for payment.

607.04.3 Gates

Gates are measured by the foot (m) from center to center of adjacent fence posts.

607.04.4 Fence Panels

Single and double fence panels are measured by the unit. Where R/W monuments are set, the construction of the corner gap as shown in the Detailed Drawings is not measured for payment. Include the cost of this construction in the adjacent panel(s).

607.04.5 Deadman

Deadman are measured by the unit. Anchors are not measured for payment.

607.04.6 Dozer Operation

Dozer operation is measured by the hour in accordance with Subsection 210.04.1. When dozer operation is not a bid item, it is incidental to and included in other fencing items.

607.04.7 Remove Fence

A. **Replaced with New Fence.** When the removed fence is being replaced with new fence, the existing fence removal is not measured for payment.
B. **Without New Fence.** Remove fence is measured by the foot (m) in place before removal along the top wire, or on a line parallel thereto, exclusive of gates, cattle guards, and other openings.
C. **Postholes.** Backfill and compact the postholes left from post removal using clean material or crushed base. Do not cut off and leave existing posts in place.

607.04.8 Fence Preparation

Fence preparation is not measured for payment but is incidental to the fencing items.

607.05 BASIS OF PAYMENT

Payment for the completed and accepted quantities is made under the following:

Pay Item	Pay Unit
Deadman	Each
Dozer Operation	Hour (see Subsection 210.05)
Fence Panels	Each
Gates	Foot (m)
New Fence	Foot (m)
New Wood or Metal Posts	Each
Remove and Reset Fence	Foot (m)
Remove Fence	Foot (m)

When the removed fence is being replaced with new fence, the cost of removing existing fence is included in the contract unit price per foot (m) of new fence.

Fence preparation is not paid for but is included in the contract unit price of the fencing items.

Payment at the contract unit price is full compensation for all resources necessary to complete the item of work in accordance with the contract.

SECTION 712
FENCING MATERIALS

712.01 CHAIN LINK FENCE

712.01.1 General

Meet AASHTO M 181 requirements, as modified herein. Use one of the following fence fabrics, as specified in the contract:

- Type 1 Class C zinc-coated steel
- Type 2 aluminum-coated steel
- Type 3 aluminum alloy

Zinc-5% aluminum-mischmetal alloy in accordance with ASTM B750 may be substituted for zinc coating (hot-dipped) at a Class 2, or 1.0 oz/ft^2 (305 g/m^2), coating thickness as specified by ASTM F1345.

Use zinc-coated steel for all Type 1 and Type 2 fabric fence parts; including posts, rails, gate frames, expansion sleeves, wire ties, fabric ties, hog rings, tension wire, miscellaneous fittings, and hardware. Use aluminum alloy for these same Type 3 fabric fence parts. Use either zinc-coated steel or aluminum alloy for these Type 4 fabric fence parts.

712.01.2 Fence Fabric

Furnish fence fabric having 2-inch (50 mm) openings and in accordance with AASHTO M 181. Use 11-gauge wire for fabric 48 inches (1,220 mm) high and under. Use 9-gauge wire for fabric 60 inches (1,525 mm) high and over. The fabric height is specified in the contract.

712.01.3 Posts, Rails, and Braces

Meet ASTM F1043 and the contract length requirements. Furnish all posts with a watertight cap that fits securely over the outside post top and supports the top rail.

712.01.4 Truss Rods

Furnish ⅜-inch (9.5 mm) truss rods as follows:

- Steel - galvanized with dropforged turnbuckles or other approved type of adjustment.
- Aluminum - with cast aluminum turnbuckles or other approved type of adjustment.

712.01.5 Fabric Bands and Stretcher Bars

Furnish bands as follows:

- Steel - a minimum ⅛-inch (3 mm) thick x 1-inch (25 mm) wide.
- Aluminum - a minimum ⅛-inch (3 mm) thick x ⅞-inch (22 mm) wide.

Furnish aluminum or steel stretcher bars as follows:

- A minimum ¼-inch (3 mm) thick x ¾-inch (19 mm) wide.
- At least 2 inches (50 mm) shorter than the fabric width used.

712.01.6 Tie Wire

Furnish 9-gauge galvanized steel tie wire in accordance with AASHTO M 279. Furnish 11-gauge; Class 1 galvanized steel hog ring fasteners in accordance with AASHTO M 279.

Furnish 9-gauge aluminum tie wire in accordance with ASTM B211 Alloy 1100, Temper H14. Furnish minimum 11-gauge aluminum hog ring fasteners in accordance with ASTM B211, Alloy 6061.

712.01.7 Tension Wire

Furnish 7-gauge galvanized coiled spring steel tension wire. Meet AASHTO M 279, Class 1 galvanizing requirements.

Furnish 6-gauge aluminum tension wire in accordance with ASTM B211, Alloy 6061, Temper T 94.

712.01.8 Gates

Furnish gates complete with all necessary hinges, latch, and drop-bar locking device for the type of gate and gateposts specified. Weld in accordance with Section 624.

A. **Steel Gates.** Construct gate frames from steel sections in accordance with ASTM F900. The gate frame corners may be welded or fastened and reinforced with galvanized malleable-iron fittings designed for this use.

Use chain link fabric for gate frames in accordance with Subsection 712.01.2 and match the fabric used in the fence.

B. **Aluminum Gates.** Construct gate frames from aluminum sections in accordance with ASTM F900. Assemble the gates frames by welding.

Use aluminum alloy cast hinges in accordance with ASTM B108 or B26 or made of malleable iron or steel and hot-dip galvanized or mechanically galvanized in accordance with ASTM B695 (Class 50). Make all latches, stops, and keepers of the aluminum alloy specified for hinges or use galvanized malleable iron or pressed steel.

Use chain link fabric for the gate frame in accordance with Subsection 712.01.2 and matching the fabric used in the fence.

712.02 WIRE FENCE

712.02.1 Woven Wire

Furnish woven wire in accordance with AASHTO M 279 and either of Table 712-1 designations.

TABLE 712-1
WOVEN WIRE REQUIREMENTS

Specification	Grade	Design Number	Metallic Coating
AASHTO M 279	No. 12½ Grade 60	832-6-12 ½*	Type Z, Class 1 or Type ZA, Class 20
AASHTO M 279	No. 14 Grade 125	832-6-14*	Type Z, Class 3 or Type ZA, Class 40

*For use with Type C fence.

Provide a 6-inch (150 mm) stay spacing. Match the fence height and mesh dimensions of the fence being replaced if not specified.

712.02.2 Barbed Wire

Use 2-point 12½ or 13½-gauge barbed wire in accordance with AASHTO M 280. Space barbs at a 4-inch nominal (100 mm) or a 5-inch nominal (130 mm) spacing. Provide the Project Manager certification that the wire is in accordance with AASHTO M 280.

712.02.3 Brace Wire

Use 9 or 12½-gauge soft, smooth wire.

712.02.4 Staples and Nails

Use minimum 9-gauge U-shaped, 1¾-inch (45 mm) long staples unless otherwise specified in the contract.

712.02.5 Tie Wires

Use minimum 12½-gauge galvanized tie wire. Commercial galvanized fasteners supplied with the wire may be used if approved by the Project Manager.

712.02.6 Metal Fence Stays

Use commercially made and fabricated metal fence stays from 9½-gauge wire twisted to form a two-wire unit.

712.02.7 Metal Posts and Assemblies

Provide metal fence posts and assemblies in accordance with AASHTO M 281, modified as follows:

- Section 7 and Tables 3 and 4 of AASHTO M 281 apply to finished posts and assemblies after fabrication, punching, drilling, and finish coating.

Galvanize or paint posts, braces, and anchor plates. Meet AASHTO M 111 galvanizing requirements. Furnish nuts, bolts, fittings, and other hardware in accordance with ASTM A153 or B695 (Class 50) galvanizing. Paint following the paint manufacturer's recommendations.

Furnish fence posts and braces of the lengths shown in Table 712-2.

TABLE 712-2
POST LENGTHS

Post Type	Braces, Brace Rails And Panel Posts	Line Posts
Metal	--	6 feet - 6 inch (2.0 m)
Wood	8 feet (2.4 m)	7 feet (2.1 m)

Use Tee, Channel, U, or Y bar section line posts with corrugations, knobs, notches, holes, or studs placed to engage the fence line wires.

Attach a steel anchor plate to each line post so that the anchor top is 2 to 3 inches (50 to 75 mm) below ground line when the post is set to the specified depth.

712.02.8 Wood Fence Posts and Brace Rails

A. General. Make fence posts and brace rails from well-seasoned, sound, and straight-grained western larch, lodgepole pine, ponderosa pine, southern yellow pine, or douglas fir. Remove all bark from the posts.

Taper round posts, to be driven, from 6 to 12 inches (150 to 305 mm) up from the bottom to a 1 ± ½-inch (25 ± 12 mm) point. Bevel the edges of post tops to produce a flat surface with a diameter 1 ± ½-inch (25 ± 12 mm) less than post diameter. These taper lengths are included in the specified post lengths. Perform all machining before treatment.

Furnish posts and rails 10 feet (3 m) in length or less free of crooks and sweeps greater than ¾-inch (19 mm) from the post centerline. The maximum offset from centerline for posts and rails longer than 10 feet (3 m) is ¾ plus 1/16-inch (19 plus 2 mm) per additional foot (305 mm) of length. The centerline is defined as a straight line from the center of the tip to the center of the butt.

Treat round posts and rails meeting AWPA Standards for Commodity Specification B and Use Category 4A. Supply round posts and rails meeting the AWPA minimum penetration requirements specified for natural posts, with a penetration of at least ⅜-inch (9 mm). Posts and rails must have sufficient sapwood to provide the ⅜-inch (9 mm) minimum penetration. Treat the S4S post in accordance with Subsection 706.04.

Treat injuries, cuts, and holes in timber pile after treatment in accordance with Subsection 706.04.

B. Line Posts. Furnish line posts and brace rails from a minimum 4-inch (100 mm) diameter round, or a minimum 4 x 4-inch (100 x 100 mm) square sawn. Furnish corner, end, gate,

and pull posts from a minimum 5-inch (130 mm) diameter round post or a 5 x 5-inch (130 x 130 mm) square sawn post.

712.02.9 Metal Gates

Furnish each gate complete with hinges, latch, and all other hardware used with the type of gate and gate post specified.

712.02.10 Gates for Interstate Fence

Use plain-top single-drive metal gates of tubular steel frame with wire fabric filler. Fit the gate to the opening between the gate posts of the approximate widths shown in the Detailed Drawings. Provide a centered steel upright brace for gates for openings of less than 14 feet (4.3 m), two upright steel braces at third points for gates for openings of 14 feet (4.3 m) or greater.

Fill the metal gates with galvanized wire fabric securely fastened to the top, bottom, ends of the gate frame.

Use fabric in accordance with Subsection 712.02.1, Class 1 or better.

The approximate weight of the gate frames (less fabric) must meet Table 712-3 requirements.

TABLE 712-3
APPROXIMATE GATE FRAME WEIGHTS

Width of Opening	Approximate Wt[1]
8 feet (2.4 m)	48 pounds (22 kg)
10 feet (3.0 m)	55 pounds (25 kg)
12 feet (3.7 m)	62 pounds (28 kg)
14 feet (4.3 m)	72 pounds (33 kg)
16 feet (4.9 m)	80 pounds (36 kg)

Notes:

1. Heavier gates will be permitted if they meet all other requirements.

712.02.11 Gates for Farm Fence

Furnish farm fence gates in accordance with the Detailed Drawings and contract.

