

Standard Specifications and Details for Street and Utility Construction

2016 Edition

**City of Sheridan
55 Grinnell Plaza
PO Box 848
Sheridan, WY 82801
(307) 674-6483**

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DIVISION 0
BIDDING & CONTRACT
REQUIREMENTS

ADVERTISEMENT FOR BIDS

The City of Sheridan, Wyoming will receive sealed bids for the **[Project Name]** Project. The project is generally described as follows:

The **Base Bid** includes [DESCRIPTION].

Bid Alternate [X] includes [DESCRIPTION].

Sealed bids will be received at City Hall, Customer Service on the 1st floor, until **[TIME]** local time on **[DATE]**. The bids will then be opened and read aloud at the Council Chambers on the 3rd floor of City Hall.

All bids shall be submitted in accordance with and on the forms included in the Project Manual. Bids shall be submitted in a sealed envelope addressed to:

City of Sheridan
Customer Service
Attn: [NAME]
[PROJECT NAME]
55 Grinnell Plaza
Sheridan, Wyoming 82801

Contract Documents, including proposal Bid Forms, Construction Drawings and Project Manual, have been placed online at <https://goo.gl/ls7GBI>.

Contract Documents shall be obtained on or after **[DATE]** through <http://goo.gl/ls7GBI> or at www.questcdn.com with the project number **[PROJECT NUMBER]**, for the non-refundable cost of \$10.00 per set.

A **PRE-BID CONFERENCE** will be held on **[DATE]** at **[TIME]** local time, beginning in the Council Chambers on the 3rd floor of City Hall, Sheridan, Wyoming.

Contractors, in submitting their respective bids, acknowledge that such bids conform to all requirements of Wyoming State Statute. Each bidder must include a bid security with the bid, payable to the City of Sheridan, in accordance with the Instruction to Bidders.

No bidder may withdraw its bid after the scheduled time of the bid opening. Bids are to remain open for 60 days after the bid opening. The Owner reserves the right to reject any and all bids or parts thereof, and to waive any irregularities of any bid. The Owner also reserves the right to award the contract to such responsible bidders as may be determined by the Owner.

City of Sheridan, Wyoming

By: _____
Public Works Director

Publish Dates: [DATE]
[DATE]
[DATE]

1.0 DEFINED TERMS.

Terms used in these Instructions to Bidders which are defined in the General Conditions of the Construction Contract, have the meanings assigned to them in the General Conditions. The term "BIDDER" means one who submits a Bid directly to the OWNER, as distinct from a sub-BIDDER, who submits a bid to a BIDDER. The term "Successful BIDDER" means the lowest, qualified, responsible and responsive BIDDER to whom the OWNER (on the basis of the OWNER's evaluation as hereinafter provided) makes an award. The term "Bidding Documents" includes the Advertisement for Bids, Instructions to Bidders, the Bid Form, Statement of Qualifications, Anticipated Subcontractors, and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids).

In this section on "Instructions to Bidders", the term BIDDER is used to describe a prospective CONTRACTOR. When the term BIDDER is used, it refers to the company that could become the CONTRACTOR; therefore all requirements of the CONTRACTOR also pertain to the BIDDER, and vice versa.

The OWNER as defined in the General Conditions is the City of Sheridan. The ENGINEER as defined in the General Conditions is identified in the Project Manual.

2.0 COPIES OF BIDDING DOCUMENTS.

- 2.1 Complete sets of the Bidding Documents in the number and for the purchase sum may be obtained as stated in the "Advertisement for Bids".
- 2.2 Complete sets of Bidding Documents must be used in preparing Bids. Neither the OWNER nor ENGINEER assumes 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, does so only for the purpose of obtaining Bids on the Work, and does not confer a license or grant for any other use.

3.0 QUALIFICATIONS OF BIDDERS.

To demonstrate qualifications to perform the Work, each BIDDER must submit with the Bid (or within 48 hours of the Bid, if allowed by the Project Manual) written evidence, such as financial data, previous experience, record of performance on previous projects, plant and equipment, information on their permanent place of business, technical expertise, present commitments, and other such data as may be called for on the Statement of Qualifications contained in the Bidding Documents.

Each BIDDER must be prepared to submit evidence of the BIDDER's qualifications to do business in Wyoming, prior to the Notice of Award. BIDDERS must be properly licensed as a General or Excavator Contractor, and Utility Contractor if utility work is involved in the project, according to Sheridan City Code. BIDDERS must also be registered in the Federal Government's System of Award Management (SAM). All licensing above must either be current at the time of the Bid Opening, or be obtained prior to the Notice of Award.