712.02.12 Deadman or Anchor

Furnish deadman and anchor(s) in accordance with the Detailed Drawing.

712.02.13 Miscellaneous

Bolts, nuts, fittings, hinges, and all other metal parts for constructing fences and gates must be galvanized in accordance with ASTM specifications.

SECTION 713
MISCELLANEOUS MATERIALS

713.01 WATER

Furnish water for mixing and curing concrete in accordance with AASHTO M 157, 4.1.4. Water will be tested in accordance with AASHTO T 26. Known potable water may be used without testing.

Use irrigation quality water for irrigating trees, plants, and seeded areas, free of elements harmful to plant growth.

713.02 HYDRATED LIME

Furnish hydrated lime in accordance with AASHTO M 303.

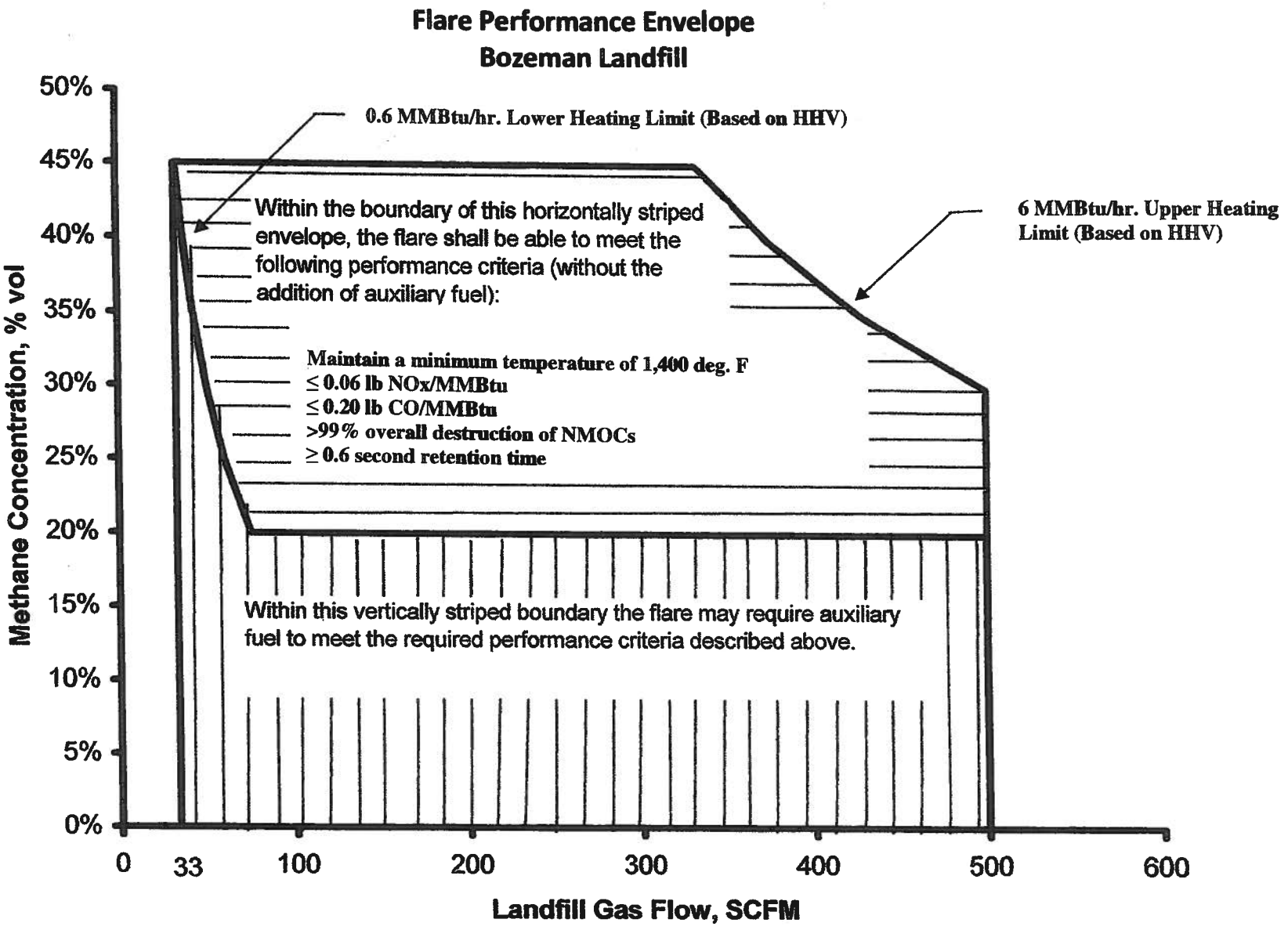
713.03 CHLORIDES

A. Magnesium Chloride. Furnish liquid magnesium chloride in accordance with Table 713-1. Products will be tested as received in accordance with MT 532.

TABLE 713-1
LIQUID MAGNESIUM CHLORIDE REQUIREMENTS

	Requirement
Alkali chlorides	≤5.0% by mass NaCl
Arsenic	≤5.0 mg/Kg
Assay	≥28.5% MgCl2 by mass
Barium	≤100.0 mg/Kg
Cadmium	≤0.2 mg/Kg
Chromium	≤1.0mg/Kg
Copper	≤1.0 mg/Kg
Cyanide	≤0.20 mg/Kg
Lead	≤1.0 mg/Kg
Magnesium hydroxide	≤0.2% by mass Mg(OH)2
Mercury	≤0.05 mg/Kg
Phosphorous	≤2500.0 mg/Kg
Selenium	≤5.0 mg/Kg
Settleable solids	≤1.0%
Sulfate	≤3.0% by mass SO4
Zinc	≤10.00 mg/Kg

APPENDIX B
FLARE PERFORMANCE ENVELOPE


Flare Performance Envelope
Bozeman Landfill
0.6 MMBtu/hr. Lower Heating Limit (Based on HHV)
6 MMBtu/hr. Upper Heating Limit (Based on HHV)
Within the boundary of this horizontally striped envelope, the flare shall be able to meet the following performance criteria (without the addition of auxiliary fuel):
Maintain a minimum temperature of 1,400 deg. F
≤ 0.06 lb NOx/MMBtu
≤ 0.20 lb CO/MMBtu
>99% overall destruction of NMOCs
≥ 0.6 second retention time
Within this vertically striped boundary the flare may require auxiliary fuel to meet the required performance criteria described above.
Methane Concentration, % vol
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
0
33
100
200
300
400
500
600
Landfill Gas Flow, SCFM

APPENDIX C – ELECTRICAL

DIVISION 16 - ELECTRICAL

SECTION 16000 -- ELECTRICAL SPECIFICATION INDEX

SECTION 16010

GENERAL ELECTRICAL REQUIREMENTS

PART I - GENERAL

1.1. SCOPE
- A. This section applies to all Division 16 and is part of all other Division 16 sections.
- B. The provisions, terms, and requirements of the General Division, Division 1, Applicable Drawings and Technical Specifications herein apply to all work under this Division.
- C. Refer to other sections of these specifications for additional requirements.

1.2 WORK INCLUDED
- A. The contractor shall provide all labor, materials, equipment, items, articles, operations, methods and skilled supervision as listed, shown, scheduled or mentioned on the drawings or in this specification.
- B. The contractor shall provide all incidental items and labor required by good practice to provide the complete systems described.
- C. All work shown on Division 16 drawings is the responsibility of Division 16 contractor unless specifically noted otherwise.
- D. The contractor shall perform all set-up, adjusting, programming and testing required to ensure a complete and working electrical system.

1.3 ALTERNATES
- A. Make allowance for any changes required in the scope of work due to the affect of alternates and assign any difference in price to each respective alternate.
- B. See the General Specifications for a Schedule of Alternates.

1.4 SPECIFICATION TERMINOLOGY
- A. Streamlining: The specifications are of the abbreviated or "streamlined" type and include incomplete sentences. Omissions of words or phrases such as "the Contractor shall," "in conformity with," "shall be," "as noted on the drawings," "according to the plans," "an," "the," and "all" are intentional. Omitted words or phrases shall be supplied by inference in the same manner as they are when a "note" appears on the drawings.
- B. "Provide" means furnish all products, labor, sub-contracts, and appurtenances required, to install a complete and properly operating, finished condition.
- C. "Furnish" means to purchase material as shown and specified, and cart the material to an approved location at the site or elsewhere as noted or agreed, to be installed.
- D. "Install" means to set in place and connect, ready for use and in complete and properly operating finished condition, material that has been furnished.
- E. "Rough-in" means provide a conduit raceway system with junction boxes, fittings, straps, etc., for future installation of wiring, devices, disconnects and breakers. Provision shall be made in panelboard for future installation of breakers.
- F. "Accessible" means arranged so that an appropriately dressed man, 6'-2" tall, weighing 250 pounds, may approach the area in question with the tools and products necessary for the work intended, and may then position himself to properly and safely perform the task to be accomplished, without disassembly or damage to the surrounding installation.
- G. "Serviceable" means arranged so that the component or product in question may be properly removed and replaced without disassembly, destruction or damage to the surrounding installation.
- H. "Product" is a generic term which includes materials, equipment, fixtures and any physical item used on the project.
- I. The terms "the Contractor" or "this Contractor," when used in this section of the specifications, shall be construed to mean the contractor for electrical work.
- J. The words "equivalent" or "equal" where used in this specification shall mean a product of like type and function that complies with all applicable provisions of the drawings and specifications and which has been approved as a substitute for the specified item in the

manner prescribed in these specifications.

1.5 INTENT OF SPECIFICATIONS AND DRAWINGS

A. It is the intent of these plans and specifications to result in a complete electrical installation in complete accordance with all applicable codes and ordinances.

B. The drawings and specifications are intended to supplement each other and any details contained in one and not the other shall be included as if contained in both. Items not specifically mentioned in the specifications or noted on the drawings, but which are necessary to make a complete working installation shall be included

C. The Electrical Drawings shall serve as the working drawings, but the Architectural Drawings shall take precedence over the Electrical Drawings, if any dimensional discrepancies exist. This Contractor shall review the plans for the work of the other trades and shall adjust his work to conform to all conditions indicated thereon.

D. Work under this section has been indicated on the drawings in locations which should allow installation without interfering with the work of other trades; however, exact finish locations cannot be indicated. Therefore, locations of all work and equipment shall be verified to avoid interferences, preserve head room and keep openings and passageways clear. Changes shall be made in location of equipment and materials which may be required to accomplish these purposes without additional claims or charges by the Contractor.

E. The drawings are partly diagrammatic and do not show precise routing of conduits or exact location of all products, and may not show in minute detail all features of the installation. Locations of devices, fixtures and equipment are approximate unless dimensioned.

F. Riser diagrams and control schematics are not to scale and do not necessarily show the physical arrangement of the equipment. Do not use riser diagrams or schematics to obtain lineal conduit and cabling distances.

G. In the event that any discrepancies of any kind exist or required items or details have been omitted, the Contractor shall notify the Architect in writing of such discrepancy or omission at least ten days prior to bid date. Failure to do so shall be construed as the willingness of this Contractor to supply all necessary materials and labor required for the proper completion of this work.

1.6 AS-BUILT DRAWINGS

A. See requirements regarding Record Drawings stated elsewhere in these specifications.

B. At the beginning of the work, the Contractor shall set aside one complete set of the drawings which shall be maintained as a complete "As-Built" set. Notations shall be done in a neat and legible manner in accordance with Architect's instructions.

C. Show the dimensioned location and routing of all electrical work which will become permanently concealed. Show routing and location of items cast in concrete or buried underground. Show routing of work in permanently concealed blind spaces within the building. Show complete routing and sizing of any significant revisions to the systems shown.

D. Provisions for future connection shall be shown on the "As-Built" drawings and shall be referenced to the building lines or approved bench marks.

E. The "As-Built" drawings shall be updated daily by the foreman to show every change from the original drawings and the exact locations, sizes and kinds of equipment. This set of drawings shall not be used for any other purpose and shall be maintained at the job site and available for review at any time.

F. Provide three copies of wiring diagrams for all individual special systems as installed. Identify all components and show all wire and terminal numbers and connections.

G. At completion of project, deliver these drawings to the Owner and obtain written receipt.

1.7 CODES, STANDARDS AND REGULATIONS

A. Codes: Perform all work in strict accordance with all applicable national, state and local codes; including, but not limited to the latest legally enacted editions of the following specifically noted requirements:

1. NFPA 70, National Electric Code - NEC
2. NFPA 72, National Fire Alarm Code
3. ANSI-C2, National Electrical Safety Code - NESC

4. Uniform Building Code - UBC
5. Uniform Fire Code - UFC

B. Standards: Reference to the following standards infers that installation, equipment and material shall be within the limits for which it was designed, tested and approved, in conformance with the current publications and standards of the following organizations:
1. American National Standards Institute - ANSI
2. American Society for Testing and Materials - ASTM
3. American Society of Heating Refrigerating and Air Conditioning Engineers ASHRAE (Standard 90-75)
4. Institute of Electrical and Electronics Engineers - IEEE
5. Insulated Cable Engineers Association - ICEA
6. National Electrical Contractors Association - NECA
7. National Electrical Manufacturers' Association - NEMA
8. National Fire Protection Association - NFPA
9. Underwriters' Laboratories, Inc. - UL

C. Regulations: Design has been performed in accordance with applicable regulations and guidelines noted below. The Contractor shall carefully apply these regulations and bring any discrepancies to the immediate attention of the Architect/Engineer.
1. Americans with Disabilities Act - ADA

1.8 PERMITS AND INSPECTIONS

A. The Division 16 Contractor shall pay for all permits or fees in connection with the work. Fees shall include any or all user fees, government fees, system development fees, connection fees or other fees that are required to be paid before the systems can be connected or used.

B. Schedule all required electrical inspections with local electrical inspector. Notify engineer of all items of discrepancy brought to the attention of the contractor by the electrical inspector if those items affect the cost or function of the system, or if they conflict with the electrical drawings and specifications.

C. Deliver all inspection certificates to the Architect prior to final acceptance of the work.

1.9 RESPONSIBILITY

A. The Contractor shall be responsible for the installation of a complete and functional piece of work in accordance with the true intent of the drawings and specifications. He shall provide all incidental items required as part of his work for complete and satisfactory operation of equipment, whether or not specifically noted in contract documents.

1.10 CONTRACTOR'S QUALIFICATIONS

A. GENERAL
1. The Contractor shall employ in connection with construction of this project, capable, experienced and reliable foreman and such skilled workmen as may be required for the various classes of work to be performed.
2. Where special skills and certification are required, as for work listed in this section or elsewhere in this specification, the Contractor shall ensure that the work is performed by an individual or individuals with the required experience, skill and certification.
3. If, in the opinion of the Engineer, the Contractor's employees do not possess the necessary qualifications to perform the specific specialty work, the Contractor will be required to obtain the services of workmen who are certified and approved by the manufacturer. These workmen, if required, shall be provided at no additional expense to the Owner.

1.11 GUARANTEE - WARRANTY

A. The Contractor shall and hereby does warrant and guarantee:
4. That all work executed under this Contract shall be free from defects in materials and workmanship for a period of one year from the date of substantial completion of this work, except where longer periods are specifically called for.
5. The Contractor further agrees that he will, at his own expense, repair and replace all such defective materials and all other material damaged thereby, which becomes defective during the term of warranty.

B. All warranty periods shall run from the date of substantial completion. Unless specifically noted otherwise.

PART II - PRODUCTS

2.1 GENERAL

A. Materials used under this Contract, unless specifically noted otherwise, shall be new, shall be of the best quality of their respective kind and shall conform to the latest Standard Specifications of the American Society for Testing Materials, National Electrical Manufacturers' Association, National Board of Fire Underwriters or other appropriate agency. Standard items shall bear the stamp indicating listing by Underwriter's Laboratories, Inc. when such listing is available. Custom-designed items shall be fabricated of UL approved materials.

B. Throughout these specifications various materials, equipment, apparatus, etc., are specified by manufacturer, brand name, type or catalog number. Such designations are to establish standards of desired quality and construction and shall be the basis of the bid.

C. Manufacturer's Directions

1. All equipment and material shall be applied, installed, connected, erected, used, cleaned and conditioned in strict accordance with the manufacturer's recommendations.
2. Manufacturer's installation instructions shall supersede requirements of specs and plans when a conflict arises. This situation shall be brought to the attention of the Engineer.

2.2 OWNER FURNISHED EQUIPMENT AND MATERIALS:

A. The Contractor shall accept and become responsible for all owner furnished equipment and materials. Inspect all equipment and materials to determine suitability for installation. Immediately notify the Owner of any defects or deficiencies. Failure to so notify the Owner shall indicate that the Contractor warrants that all equipment and materials are of the proper quantity, design and are free from all defects.

2.3 SUBSTITUTION OF MATERIALS

A. APPROVED MANUFACTURERS

1. In Equipment and Fixture Schedules on the contract drawings and in other sections of this specification the following verbiage many be found: "Products of equivalent or greater quality and performance characteristics manufactured by "X", "Y", or "Z" may be substituted without prior approval. Where this verbiage is found, it is the Contractor's responsibility to ensure that the item by the particular manufacturer "Y" which is used for bidding purposes is truly equivalent to that specified. If it is not equivalent, it will be rejected at the shop drawing stage and the contractor shall supply the specified item at his own cost.
2. Where the above mentioned statement is made, it is understood that the manufacturers listed may not actually have an equivalent product to that specified. If the contractor/distributor has any questions regarding the desired product characteristics and the suitability of the proposed substitution, he is encouraged to submit for prior approval.

B. PRIOR APPROVALS

1. Where the above mentioned verbiage is not employed, the equipment and materials that are specifically identified by manufacturer's name, model or catalog number are open for substitution prior to bid opening only. Manufacturers desiring approval shall submit catalog cuts which define quality of product and ability to perform as specified. Submittals shall arrive at the Engineer at least ten (10) days prior to bid opening. All approvals will be listed in the last addendum as being approved to bid. Items substituted but not listed in spec or as a prior approved item will not be considered if submitted on shop drawings.
2. Where substituted equipment requires, structural, architectural, mechanical, plumbing or electrical work that differs from the basic design, the cost of all changes,

including re-design, shall be the responsibility of the contractor using the substitution.

3. Approval of substitute equipment is on the basis of quality only. Materials supplier shall be responsible for his quotation reflecting proper selection of his particular equipment in conformance with the plans and specifications with regard to proper capacities, physical dimensions, requirements and intended function. Engineer will not give approval to specific model numbers or check capacities, dimensions, or requirements. Evaluation will be on the basis of quality and equality to specified items.

2.4 PRODUCT AND SYSTEM SUBMITTALS

A. See General Conditions, "Submittal of Information."

B. Provide six (6) sets submittal packages for the products and systems described in Schedule of Submittals to demonstrate compliance with the requirements of the project.

C. Shop drawings shall be for the actual equipment and hardware which will be installed on this project. Submittals which include more than one manufacturer or part number for a specified item will be rejected.

D. SCHEDULE OF SUBMITTALS

SECTION - ITEM	A	B	C	D	E	F	G	H	I	J
16110 - Conduit & Fittings		B								
16120 - Wire and Cable		B								
16130 - Enclosures		B								
16420 – Service Entrances			C			F		H	I	J
16440 – Disconnect Switches						F		H		
16450 - Grounding Devices		B						H	I	
16460 - Transformers						F		H	I	J
16470 - Panelboards						F		H	I	J
16475 - Overcurrent Protective Devices						F		H		J

A - **Prior Approvals** Provide under timetable and conditions listed above.

B - **Certificate of Compliance** Provide under timetable listed below for shop drawings.

C - **Installer's Qualifications** Provide under time-table listed below for shop drawings.

D - **Color Selection** Provide under timetable listed below for shop drawings.

E - **Production Model Samples** Provide under timetable listed below for shop drawings. (Contact Engineer for specific items requiring samples).

F - **Shop Drawings** Provide under timetable listed below.

G - **Wiring Diagrams** Provide under timetable listed below for shop drawings.

H - **Manufacturer's Recommendations for Installation, Setup and Use** Provide under timetable listed below for shop drawings.

I - **Test Reports** Provide as required elsewhere in this specification.

J - **Operation and Maintenance Instructions** Provide as part of the Brochure of Equipment.

Note that information in columns F, G, H, I & J shall be included in Brochure of Equipment.

E. Submit shop drawings not later than 30 days after award of contract or, in any case, to allow sufficient time for review without delaying construction. Furnish equipment submittals in the manner described elsewhere in these specifications. In addition, include data for review, and organize data, as noted below:

1. Specification reference and/or drawing reference for which literature is submitted for review with an index, following specification format, and item by item identification.

2. Manufacturer's name and address, and supplier's name, address and phone number.
3. Catalog designation or model number.
4. Rough-in data and dimensions.
5. Operation characteristics.
6. Complete customized listing of characteristics required. Indicate whether item is "As Specified" or "Proposed Substitution." Indicate any deviations on submittal. Mark out all non-applicable items. The terminology "As Specified" used without this customized listing is not acceptable.
7. Wiring diagrams for the specific system.
8. Working construction drawings (shop drawings).
9. Color charts for selection of standard factory finishes, or special finishes as indicated for each item.

F. Submittal Data: Prior to the submission of the required shop drawings, hold a meeting with all the trades and check the shop drawings for discrepancies, dimensional errors, omissions, contradictions and departures from the contract requirements. The shop drawings shall then be corrected and submitted with appropriate notes. Submittal of shop drawings which affect other trades indicates that coordination has been done and that all parties are in agreement as to who provides, installs and connects the various hardware and equipment.

G. All submittals shall be accompanied by a transmittal letter indicating date, project name, contractor's name and address, product description/type, and deviations from contract documents if any.

H. The Contractor shall approve and sign all shop drawings prior to submitting same for review. Drawings received without the Contractor's note of approval will be subject to return without review. This required approval is in addition to any notation the general contractor may apply to the shop drawings.

I. With prior permission from the Engineer, partial submittals will be considered for review provided that they are complete sections, as listed below:
1. Section 16100 equipment
2. Section 16400 equipment

J. Mark submittal literature and shop drawings clearly and bind 8½" x 11" literature in three-hole loose-leaf binders by individual sets.

K. Shop drawings on substituted equipment shall include required project drawings and engineering changes that are necessary to implement installation of the substituted equipment.

L. Submittal review is for general design and arrangement only and does not relieve the Contractor from any of the requirements of the Contract Documents. Submittals will not be checked for quantity, dimension, fit or proper technical design of manufactured equipment. Where deviations of substitute product or system performance have not been specifically noted in the submittal by the Contractor, provision of a complete and satisfactory working installation of equal quality to system specified is the responsibility of the Contractor.