4.0 LIST OF SUBCONTRACTORS.

Each BIDDER shall submit a list of subcontractors on the form included in the Project Manual with his or her Bid.

Prior to the award of Contract, the OWNER shall notify the BIDDER if the OWNER, after due investigation, has reasonable objection to any Subcontractor listed and does not accept them. Acceptance of any or all listed Subcontractors by the OWNER does not relieve the CONTRACTOR from any responsibility for its Subcontractors.

5.0 PREFERENCE TO WYOMING CONTRACTORS, LABORERS AND MATERIALS.

Preference shall be given to responsible Wyoming Contractors, Laborers and Materials as required by Wyoming Statutes. Preference is hereby given to materials, supplies, equipment, machinery and provisions produced, manufactured, supplied or grown in Wyoming, quality being equal to articles offered by the competitors outside of the state.

Therefore, a 5% preference shall be given to Wyoming state resident bidders over non-residents. This applies to all subcontractors, suppliers and general contractors.

The 5% state preference takes effect whenever any Wyoming BIDDER is in direct competition with a non-Wyoming BIDDER.

Under the guidelines noted above, the Contract shall be awarded to the responsible resident making the lowest bid if the resident's bid is not more than 5% higher than that of the lowest responsible non-resident BIDDER.

The Contractors, in submitting their respective bids, acknowledge that such bids conform to all Wyoming State Statute requirements.

In accordance with State Statute 16-6-103, successful resident Bidders shall limit subcontracts to non-resident contractors to thirty percent (30%) of the work.

6.0 QUESTIONS.

Questions regarding this project should be addressed to _____

7.0 EXAMINATION OF CONTRACT DOCUMENTS AND SITE.

7.1 It is the responsibility of each BIDDER, before submitting a Bid, to (a) examine the Contract Documents thoroughly, (b) visit the site to become familiar with local conditions that may affect cost, progress, performance or furnishing of the Work, (c) consider federal, state and local laws and regulations that may affect cost, progress, performance or furnishing of the Work, (d) study and carefully correlate BIDDER's observations with the Contract Documents, and (e) notify ENGINEER of all conflicts, errors or discrepancies in the Contract Documents.

7.2 Information and data reflected in the Contract Documents, with respect to Underground Facilities at or contiguous to the site, is based upon information and data furnished to the OWNER and ENGINEER by owners of such Underground Facilities or others, and the OWNER and ENGINEER do not assume responsibility

for the accuracy or completeness thereof, unless it is expressly provided otherwise in the Supplementary Conditions.

- 7.3 Provisions concerning responsibilities for the adequacy of data furnished to prospective BIDDERS on subsurface conditions, Underground Facilities and other physical conditions, and possible changes in the Contract Documents, due to differing conditions, appear in the General Conditions and Supplemental General Conditions.
- 7.4 Before submitting a Bid, each BIDDER will, at the BIDDER's own expense, make or obtain any additional examinations, investigations, explorations, tests and studies, and obtain any additional information and data which pertain to the physical conditions (surface, subsurface and Underground Facilities), at or contiguous to the site or otherwise which may affect cost, progress, performance or furnishing of the Work, and which the BIDDER deems necessary to determine its Bid for performing and furnishing the Work in accordance with the time, price, and other terms and conditions of the Contract Documents.

A copy of the Geotechnical Study/Report (if one was prepared), is a part of the Contract Documents for this project.
- 7.5 On request, in advance, OWNER will provide each BIDDER access to the site to conduct such explorations and tests as each BIDDER deems necessary for submission of a Bid. BIDDER shall fill all holes, clean up, and restore the site to its former condition upon completion of such explorations.
- 7.6 The lands upon which the Work is to be performed, rights-of-way and easements for access thereto, and other lands designated for use by the CONTRACTOR in performing the Work are identified in the Contract Documents. All additional lands, and access thereto, required for temporary construction facilities or storage of materials and equipment are to be provided by the CONTRACTOR. Easements for permanent structures or permanent changes in existing structures are to be obtained and paid for by the OWNER, unless otherwise provided in the Contract Documents.
- 7.7 The submission of a Bid will constitute an incontrovertible representation by the BIDDER that the BIDDER has complied with every requirement of this Article 7, and that without exception, the Bid is premised upon performing and furnishing the Work required by the Contract Documents, and such means, methods, techniques, sequences or procedures of construction, as may be indicated in or required by the Contract Documents and that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

8.0 INTERPRETATIONS AND ADDENDA.

- 8.1 All questions about the meaning or intent of the Contract Documents are to be directed to the ENGINEER. Interpretations or clarifications considered necessary by the ENGINEER in response to such questions will be issued by Addenda mailed or delivered to all parties recorded by the ENGINEER as having received the Bidding Documents. Questions received within five days prior to the date for opening of Bids or as stated in the Pre-bid meeting will not be answered. Only questions answered

by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

- 8.2 Addenda may also be issued to modify the Bidding Documents, as deemed advisable by the OWNER or ENGINEER.