M. Submittals which are not in strict compliance with these standards will be rejected.

2.5 BROCHURE OF EQUIPMENT

A. Upon completion of Contract, the Contractor shall prepare two (2) copies of a "Brochure of Equipment" containing data pertinent to equipment and systems on the job. Binders containing material shall be of the three ring binder type of sufficient number to hold all literature.

B. Provide a separate chapter for each section of the electrical specifications with sub-chapters for each class of equipment or system. Provide a table of contents for each chapter, and each major item in each chapter, to indicate the page number of each. Label all pages to assure correct placement in manual. Identify each piece of equipment with its associated specification description.

C. Maintenance Instructions:
1. Provide complete information for preventive maintenance for each product, including recommended frequency of performance for each preventive maintenance task.

2. Provide instructions for minor repair or adjustments required for preventive maintenance routines, limited to repairs and adjustments which may be performed without special tools or test equipment and which require no extensive special training or skills.
3. Provide all information of a maintenance nature covering warranty items, etc., which have not been discussed in the manufacturers literature or the operating sequence narrative.
4. Provide complete information data for all the spare and replacement parts for each product and system. Properly identify each part by part number and manufacturer.

D. Manufacturers' Brochures: Include manufacturers' descriptive literature covering all products used in each system, together with illustrations, exploded views and renewal parts lists. Highlight all applicable items and instructions, or mark-out non-applicable items.

E. Shop Drawings: Provide a copy of all corrected, approved shop drawings for the project either with the manufacturers' brochures or properly identified in a separate subsection.

F. A training manual shall be provided and shall include control system as well as field device specification sheets, system schematics, operation and installation instructions and applicable service bulletins.

G. Provide a typewritten list in the front of the brochure listing suppliers with their address and phone number for all pieces of equipment.

H. Submit one copy of the brochure to the Engineer for approval prior to preparation of final copies. The final copies shall incorporate any changes or additions deemed necessary by the Engineer and shall bear his stamp of approval. After approval, the final two copies of the brochure shall be turned over to the Owner. This shall take place prior to authorization of final payment.

PART III - EXECUTION

3.1 SITE EXAMINATION

A. Prior to submitting a bid, the Contractor shall visit the site of the proposed work and familiarize himself with the conditions affecting the work. Allowance shall be made in the bid for these conditions and no additional allowance shall be granted because of lack of knowledge of such conditions.

B. The Contractor shall verify all measurements at the building site.

C. Prime Electrical Contractors may be required to attend a pre-bid walk-through of the project in order to bid. See Advertisement for Bids.

3.2 COORDINATION

A. The Electrical Contractor shall consult <u>all</u> drawings for the project, shop drawings of other trades, and actual building dimensions, to predetermine that his work and equipment will fit as planned. Do not scale drawings for fabrication. No extra payment will be issued for materials or items which do not fit because of Contractor's failure to verify as-built building dimensions.

B. The Contractor shall check the location of fixtures, outlets, equipment, conduit, etc., to determine they clear all openings, structural members, piping, ducts and miscellaneous equipment having fixed locations.

C. If at any time, and in any case, changes in location of electrical work becomes necessary due to obstacles or installation of other trades shown on the drawings, such required changes shall be made by Electrical Contractor at no extra cost.

D. The Contractor shall coordinate with Plumbing and Mechanical Contractors to avoid installation of piping and ductwork above or below panelboards in violation of the National Electrical Code.

E. Lay out all the work in advance and avoid conflict with other work in progress. Physical dimensions shall be determined from architectural and structural plans. Verify locations for junction boxes, disconnect switches, stub-ups, etc., for connection to equipment furnished by others, or in other Divisions of this work.

F. The Electrical Contractor shall coordinate and plan his work to proceed with the work of other

trades.

G. This Contractor shall inform the General Contractor of all required openings in the building structure for installation of electrical equipment.

H. The Contractor shall check dimensions of all electrical equipment installed, provided by himself or by others, so correct clearances and connections can be made.

I. The Contractor shall be responsible for the correct size and locations of chases and openings whether provided by the General Contractor or himself.

J. The Contractor shall inform and coordinate with the General Contractor access doors through non-accessible floor, wall, and ceiling finishes to access all electrical junction and pull boxes, electrical devices, electrical equipment, etc. at all required locations whether shown or not shown on plans. The Contractor is responsible for determining the size and location of the doors. General Contractor shall supply and install doors in building elements. Report any conflicts to Architect/Engineer.

3.3 WORKMANSHIP

A. CUTTING & PATCHING

1. Obtain written permission of the Architect/Engineer before cutting or piercing structural members.

2. Sleeves through floors and walls shall be black iron pipe, flush with walls, ceilings or finished floors, sized to accommodate the raceway. Grout all penetrations through concrete walls or floors. Holes through existing concrete and concrete block (CMU) shall be core drilled.

3.4 TESTS AND INSPECTIONS

A. Operating Tests: At completion of work, or upon request from the Architect/Engineer, place the entire electrical installation, and/or any portion thereof, in operation to demonstrate satisfactory operation.

B. Prior to final test, all switches, panelboards, devices, and fixtures shall be in place.

C. Test all electrical systems. They shall be free from short circuits and unintentional grounds.

D. Make all changes necessary to balance the connected electrical loads on the complete system. Arrange for balanced conditions of circuits under connected load demands, as contemplated by the normal working conditions. Final load and balance test shall be demonstrated in the presence of the Architect/Engineer.

E. Deficiencies: Immediately correct all deficiencies which are evidenced during the tests and repeat tests until system is approved. Do not cover or conceal electrical installations until satisfactory tests are made and approved.

F. Furnish one (1) copy of certified test results to the Architect/Engineer prior to final inspection and include one (1) copy in the Brochure of Equipment.

3.5 CLEAN-UP AND COMMISSIONING

A. Throughout the work, the Contractor shall keep the work area reasonably neat and orderly by periodic clean-ups.

B. Upon completion of work, remove materials, scraps, etc., relative to this work and leave premises in clean and orderly condition. This includes all tunnels, attics, ceiling and crawl spaces.

C. Clean equipment of dirt and debris, including interior of panels, outlet boxes, etc. Remove labels from and clean all fixture lenses.

D. As independent parts of the installation are completed, they may be commissioned and utilized during construction.

3.6 PROJECT COMPLETION AND DEMONSTRATION

A. Tests: During final inspection, conduct operating tests for approval. Demonstrate installation to operate satisfactorily in accordance with requirements of Contract Documents. Should any portion of installation fail to meet requirements of Contract Documents, repair or replace items failing to meet requirements until items can be demonstrated to comply.

B. Have instruments available for measuring light intensities, voltage and current values and for the demonstration of continuity, grounds, or open circuit conditions.

C. Furnish personnel to assist in taking measurements and making tests. In the event that

systems are not complete and fully operational at the time of final inspection, all costs of any subsequent inspections shall be borne by the Contractor at no additional cost to the Owner.

3.7 OWNER ORIENTATION AND TRAINING

A. The Contractor shall instruct the Owner as to function, operation, maintenance and adjustment of each piece of equipment and system provided. The Contractor shall set aside one day for this instruction at which the Owner or Owner's representative (preferably the person who will be maintaining the particular system) shall be present. Provide written verification to the Architect/Engineer that instruction was given, listing who was present. Final payment will not be made until this is received.

B. The Contractor shall provide the Owner or Owner's representative with a copy of the "Brochure of Equipment" as called for in the specifications. This brochure shall be used during the instruction period to familiarize the Owner with the booklet.

End of Section

SECTION 16050

IDENTIFICATION

PART I - GENERAL

1.1 IDENTIFICATION

A. Equipment Labels and Nameplates:

1. Provide rigid engraved labels and nameplates of laminated plastic 1/16 inch thick with white letters on a black or gray background. Label emergency equipment red with white letters.
   a. Securely attach labels with two screws, minimum, per label. Adhesives or glue not acceptable.
   b. Temporary markings not permitted on equipment. Repaint trims, housings, etc., where markings cannot be readily removed. Refinish defaced finishes.
   c. No labeling abbreviations will be permitted without prior approval.
2. Label and Nameplate Locations:
   a. Provide ½" minimum height letters on following equipment:
      i. Service disconnect (red background).
      ii. Secondary feeder breakers in distribution equipment. Designation as required by load served.
      iii. Special equipment housed in cabinets, as designated on plans, on outside of door.
      iv. Panelboards, switchboards, motor control centers, as designated on plans, on outside of door.
   b. Provide ¼" minimum height letters on:
      i. Disconnects and starters for motors or fixed appliances.
      ii. Designated electrical equipment.
   c. Provide 1/8" minimum height, engraved device plates on switches and receptacles where item controlled is not visible from the switch, or as noted on drawings.
   d. Provide 1/8" minimum height letters on lighting control relays, dimmer controls and remote lighting control equipment.
3. Fuse labeling - Provide laminated plastic label on the interior of every fused safety switch or fused device over 5 amps. Label to read "Replace with 400-LPN-RK fuses only" or as appropriate for size and type of fuse as specified or installed.

B. Branch Circuit Panelboard Directories: Provide neatly typed schedule (odd numbered circuits on left side or top, even on right side or bottom) under plastic jacket or protective cover to protect the schedule from damage or dirt. Securely mount on inside face of panelboard door. Define briefly, but accurately, nature of connected load (i.e., Lighting Room 102, Receptacles Boiler Room, etc.).

C. Empty Conduits: Provide tags with typed description of purpose, and location of opposite end, wired to each end of conduits provided for future equipment.

D. Conduits: Mark all conduits entering or leaving panelboards with indelible black magic marker with the circuit numbers of the circuits contained inside.

E. Junction Boxes: Mark the circuit numbers of wiring on all junction boxes with sheet steel covers. Mark with indelible black marker. On exposed junction boxes in public areas, mark on inside of cover.

End of Section

SECTION 16100

BASIC MATERIALS AND METHODS

PART I - GENERAL

1.1 DESCRIPTION - This section describes specific requirements, products, and methods of execution which are typical throughout the electrical work of this project. Additional requirements for the specific systems may modify these requirements.

1.2 SERVICEABILITY OF PRODUCTS

A. Furnish all products to provide the proper orientation of serviceable components to access space provided.

B. Coordinate installation of panels, equipment, system components, and other products to allow proper service areas for all items requiring periodic maintenance inspection or replacement.

C. Replace or relocate all products incorrectly ordered or installed.

1.3 ACCESSIBILITY OF PRODUCTS

A. Arrange all work to provide access to all serviceable and/or operable products. Layout work to optimize net usable access space within confines of space available. Advise Engineer, in a timely manner, of areas where proper access cannot be maintained. Furnish layout drawings to verify this claim, if requested.

B. Provide access doors in ceilings, walls, floors, etc., for access to junction boxes, automatic devices, and all serviceable or operable equipment in concealed spaces.

PART II - PRODUCTS

2.1 MATERIALS AND EQUIPMENT FURNISHED IN DIVISION 16

A. All materials furnished and installed in permanent construction shall be new, full-weight, standard in every way, and in first class condition.

B. All materials shall conform with the standards of Underwriters Laboratories or other organization acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of labeled equipment or materials and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner. Only materials designed for the purpose employed shall be used.

C. Materials shall be identical with apparatus or equipment which has been in successful operation for at least two years. All materials of similar class or service shall be of one manufacturer.

D. Capacities, sizes, and dimensions given are minimum unless otherwise indicated. All systems, materials and equipment proposed for use on this project shall be subject to review for adequacy and compliance with contract documents.

2.2 MATERIALS AND EQUIPMENT FURNISHED IN OTHER DIVISIONS

A. Controls, including conduit, wiring, and control devices required for the operation of systems in other divisions of the specifications will be furnished under the division in which the equipment is specified.

B. All work on the project that falls under the jurisdiction of the electrical trade shall be performed by Licensed Electricians in conformance with the electrical specifications.

C. Provide complete power connections to equipment including but not limited to feeders, connections, disconnects and motor running overcurrent protection. Where starters are provided as part of a packaged equipment, overcurrent heaters shall be provided by the Electrical Contractor.

PART III - EXECUTION

3.1 STORAGE AND HANDLING - All items shall be delivered and stored in original containers, which shall indicate manufacturer's name, the brand, and the identifying number. Items subject to moisture

and/or thermal damage shall be stored in a dry, heated place. All items shall be covered and protected against dirt, water, chemical and/or mechanical damage.

3.2 PROTECTION OF MATERIALS AND EQUIPMENT - The Contractor shall be held responsible for any and all materials and equipment to be installed under this contract. The Contractor will be required to make good at his own cost any injury or damage which said materials or equipment may sustain from any source or cause whatsoever before final acceptance.

3.3 INSTALLATION

A. All materials and equipment shall be installed by skilled craftsmen. The norms for execution of the work shall be NEC Chapter 3 and the National Electrical Contractors' Association "Standards of Installation", which herewith is made part of these specifications.

B. Repair all surfaces and furnish all required material and labor to maintain fireproof, airtight and waterproof characteristics of the construction.

C. Installation of all equipment shall be in accordance with manufacturers' instructions.

3.4 SUPPORT SYSTEMS

A. Pipe straps and hanger rods shall be fastened to concrete by means of inserts, expansion bolts, or power-driven fasteners, to brickwork by means of expansion bolts, and to hollow masonry by means of toggle bolts.

B. Hanger rods with spring steel fasteners may be used for 1½" EMT and smaller conduits in dry locations.

3.5 MOUNTING HEIGHTS

A. Mounting heights shall be above finished floor (AFF) as noted below unless otherwise shown or indicated. Other mounting heights are shown on the drawings adjacent to the symbol. Where devices are shown on architectural elevations, the elevation height shall govern.

DEVICE	HEIGHT	T0	NOTES
Convenience outlets	16"	Center	1
Exterior WP convenience outlets	24"	Center	3
Lighting and dimmer switches	48"	Center	2
Panelboards	72"	Top	

Notes:

1 - Can be moved to 18" AFF where installed in 8" CMU's.

2 - Can be moved to 46" AFF where installed in 8" CMU's.

3 - Height is from interior finished floor. Notify Architect/Engineer if this will leave outlet less than 24" above grade or more than 48" above grade.

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3.6 PROTECTIVE FINISHES

A. Take care not to scratch or deface factory finish of electrical apparatus and devices. Repaint all marred or scratched surfaces.

B. Provide hot dip galvanized components for ferrous materials exposed to the weather.

End of Section

SECTION 16110

CONDUIT AND FITTINGS

PART I - GENERAL

1.1 DESCRIPTION - This section describes specific requirements, products, and methods of execution relating to conduit and conduit fittings approved for use. Type, size and installation methods shall be as shown on drawings, required by code and specified herein.

1.2 QUALITY ASSURANCE - Conduit and conduit fittings shall be standard types and sizes as manufactured by a nationally recognized manufacturer of this type of materials and shall be in conformity with applicable standards and UL listings.

PART II - PRODUCTS

2.1 CONDUIT - Where installed using methods and locations specified in this section, the following conduit types are approved:

A. Galvanized rigid steel conduit - GRC (NEC Article 346)
B. Electrical metallic tubing - EMT (NEC Article 348)
C. Flexible metallic conduit (NEC Article 350)
D. Liquid-tight flexible metallic conduit - LT (NEC Article 351)
E. Polyvinyl Chloride Conduit - PVC Schedule 40 (NEC Article 347)

2.2 FITTINGS

A. All connectors and couplings shall have insulated throats.
B. Fittings utilized with rigid steel conduit shall be galvanized steel. Conduit bushings shall be insulated. Where grounding bushings are required, insulated grounding bushings with pressure type lugs shall be provided.
C. Couplings and connectors for EMT shall be steel set screw type (not diecast) or steel compression type.
D. Fittings for flexible metal conduit shall be steel.
E. Fittings for liquid-tight flexible conduit shall be steel incorporating a threaded grounding cone, nylon or plastic compression ring, and a tightening gland to provide a low resistance ground connection.

2.3 EXPLOSION PROOF FITTINGS (ALSO USED AS MOISTURE BARRIERS)

A. Fittings shall be NEMA and UL listed for Class and Division in which they are installed.
B. Install EYS vertical conduit seal at each boundary of any classified envelope, at other locations required by NEC, and where moisture barrier is required.
C. Install fiber fill and sealing cement in conduit seals according to manufacturer's recommendations. All plugs shall be installed with non-conductive thread/joint lubricant such as Appleton TLNC.

PART III - EXECUTION

3.1 LOCATION - Conduits installed using methods noted in this section and in the following locations shall be of the following types:

A. Underground or encased in concrete - rigid steel or PVC (aluminum conduit shall not be installed in concrete).
B. Elevated structural concrete slabs - no conduit of any kind shall be installed.
C. Outdoors above-ground or damp locations - rigid steel.
D. Dry indoor locations, exposed - rigid steel, EMT or flexible conduit.
E. Dry indoor locations, concealed - rigid steel or EMT conduit.
F. Motor and equipment flexible connections (interior and exterior) - liquid-tight flexible conduit.

3.2 INSTALLATION METHODS

A. All conduit and tubing shall be cut square and reamed smooth at the ends and all joints made tight. Conduit threads shall be lubricated with an approved thread lubricant.

B. Exposed raceways shall be run parallel or perpendicular to building lines and bent symmetrically or made up with standard elbows or fittings. Concealed raceways shall be routed as directly as possible with a minimum of bends.

C. Flexible conduit (metallic or liquid-tight) shall have ground wire regardless of length. The ground wire in flexible conduits may be bonded to the exterior of the conduit. Flexible conduit shall not exceed 36" in length, except for lighting fixture whips or where specifically noted.

1. Flexible metalic conduit shall only be used for the following:

a. Where installation conditions warrant its use. (Must have Engineer's approval in writing.)

2. Liquid-tight flexible conduit shall be used for all motor connections.

D. Each conduit shall enter and be securely connected to a cabinet, junction box, pull box or outlet box by means of a locknut on the outside and a locknut bushing on the inside, or by means of a liquid-tight, threaded, self-locking, cold-weld type wedge adapter. In EMT or flexible metal conduit, the one locknut shall be made wrench tight. All locknuts shall be the bonding type with sharp edges and shall be installed in a manner that will assure a locking installation. Locknuts and bushings or self-locking adapters will not be required where conduits are screwed into threaded connections. All runs of conduit shall be protected from the entrance of foreign material prior to the installation of conductors.

E. Conduit or tubing deformed or crushed in any way shall not be installed. Conduit shall be bent only with approved bender (hydraulic or hickey). Bending machines shall be used to make field bends in conduit of 1¼" size and larger. Torches shall not be used in making conduit bends.

F. Raceways shall be run at least 5" from parallel runs of heating system pipes, flues, or other high temperatures piping systems.

G. Pull wires shall be left in all spare and unused conduits. (Nylon "jet-line" or equal.)

H. All conduit stubbed up out of floor and terminating inside of an enclosure shall have insulating grounding bushings installed.

I. Raceways penetrating vapor barriers or traversing from warm to cold areas shall be sealed with a non-hardening duct sealing compound to prevent the accumulation of moisture.

J. Raceways shall be provided with expansion joints where necessary to allow for thermal expansion and contraction.

K. PVC conduit may be used for power and telephone service where installed underground. Rigid steel elbows required underground and rigid steel conduits shall rise exposed.

3.3 CONDUIT SIZES - Conduits shall be of the size shown on the drawings or as required by NEC, whichever is larger. Base sizes on using type THW wire for size #6 AWG or larger, and type THWN for size #8 AWG or smaller.

A. Minimum sizes for rigid steel conduits shall be 3/4".

B. Minimum size for EMT and flexible conduits shall be 1/2", except fixture whips which may be 3/8" as allowed by NEC.

C. Maximum size for EMT shall be 3".

D. Minimum size for conduits installed underground or encased in concrete shall be 1".

End of Section

SECTION 16120

WIRE AND CABLE

PART I - GENERAL

1.1 DESCRIPTION -This section describes specific requirements, products, and methods of execution relating to wire and cable, 600 volts or less, approved for use on this project.

1.2 QUALITY ASSURANCE - All conductors shall be sized according to American Wire Gauge (AWG). Stranding, insulation, rating and geometrical dimensions shall conform to UL and ICEA specifications.

PART II - PRODUCTS

2.1 SERVICE AND FEEDER CABLE - Insulation shall be 600 volt type THW, RHW, THHN or XHHW.

2.2 BRANCH CIRCUIT WIRING - Insulation shall be 600 volt type THW, THHN or XHHW. Wiring in fixture channels shall be rated 90 degrees C or over, 600 volt.

2.3 MC CABLE - Under NO circumstance shall Metal-clad (MC) cable be used.

2.4 NM, NMC and NMS CABLE - Under NO circumstance shall Nonmetallic-sheathed cable (ROMEX) be used.

2.5 WIRES CONNECTED TO HEATING DEVICES - Wire type and rating shall be in accordance with heater manufacture's guidelines.

2.6 FLEXIBLE CORD - All flexible cord shall be type SO or ST. For the larger size cable, cord shall be type G.

2.7 MISCELLANEOUS - Miscellaneous wire and cable for special purpose applications and not covered in the categories as indicated above, shall be as shown on the plans and/or required by the intended use.

2.8 MINIMUM SIZE - Unless specified otherwise minimum wire sizes shall be as follows:

A. #12 AWG for branch circuit wiring.
B. #14 for control circuit wiring.
C. #10 AWG for all 120V homeruns over 75'.
D. #20 AWG for low voltage switching circuits if part of an approved cable assembly, #18 AWG otherwise.
E. Cable or conductors for fire alarm systems and other special systems shall be as described in other sections of the specifications, noted on the drawing, or recommended by the equipment manufacturer, whichever is greatest.

2.9 CONDUCTORS

A. All conductors used on this project shall be copper, solid or stranded for sizes #10 and smaller, stranded for #8 and larger.
B. Aluminum conductors shall be NOT be used.
C. Stranded control, communication, and alarm conductors shall have compression terminations where terminated on screw terminals.

PART III - EXECUTION

3.1 INSTALLATION

A. Conduit shall be completely installed, free from obstructions, and clean before conductors are installed. Provide conductors from outlet to outlet and splice only at outlet or junction boxes. Install all conductors in a single raceway at one time and leave sufficient cable at all fittings or boxes. Keep all conductors within the manufacturer's allowable tension. Do not violate minimum bending radii.
B. Lubricants for wire pulling, if used, shall conform to UL requirements for the insulation and raceway material.
C. Do not install thermoplastic insulated conductors when the ambient temperature is below 0 degrees F.