9.0 BID SECURITY.

- 9.1 Each BIDDER must deposit bid security with the bid, payable to the OWNER, which deposit shall be one of the following:

1. Certified check, cashier's check or draft drawn on a State or National Bank in the amount of five percent (5%) of the total bid.
2. Bid Bond, prepared on the form provided in the Project Manual, issued by a Surety authorized to do business in the State of Wyoming and acceptable to the OWNER in the amount of five percent (5%) of the total bid.

- 9.2 The Bid Security of the successful BIDDER will be retained until such BIDDER has executed the Agreement and furnished the required contract security, whereupon the Bid Security will be returned. If the Successful BIDDER fails to execute and deliver the Agreement and furnish the required contract security within ten (10) 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 the OWNER believes to have a reasonable chance of receiving the award may be retained by the OWNER, until the earlier of the seventh day after the effective date of the Agreement, or the sixty-first (61st) day after the Bid Opening, whereupon Bid Security furnished by such Bidders will be returned. Bid Security with Bids which are not competitive will be returned within seven days after the Bid Opening.

10.0 CONTRACT TIME.

Substantial Completion of the Work is to be completed within ___ calendar days from the issuance of the Notice to Proceed. Final completion is to be reached within ___ days of Substantial Completion. Final Payment will not be made until Final Completion is reached and all closeout documents acceptably submitted.

11.0 LIQUIDATED DAMAGES.

Provisions for liquidated damages are set forth in the Agreement.

12.0 SUBSTITUTE OR "OR-EQUAL" ITEMS.

The Contract, if awarded, will be on the basis of materials and equipment described in the Drawings or specified in the Specifications. A substitute or "or-equal" item of material or equipment may be furnished or used by the CONTRACTOR, if acceptable to the ENGINEER. Application for such acceptance will not be considered by the ENGINEER until after the effective date of the Agreement. The procedure for submission of any such application by the CONTRACTOR, and consideration by the ENGINEER, is set forth in paragraph 6.05 of the General Conditions, and may be supplemented in the Special Provisions.

13.0 SUBCONTRACTORS, SUPPLIERS, AND OTHERS.

- 13.1 If requested by the ENGINEER, the BIDDER shall provide information on the qualifications, experience and financial or other data of any Subcontractors or suppliers proposed on this project. If OWNER or ENGINEER, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, other person or organization, they may, before the Notice of Award is given, require the apparent Successful BIDDER to submit an acceptable substitute without an increase in Bid price. If apparent Successful BIDDER declines to make any such substitution, OWNER may award the contract to the next lowest BIDDER that proposes to use acceptable Subcontractors, Suppliers and other persons and organizations. The declining to make requested substitutions will not constitute grounds for sacrificing the Bid security of any BIDDER. Any Subcontractor, Supplier, or other person or organization listed and to whom the OWNER or ENGINEER does not make written objection prior to giving of the Notice of Award will be deemed acceptable to the 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. Operational maintenance issues may be considered in this evaluation to help determine what is deemed acceptable.
- 13.2 No CONTRACTOR shall be required to employ any Subcontractor, Supplier, other person or organization against whom CONTRACTOR has reasonable objection.

14.0 BID FORM.

- 14.1 The Bid Form is included with the Bidding Documents; additional copies may be obtained from the ENGINEER. Bids must be submitted on the forms requested.
- 14.2 All blanks on the Bid Form must be completed in ink or by typewriter. The Bidder must include both unit prices and extended prices. In case of a difference between the unit price and the extended price, the unit price shall be used in computing the total amount of the bid. In case of a difference between the total bid price and the sum of the extended prices, the sum of the extended prices shall govern.
- 14.3 Bids by corporations must be executed in the corporate name by the president or vice president (or other corporate officer accompanied by evidence of authority to sign), and the corporate seal must be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation must be shown below the signature.
- 14.4 Bids by partnerships must be executed in the partnership name and signed by a partner, whose title must appear under the signature, and the official address of the partnership must be shown below the signature.
- 14.5 All names must be typed or printed below the signature.
- 14.6 The Bid shall contain an acknowledgement of receipt of all Addenda (the numbers of which must be filled in on the Bid Form).
- 14.7 The address, telephone, email address and fax numbers for communications regarding the Bid must be shown.