3.2 TERMINATIONS AND SPLICING

A. No splicing or joints will be permitted in either feeder or branch circuits except at outlet or accessible junction boxes.

B. Utilize compression type solderless connectors when making splices or taps in conductors No. 8 AWG or larger. Utilize pre-insulated connectors, 3M Company "Scotchlok" or Ideal Industries, Inc., "Super Nut" for splices and taps in conductors No. 10 AWG and smaller. Tape all splices and joints with Scotch #88 plastic tape to secure splices and provide insulation strength equal to that of the conductors joined.

C. Keep splices in underground junction boxes, handholes, and manholes to an absolute minimum. Where splices are necessary, use resin splicing kits manufactured by 3M Company to totally encapsulate the splice.

3.3 CONDUCTOR TERMINATION - Provide all power and control conductors that terminate on equipment or terminal strips with solderless lugs or T & B "Sta-Kon" terminals.

3.4 CONDUCTOR PHASE COLOR CODING

A. All service, feeder and branch circuit conductors on the project secondary electrical system shall be color coded as follows:

480/277 Volts	240/120 Volts	Phase
Brown	Black	A
Orange	Red	B
Yellow		C
Gray	White	Neutral
Green	Green	Ground

B. Where color coded conductors are not commercially available, colored non-aging, plastic tape may be utilized.

C. Phases in panelboards and similar equipment shall be connected Phase A, B, C from left to right, top to bottom, or front to back.

3.5 CONDUCTOR AMPACITIES

A. Unless both the equipment, panelboard and enclosures are marked otherwise, conductors shall be sized as follows: Conductors of No. 14 to No. 1 AWG shall be applied at their 60 degree C ampacities. Conductors No. 1/0 AWG and greater shall be applied at their 75 degree C ampacities.

B. Derating of conductors shall be in accordance with National Electrical Code "Notes to Tables 310-16 through 310-19." The maximum allowable load current shall be determined by the trip setting of the overcurrent protection.

3.6 VOLTAGE DROP - The maximum total voltage drop shall not exceed three (3) percent in branch circuits or feeders, for a total of five (5) percent to the farthest outlet based on steady state design load conditions. Wire sizes shown on the drawings are for minimum ampacity. Wire and conduit sizes shall be increased to limit voltage drop based upon actual lengths required in the field.

3.7 HARMONICS -To allow for harmonic current, any shared neutral shall be at least one size greater than its respective phase conductors.

End of Section

SECTION 16130

ENCLOSURES

PART I - GENERAL

1.1 DESCRIPTION
- A. This section describes general requirements, products and methods of execution relating to outlet, pull and junction boxes for use with wiring devices, light fixture outlets and general raceway installation approved for use on this project.
- B. All boxes 150 cubic inches or smaller shall be sized per NEC Article 370.
- C. Pull and junction boxes larger than 150 cubic inches shall conform to UL Standard 50-1970, Cabinets and Boxes

1.2 QUALITY ASSURANCE - UL listing for intended usage shall constitute proof of acceptable quality.

PART II - PRODUCTS

2.1 Cast Boxes with threaded hubs and gasketed covers shall be used in the following locations:
- A. All exterior locations
- B. All wet or damp locations
- C. All surface mounted interior locations below 48" above floor
- D. Where shown on drawings

2.2 Galvanized Pressed Steel Boxes may be used wherever they are permitted by code, except in areas indicated in preceding paragraph.

2.3 Ceiling Boxes and wall boxes for bracket light shall be not less than 4" in diameter by 1¼" deep and shall have 3/8" malleable iron fixture studs if required.

2.4 Grounding Screw: All boxes shall have a drilled and tapped hole in the back of the box for a grounding screw.

2.5 Accessories: Box covers, extension rings, bases, hanger bars, etc., for use in connection with the installation, shall be approved for use in the various applications.

2.6 Pull and Junction Boxes shall conform to Article 370 of the NEC and the following requirements:
- A. Sheet metal boxes shall be approved for use in all dry, interior, non-hazardous locations.
- B. Boxes exposed to rain or installed in wet locations shall be NEMA 3R or 4, as noted.
- C. Boxes installed underground shall be either precast concrete or cast iron.

PART III - EXECUTION

3.1 All boxes shall be securely fastened in position and supported independently of the conduit system.

3.2 All boxes located in suspended ceiling system shall be fastened to cross-members supported by the main ceiling support members, or from hanger rods with solid supports from above. Do not support from piping or ductwork.

3.3 Boxes shall be installed true to the building lines and at equal heights in conformity with mounting heights specified in other sections of the specification. Provide the best suitable box for each outlet requirement.

3.4 Boxes shall have only the holes necessary to accommodate the conduits at point of installation. All boxes shall have lugs or ears to secure covers.

3.5 All boxes shall be rigidly secured in position. All recessed boxes shall be so set that the front edge of the box shall be flush with the finished wall or ceiling line, or not more than 1/4" back of same.

3.6 All boxes shall be installed so that covers are readily accessible and adequate working clearance is maintained after completion of the installation.

3.7 All boxes interior and exterior shall be flush mounted in walls unless otherwise noted.

End of Section

SECTION 16420

SERVICE ENTRANCE

PART I - GENERAL

1.1 GENERAL REQUIREMENTS

A. The Contractor shall arrange with the serving utility to provide permanent electrical service. The Owner shall be responsible for all charges or fees levied by the serving utility relative to this project.

B. The Contractor shall be responsible to contact the electrical utility to coordinate timing and logistics in order to install the electrical service in a timely manner.

C. The Contractor shall be aware that other utilities such as TV and telephone may be able to utilize the same trenching as the power utility. At the onset of the project the Contractor shall coordinate with all the utilities involved and make all parties aware of the intended scheduling for trenches.

D. The contractor shall coordinate with the utility to determine installation requirements. The following sections describe work that is typically required for the service entrance installation. Each situation is unique, however, and the contractor shall conform with the utility's standards and procedures whether outlined below or not.

1.2 WORK INCLUDED - The following items will be provided and installed by the electrical contractor.

A. PRIMARY

1. Weatherhead and conduit for overhead service. Conduit shall be sized in accordance with utility requirements.

B. SECONDARY

1. Weatherproof current transformer (C/T) enclosure. Size shall be in accordance with utility requirements.
2. Conduit, sized in accordance with utility requirements, from C/T enclosure to 18" below grade.
3. Meter socket. Contractor shall verify configuration of meter with utility.
4. 1" conduit between the C/T enclosure and meter socket.
5. Grounding in accordance with NEC Article 250 and Section 16450 of this specification.
6. Lightning arrestor surge suppression.
7. Secondary conductors and conduit, sized in accordance with Feeder Schedule and/or One-line Power Riser Diagram, from C/T's to main distribution panel.

1.3 WORK PERFORMED BY OTHERS

The following items will be provided and installed by the electrical power utility.

A. PRIMARY

1. High voltage primary overhead or underground cabling.
2. Trenching from high voltage distribution to pad mounted transformer.
3. Utility transformer(s): pole mounted.

B. SECONDARY

1. Conduit and conductors from transformer(s) to C/T's.
2. Trenching and backfill from transformer(s) to C/T enclosure.
3. Current transformers.
4. Control wires from C/T's to meter socket.
5. Meter.

1.4 JOB CONDITIONS

A. Contractor shall refer to Section 16020 regarding site work and shall install all equipment in accordance with manufacturer's guidelines.

1.5 SHOP DRAWING SUBMITTALS

A. Contractor shall submit shop drawings for lightning arrestor surge suppression.

1.6 BROCHURE OF EQUIPMENT

A. Maintenance and replacement guidelines shall be included for lightning arrestor surge suppression.

PART II - PRODUCTS

2.1 GENERAL - Products and equipment required in this section shall be as specified in other portions of this specification.

2.2 LIGHTNING ARRESTOR SURGE SUPPRESSION - Lighting arrestor shall be Square D No. SDSA-1175 or equivalent.

PART III - EXECUTION

3.1 COORDINATION

A. Coordinate with general contractor for installation of transformer pad.

B. Coordinate with serving utilities as outlined above.

C. Coordinate exact location of transformer pad with utility and Owner prior to installation.

D. Contractor shall verify separation requirements between electric entrance equipment (including meter, C/T enclosure and disconnect) and natural gas entrance equipment (including meter, piping and regulators). A minimum of 36" is required between any electric service equipment and any natural gas entrance equipment.

3.2 INSTALLATION

A. Work required in this section shall be performed as specified in other portions of this specification.

B. For underground services, all secondary service conductors shall be enclosed in conduit. Conduits shall be buried at 36" minimum below finished grade. Install conduit under concrete or asphalt sidewalks or driveways for primary service conductors.

C. Install a 4" wide strip of bright orange or red plastic tape at 6-9" above buried service entrance conduits as a warning strip. Klein #58003, ITT Blackburn Type RT; Griffolyn Terra Tape or equal.

End of Section

SECTION 16440

DISCONNECT SWITCHES

PART I - GENERAL

1.1 DESCRIPTION - This section describes general requirements, products, and methods of execution relating to fusible and non-fusible disconnecting devices approved for use on this project.

1.2 QUALITY ASSURANCE - Devices shall be of the latest approved design as manufactured by a nationally recognized manufacturer and in conformity with UL listings and the governing NEMA standards. Product of Square D, G.E., Siemens, Cutler-Hammer, Westinghouse or Allen-Bradley.

PART II - PRODUCTS

2.1 SAFETY SWITCHES - Safety switches, fusible and non-fusible, shall conform to NEMA Standard KSI-1975 for type HD (Heavy Duty) and be UL listed.

A. Switch Interior: All switches shall have switch blades which are fully visible in the OFF position when the door is open. Switches shall be of dead-front construction with permanently attached arc suppressors. Lugs shall be UL listed for copper and/or aluminum cables and be front removable.

B. Switch Mechanism: Switches shall have a quick-make and quick-break operating handle and mechanism which shall be an integral part of the box, not the cover. Switches shall have a defeatable dual cover interlock to prevent unauthorized opening of the switch door in the ON position or closing of the switch mechanism with the door open. The switch shall be capable of being locked in the OFF position with three (3) padlocks.

C. Enclosures: Switch enclosure shall be suitable for the environment in which the switch is mounted. NEMA 1 enclosure shall be code gauge, UL-98, sheet steel, treated with a rust inhibiting phosphate and finished in gray, baked enamel. NEMA 3R enclosure shall have the same requirements as NEMA 1 except galvanized prior to painting.

D. Rating: Ampere, volt and horsepower ratings, as well as number of poles and presence of neutral bar shall be shown on the nameplate.

2.2 CIRCUIT BREAKERS - Circuit breakers used as disconnects shall meet requirements specified in Section 16475 - OVERCURRENT PROTECTIVE DEVICES.

2.3 FUSES - Fuses used in disconnects shall meet requirements specified in Section 16475 - OVERCURRENT PROTECTIVE DEVICES.

PART III - EXECUTION

3.1 Coordinate all details pertaining to size of motor and/or equipment, location and requirements to enclosure, ratings, etc., so as to provide the most suitable unit for the intended purpose.

3.2 Provide nameplates for all disconnects. Coordinate names with mechanical equipment lists.

3.3 Where recommended or required by the equipment manufacturer, or required by UL, disconnects shall be the fusible type, fused in accordance with the equipment nameplate information.

3.4 The ratings indicated on the drawings are for guidance only and do not limit the equipment size. When electrically driven equipment furnished under other sections of these specifications materially differs from the design, the Contractor shall make the necessary adjustments to the disconnect and branch-circuit protection to accommodate the equipment actually installed.

End of Section

SECTION 16450

GROUNDING

PART I - GENERAL

1.1 DESCRIPTION - This section describes general requirements, products and methods of execution relating to the furnishing and installation of a grounding system complete as required for this project.

1.2 MINIMUM REQUIREMENTS - The minimum requirements for the system shall conform to NEC Article 250.

1.3 SPECIAL REQUIREMENTS - Unless specified elsewhere, the ohmic values for grounds and grounding systems shall be as follows:

A. For grounding metal enclosures and frames for electrical and electrically operated equipment -- 5Ω maximum.

B. For grounding systems to which electrical utilization equipment and appliances are connected -- 5Ω maximum.

C. For grounding secondary distribution systems, neutrals, non-current carrying metal parts associated with distribution systems, and enclosures of electrical equipment not normally within reach of other than authorized and qualified electrical operating and maintenance personnel -- 10Ω maximum.

D. For individual transformer and lightning arrester grounds on distribution systems -- 10Ω maximum.

E. For equipment not covered in the above -- 10Ω maximum.

PART II - PRODUCTS

2.1 GENERAL - All grounding conductors, ground rods, and equipment required for ground systems shall be in accordance with UL 467.

2.2 GROUND RODS - 3/4" copper clad steel, 10' or longer. (VFC No. 3410 or equivalent).

2.3 GROUNDING CONDUCTORS

A. Buried conductors between ground rods shall be rope lay, copper wire with (28) strands of #14 AWG.

B. Service ground conductor shall be bare copper sized in accordance with NEC Table 250-94.

C. Water piping ground jumper conductors shall be bare, stranded copper, #4/0 AWG.

D. Telephone backboard grounding conductor shall be bare stranded copper, #4/0 AWG.

E. Equipment and wiring device grounding conductors shall be as follows:

1. Have green insulation of a type identical to circuit conductors serving the loads.
2. Be sized the same as circuit conductors for wiring devices.
3. Be sized in accordance with NEC Table 250-95 for equipment.

2.4 GROUNDING CONNECTORS

A. GROUND RODS

1. Connections to buried conductor between ground rods shall be Cadweld or equivalent.
2. Connection to service ground conductor shall be heavy duty bronze clamp with two stainless steel cap screws (VFC No. 302 or equivalent.)

B. REBAR AND BUILDING STEEL -Connections shall be Caldwell or equivalent.

C. WATER PIPES

1. Up to 3/4" diameter pipes - stainless steel "U" bolt clamp. (VFC no. 305 or equivalent.)
2. 1" to 2" diameter pipes - adjustable bronze pipe clamp (VFC no. 233 or equivalent.)

3. 2" to 3" diameter pipes - bronze "U" bolt clamp. (VFC no. 234 or equivalent.)
4. 3" and up diameter pipes - 2" wide copper strap type clamp (VFC no. 231 or equivalent.)

PART III - EXECUTION

3.1 SERVICE GROUND

A. Connect to existing service entrance grounding system for this project at the service entrance equipment by connecting the following to the service entrance ground bus:
   1. The commercial system's grounded neutral conductor.
   2. All metallic water services to the building at point of entry to the building regardless of distance.
   3. All "man-made" grounds specified to be installed.
   4. The service entrance equipment and all conduits entering and leaving the equipment.
   5. Reinforcing steel in slab and footings.
   6. Structural steel columns (one, minimum).
   7. Other items or equipment called for on the drawings.

B. Current carrying capacity of the grounding and bonding conductors shall conform to NEC Table 250-94.

3.2 "MAN-MADE" GROUNDS - Man-made ground shall consist of three ground rods in a triangular pattern connected with a continuous ground wire sized per NEC. The man-made ground shall be tested with an approved measuring device, such as "Vibroground", in order to verify that resistance does not exceed the specified level. Furnish certified test results.

3.3 EQUIPMENT AND WIRING DEVICE GROUND

A. Install grounding conductors for all equipment and wiring devices. Do not rely on conduit for grounding path.

B. Multiple circuits sharing a single raceway may share a single grounding conductor as long as it is sized for the largest circuit or wire size and all circuits originate in the same panel.

C. Multiple circuits sharing a single raceway may share a single grounding conductor if all of the following requirements are met:
   1. All circuits orignate in the same panel.
   2. No more than three single pole circuits may share a ground conductor.
   3. Size ground conductor for largest circuit.

D. Each isolated ground receptacle, specifically designated for computer equipment shall have a separate grounding conductor from the panelboard ground bus to the receptacle. This ground shall not be shared with any other circuits. Isolated ground receptacles shall also have a separate neutral wire from the panelboard neutral bus.

End of Section

SECTION 16460

TRANSFORMERS

PART I - GENERAL

1.1 DESCRIPTION

A. This section describes general provisions, products, and methods of execution relating to transformers approved for use on this project. Type, size, ratings, etc., shall be as shown on the plans and in accordance with UL and NEMA standards.

B. Include all line and low voltage transformers in this and other Divisions of specifications, including items such as: Control, communications systems, lighting and power, distribution and signal systems transformers, whether furnished as an integral component of an item of equipment or separately provided.

1.2 QUALITY ASSURANCE

A. Transformers shall be of the latest approved design as manufactured by a nationally recognized manufacturer and be listed in the UL and bear the UL label.

B. These specifications are based upon equipment from Square D Company, General Electric Company or Gould-ITE. All other manufacturers require prior approval by engineer.

1.3 SUBMITTALS

A. Submit for approval manufacturer's shop drawings to show weights, dimensions, mounting arrangements, interconnecting diagrams, and electrical power requirements. Furnish typical test data, including ratio, resistance, losses, sound level, applied voltage, induced voltage, temperature rise, impulse test and short circuit test.

1.4 WARRANTY - Warrant all components, parts and assemblies against defects in materials and workmanship for a period of 12 months after acceptance.

PART II - PRODUCTS

2.1 TRANSFORMERS

A. All transformers shall be dry-type, except where specifically noted on plans.

B. Except as specifically noted on the drawings, single phase transformers shall be 480 volt primary and 120/240 volt secondary. Transformers 25 KVA and larger shall have a minimum of four 2½% full capacity primary taps unless otherwise noted.

C. Transformers 15 KVA and above shall be 150°C temperature rise above 40°C ambient. All insulating materials to be in accordance with NEMA ST201972 standards for a 220°C UL component recognized insulation system.

D. Transformer coils shall be of continuous wound construction and shall be impregnated with non-hygroscopic, thermo-setting varnish.

E. All cores to be constructed of high grade, non-aging silicon steel with high magnetic permeability, and low hysteresis and eddy current losses. Magnetic flux densities are to be kept well below the saturation point. The core laminations shall be clamped together with structural steel angles. The complete core and coil shall then be bolted to the base of the enclosure but isolated by means of rubber, vibration-absorbing mounts. There shall be no metal-to-metal contact between the core and coil and the enclosure. On transformers 500 KVA and smaller, the vibration isolating system shall be designed to provide a permanent fastening of the core and coil to the enclosure. Sound isolating systems requiring the complete removal of all fastening devices are not acceptable.

F. Transformers 15 KVA and larger shall be in a heavy gauge, sheet steel, ventilated enclosure. The ventilating openings shall be designed to prevent accidental access to live parts in accordance with UL, NEMA, and NEC standards for ventilated enclosures. Single phase transformers 15 KVA through 167 KVA, and three phase transformers through 112½ KVA shall be designed so they can be either floor or wall mounted. Larger

transformers shall be designed only for floor mounting.

G. The entire transformer enclosure shall be de-greased, cleaned, phosphatized, primed, and finished with gray, baked enamel.

H. The maximum temperature of the top of the enclosure shall not exceed 50°C rise above a 40°C ambient.

I. The core of the transformer shall be visibly grounded to the enclosure by means of a flexible grounding conductor sized in accordance with applicable NEMA, IEEE, AND ANSI standards.

J. The transformer shall be listed by UL for the specified temperature rise.

K. Transformer shall be in NEMA 3R enclosure, or as required by the classification.

2.2 SOUND RATINGS

A. Sound levels shall be guaranteed by the manufacturer not to exceed the following:
   1. 15 to 50 KVA: 45dB
   2. 51 TO 150 KVA: 50dB

B. Replace transformers deemed excessively noisy by the Owner at no additional contract cost.

PART III - EXECUTION

3.1 MOUNTING

A. Provide all required structural provisions including floor, wall brackets, or trapeze suspended from structural members as indicated on drawings, or approved.

B. Mount transformers on double-deflection neoprene-in-shear isolators sized for minimum 0.35" static deflection and no harder than 50 durometer. Use base-mount or hanger type isolators by Amber/Booth, Mason Industries, Peabody/Kinetics, Vibration Mountings, Inc. or approved equal.

3.2 ADJUSTMENT - On multi-tap transformers, adjust transformer taps to provide rated voltage at the secondary bus with all connected loads "on", except the no-load secondary line-to-neutral voltage shall not exceed 125 volts. Submit log of final voltage readings.

3.3 ELECTRICAL CONNECTIONS - Liquid-tight flexible metal conduit with supplemental ground jumper shall be used for all transformer connections. The flexible conduit shall be installed in a slack, shallow "U" form. The ground jumper in flexible conduits may be either within or bonded to the exterior of the conduit.

End of Section

SECTION 16470

PANELBOARDS

PART I - GENERAL

1.1 DESCRIPTION - This section describes general provisions, products, and methods of execution relating to branch circuit panelboards approved for use on this project. Type, size, ratings, etc., shall be as shown on the plans and in accordance with UL Standards 50 and 67.

1.2 SPECIAL REQUIREMENTS - Special features such as main contactor, submain contactor, split bus, etc., shall be provided if called for on the plans.

1.3 QUALITY ASSURANCE

A. The panelboards shall be of the latest approved design as manufactured by a nationally recognized manufacturer and be listed in the Underwriters' Laboratories and bear the UL label.

B. These specifications are based upon equipment from Square D. Equals in G.E., Cutler-Hammer, Allen-Bradley, Westinghouse or Siemens are acceptable.

1.4 SUBMITTALS

A. Submit for approval manufacturer's shop drawings to show weights, dimensions, mounting arrangements, interconnecting diagrams, schedules of all overcurrent devices, voltage ratings, and all specified accessories.

B. Delete all superfluous information from submittal data such as model numbers and options for equipment contained on manufacturer's data sheets but not used on this project.

PART II - PRODUCTS

2.1 CABINETS AND FRONTS

A. Panelboard assembly shall be enclosed in a steel cabinet. Fronts shall include doors and have flush, brushed stainless steel, cylinder tumbler-type locks with catches and spring-loaded door pulls. Trims shall be furnished to be compatible with type of mounting.

B. All panelboard locks shall be keyed alike. Fronts shall have adjustable, indicating trim clamps which shall be completely concealed when the doors are closed. Doors shall be mounted by completely concealed steel hinges. Fronts shall not be removable with door in the locked position.

C. A circuit directory frame and card with a clear plastic covering shall be provided on the inside of the door. The directory card shall provide a space at least ¼" high by 3" long or equivalent for each circuit. The directory shall be typed to identify the load fed by each circuit.

D. Fronts shall be of code gauge, full finished steel with rust-inhibiting primer and baked enamel finish.

E. Cabinets shall be labeled in accordance with the drawing and SECTION 16050 - ELECTRICAL IDENTIFICATION.

2.2 SAFETY BARRIERS - The panelboard interior assembly shall be dead front with panelboard front removed.

2.3 BUS ASSEMBLY - Panelboard bus structure and main lugs or main breaker shall have current ratings as shown on the panelboard schedule. Bus bars shall be either copper or aluminum as specified on panel schedule.

2.4 SHORT CIRCUIT RATING - Each panelboard, as a complete unit, shall have a short circuit rating equal to or greater than that shown on the panelboard schedule. If none is shown, minimum is 10,000 A.I.C.

2.5 PROTECTION DEVICES - Circuit breakers shall individually comply with Section 16475 - OVERCURRENT PROTECTIVE DEVICES. The type to be furnished shall be as shown on the plans. If no withstand rating is specified, minimum requirements shall be 10,000 AIC symmetrical at 240 volts, 14,000 AIC symmetrical at 460 volts. All breakers in an individual panel shall conform to minimum AIC symmetrical for panel.

2.6 NEUTRAL TERMINAL AND EQUIPMENT GROUNDING TERMINALS

A. All panelboards shall be equipped with an insulated neutral terminal bar. An insulated equipment grounding terminal bar shall be furnished to terminate equipment grounding conductors.

B. An insulated ground bar shall be installed where noted on plans.

PART III - EXECUTION

3.1 Verify mounting arrangements for each location shown on the plans. Where cabinets are recessed, verify adequate thickness of wall and make arrangements for furring as required. In general, all conduits shall enter the top or bottom of panel.

3.2 Provide additional wire gutters or pull boxes to facilitate orderly entry of conduits into cabinets. Bundle and support wires and arrange them in an orderly manner in the designated wire gutters.

3.3 Panelboards shall not be used for pull boxes for wiring not terminating in the panelboard.

3.4 PANELBOARD LABELS - Label panelboards in accordance with Section 16050.

A. First line shall be panelboard name.

B. Second line shall be voltage and phase.

3.5 GROUND BAR CONNECTION

A. A separate insulated ground wire shall be run from the insulated isolated ground bar in the panelboard to the service entrance ground connection point at the service panel.

End of Section

SECTION 16475

OVERCURRENT PROTECTIVE DEVICES

PART I - GENERAL

1.1 DESCRIPTION - This section describes general requirements, products, and methods of execution relating to overcurrent protective devices approved for use on this project. Type, duty rating and characteristics, fault interrupting capability and coordination requirements shall be determined from the plans and the following specifications.

1.2 QUALITY ASSURANCE

A. Devices shall be the latest approved design as manufactured by a nationally recognized manufacturer and in conformity with applicable standards and UL listings.

B. Circuit breaker manufacturer shall match panelboard manufacturer and shall be product of Square D, General Electric, Siemens, Cutler-Hammer, Westinghouse or Allen-Bradley.

C. Fuses shall be Bussmann or equivalent in Littelfuse or Gould Shawmut.

PART II - PRODUCTS

2.1 MOLDED CASE CIRCUIT BREAKERS

A. Molded case circuit breakers shall be suitable for individual as well as panelboard mounting. Bolt-on type only. No breakers designated "plug-on" type allowed.

B. The breakers shall meet current NEMA and UL specifications as applicable to frame size, standard rating and interrupting capability.

C. The breakers shall be one-, two-, or three-pole as scheduled, operate manually for normal ON-OFF switching and automatically under overload and short circuit conditions.

D. Operating handle shall open and close all poles simultaneously on a multi-pole breaker. Operating mechanism shall be trip-free so that contacts cannot be held closed against abnormal overcurrent or short circuit condition. Do not use single-pole circuit breakers with handle ties where multi-pole breakers are indicated.

2.2 FUSIBLE SWITCHES

A. Fusible switches shall be designed for individual mounting as specified in SECTION 16440 - DISCONNECT SWITCHES, or for panelboard mounting.

B. Switches designed for panelboard mounting shall have the same properties as specified for the individually mounted switches.

C. Switches shall conform to NEMA and UL 67 standards.

D. Switches shall be used in conjunction with fuses as specified in the following in order to constitute a complete "Overcurrent Protective Device."

2.3 FUSES

A. Fuse types shall be as follows (unless otherwise specified):

PROTECTED EQUIPMENT	ELECTRICAL CHARACTERISTICS	UL Class	FUSE TYPE	BUSSMANN NUMBER
Main switch, panelboard,	0-600A, 250V AC	RK1	Dual-element, Time-delay	LPN-RK
feeders and branch circuits	0-600A, 600V AC	RK1	Dual-element, Time-delay	LPS-RK

B. Fuses of the sizes recommended by equipment manufacturer or as specified on the drawings shall be installed. Fuses shall be capable of interrupting the prospective symmetrical fault current.

C. Furnish one complete set of spare fuses of each rating installed to the Owner. Provide fuse puller(s) for fuse sizes used.

2.4 FUSE CABINET - Provide hinged metal fuse cabinet in mechanical/electrical room of sufficient size to house all spare fuses provided under this section.

PART III - EXECUTION

3.1 Size devices as shown and specified, or as required by the load being served.
3.2 Provide phenolic label on the interior of every fusible switch. Label to read "Replace with 400-LPN-RK fuses only" or as appropriate for size and type of fuse as specified or installed.
3.3 Provide any adjusting or programming of breakers as required to allow proper protection of the loads served.

End of Section

SECTION 16690

TRANSIENT VOLTAGE SURGE SUPPRESSION

PART I - GENERAL

1.1 DESCRIPTION

A. This section describes general requirements, products, and methods of execution relating to Transient Voltage Surge Suppression (TVSS).

B. The TVSS system shall be designed to protect all AC electrical circuits and connected equipment from destructive, damaging or disruptive effects of lightning induced transients, normal utility load switching activities, and internally generated transients which are caused by normal operation of connected equipment as well as capacitive and inductive load switching.

C. An appropriate TVSS device shall be provided for each building service entrance, distribution panel, sub-panel and individual equipment as designated in the plans. The TVSS units shall be as specified and shall be installed in accordance with the TVSS manufacturer's requirements.

1.2 RELATED WORK

A. All work performed under this section shall be subject to requirements in the General Division, Division 1 and Division 16. It shall be performed in accordance with the contract drawings and manufacturer's guidelines.

B. Contractor shall thoroughly examine the following sections which contain related work:

1. Section 16420 - Electrical Service
2. Section 16470 - Electrical Panelboards

1.3 REFERENCES AND STANDARDS - All TVSS devices shall be designed, manufactured, and installed in accordance with the following standards:

A. ANSI/IEEE C84.1 American National Standard for Electric Power Systems and Equipment - Voltage Ratings (60 Hertz)

B. ANSI/IEEE C62.45 Recommended Practice on Surge Voltages in Low-Voltage AC power Circuits

C. ANSI/IEEE C62.45 IEEE Guide on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits

D. Underwriters Laboratories UL 1449 Standard for Safety - Transient Voltage Surge Suppressors.

E. Underwriters Laboratories, UL 1283, Standard for Safety - Electromagnetic Interference Filters.

F. NFPA 70, National Electrical Code

G. IEEE Standard 142-1991, IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systems (IEEE Green Book)

H. ANSI/IEEE Standard 141-1986, IEEE Recommend Practice for Electric Power Distribution for Industrial Plants (IEEE Red Book)

I. IEEE Standard 1100-1992, IEEE Recommended Practice for Powering and Grounding Sensitive Electronic Equipment (IEEE Emerald Book)

1.4 QUALITY ASSURANCE - Equipment and materials shall be new, unused and shall be standard products of an established manufacturer who has produced, and had in operation, the type of equipment being installed for at least five (5) years. All equipment shall conform to UL 1449 listing and governing NEMA standards and shall be labeled as such.

1.5 SUBMITTALS

A. Data sheet for each unique unit showing options, etc.

B. Outline drawings showing overall dimensions and giving complete mounting and conduit entry dimensions.

C. Complete electrical drawings (schematics and connection diagrams).

D. Manufacturers' literature giving detailed information of equipment being supplied indlucing

part numbers, model numbers, replacement parts and ratings.

E. All Let - Through voltage data will be measured on an "As Installed" lead length basis, simulating actual installation. At the module or at the bus "Zero lead length" data is not acceptable. Testing will be conducted in accordance with UL-1449, ANSI/IEEE C62.41-1991 and ANSI/IEEE C62.45-1992 standards. No testing will be done with "outside of the suppressor" lead lengths less than that specified for the product(s). The lead length parameter must be specified on test documentation.

F. Qualifications and name of technical persons responsible for support and warranty.

1.6 BROCHURE OF EQUIPMENT - Brochure of equipment shall include the following as a minimum:

A. Reviewed, corrected and approved shop drawings.

B. Notes from owner orientation and training sessions.

C. Operation and maintenance manual ith:

1. Vendor information for equipment being supplied.
2. Connection information.
3. Wiring diagrams.
4. Parts list.
5. Module replacement procedures.

1.7 WARRANTY - The TVSS system vendor shall supply a complete parts and labor warranty for five (5) years from the date of substantial completion. Warranty shall cover entire TVSS system and all associated equipment and devices.

PART II - PRODUCTS

2.1 APPROVED MANUFACTURERS

A. In as much as these specifications are met, the following manufacturers will not require prior approval:

1. Leviton
2. Joslyn
3. Liebert

B. Equipment meeting these specifications manufactured by others may be submitted for prior approval.

2.2 MATERIALS/CONSTRUCTION

A. The circuit configuration of the suppression units shall be thermal stress reducing, custom parallel, solid state.

B. Protection Modes: All modes shall be protected, i.e. Normal (L-L, L-N) and Common (N-G, L-G).

C. No suppression units shall be supplied which require scheduled preventive maintenance or replacement parts (lights, fuses and relays, where applicable, excluded). Units requiring functional testing, special test equipment or special training to monitor TVSS status are not acceptable.

2.3 PANEL PROTECTION

A. TVSS units protecting distribution and sub-panels shall employ replaceable modules unless otherwise indicated.

B. Distribution panels shall be TVSS protected by Leviton 57000 devices or equivalent.

C. Sub-panels shall be TVSS protected by Leviton 52000 devices or equivalent.

D. See TVSS Equivalent Schedule on contract drawings for protected modes, MCOV, voltage clamp values, maximum transient current and energy, noise rejection, etc.

PART III - EXECUTION

3.1 GENERAL

A. The electrical contractor shall verify the proper application of the TVSS (ie. Voltage, phases, etc.) and coordinate with upstream and downstream transient suppression. The electrical contractor shall assure that all Neutral conductors are bonded to the system

Ground at the service entrance or the serving isolation transformer prior to installation of the associated TVSS.

B. The electrical contractor shall furnish all labor, materials, equipment and services necessary for and incidental to the installation of the TVSS system components as specified herein. Only Licensed Electricians shall actually install TVSS units.

C. The electrical contractor shall install the transient voltage surge suppressors as indicated in manufacturer's installation instructions and in accordance with the applicable portions of NEC and in accordance with recognized industry practices to ensure that product complies with requirements. NEC, State, and Local Codes will prevail.

D. The Contractor shall examine the areas and conditions under which the transient voltage surge suppressors are to be installed and advise the General Contractor and supplier in writing of conditions detrimental to the completion of the work.

3.2 COORDINATION - Coordinate with other electrical work as necessary to interface installation of the transient voltage surge suppression systems with other work on the site.

End of Section