14.8 Work included in each Bid Item is as covered in Section 01150 and the Project Manual.

15.0 SUBMISSION OF BIDS.

Bids shall be submitted at the time and place indicated in the "Advertisement for Bids", and shall be enclosed in an opaque, sealed envelope, marked with the project title, name and address of the BIDDER, and accompanied by the Bid Security and other required documents. If the Bid is sent through the mail or other delivery system, the sealed envelope shall be enclosed in a separate envelope, with the notation "BID ENCLOSED" on the face of the separate envelope.

16.0 MODIFICATION AND WITHDRAWAL OF BIDS.

Bids may be modified or withdrawn by an appropriate document duly executed (in the manner that a Bid must be executed), and delivered to the place where Bids are to be submitted at any time prior to the time of opening of Bids, as called for in the Advertisement for Bids. No BIDDER may withdraw their Bid for a period as specified in the Invitation for Bids after the date and hour set for the opening declared therein.

17.0 OPENING OF BIDS.

Bids will be opened and read aloud publicly. An abstract of the amounts of the base Bids and major alternates (if any), will be made available to BIDDERS within one week after the opening of Bids.

18.0 BIDS TO REMAIN SUBJECT TO ACCEPTANCE.

All bids will remain subject to acceptance for sixty days (60) after the day of the Bid Opening, but the OWNER may, in its sole discretion, release any Bid, and return the Bid Security prior to that date.

19.0 AWARD OF CONTRACT.

19.1 Owner reserves the right to reject any and all Bids, including without limitations, nonconforming, non-responsive, unbalanced, or conditional Bids. Owner further reserves the right to reject the Bid of any Bidder. Owner may also reject the Bid of any Bidder if Owner believes that it would not be in the best interest of the Project to make an award to that Bidder. Owner also reserves the right to waive all informalities not involving price, time, or change in the Work and to negotiate contract terms with the Successful Bidder.

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 that 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. The Owner will consider

Bids irregular, and intends to reject them for any of the following substantial reasons:

- A. Bid Proposal not received prior to the specified deadline.
- B. Unsigned Bid Proposals.
- C. Bid Proposals which have items omitted by the Bidder.
- D. Post Bid monetary modification of Bid Proposals due to provable mistakes of fact.
- E. Post bid refusal to submit to specified bidding requirements, such as: MBE requirements, Subcontractor listing, etc.
- F. Altering a Bid as to specified time of commencement or completion of Work.
- G. Bid Proposal not accompanied by a security of character indicated or of an amount less than indicated.
- H. If the Bid Proposal is on a form other than that furnished by the Owner, or if the form is altered.
 - I. If there are unauthorized additions, conditional, or alternate Bids, or discrepancies of any kind which may tend to make the Bid Proposal incomplete, indefinite, or ambiguous as to its meaning.
- J. If the Bidder adds any provisions, reserving the right to accept or reject an award, or to enter into a Contract pursuant to an award.
- K. If the Bid Proposal does not contain a unit price for each pay item listed.
- L. If the Bid Proposal contains any erasure or alteration of written words or figures of unit prices not initialed in ink by the Bidder.
- M. Submitting more than one Bid.
- N. Failure to submit a bid on all schedules and alternates.
- O. Failure to provide proof of registration in SAM within 48 hours of Owner's request.

The Owner will consider Bids informal, but does not intend to reject them for the following minor reasons:

- A. Omission of dates when signed, or title of person signing.
- B. Failure to acknowledge an addendum, which does not affect quantity, quality, time, or price.
- C. Submission of a Bid in an unsealed envelope.
- D. Unit price Bid Proposals that include reconcilable arithmetic errors may be corrected if it does not change the unit price.
- E. Lump sum Bid Proposals which include reconcilable arithmetic errors may be corrected, if it does not change the amount on which the award will be based.

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

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

- 19.6 If the Contract is to be awarded, Owner will award to Bidder whose bid is in the best interests of the Project.
- 19.7 The award of contract will be to one CONTRACTOR and will be based on the lowest **Total** bid for the award options selected by the OWNER as required to meet available funding or other criteria.

20.0 CONTRACT SECURITY.

The successful BIDDER shall be required to furnish a contract performance bond, and a labor and materials payment bond, each in the amount of one hundred percent (100%) of the contract price as originally bid or subsequently modified. The surety company shall be authorized to do business in the State of Wyoming. The cost of the bonds shall be included in the Contractor's Bid Proposal. When the successful BIDDER delivers the executed Agreement to the OWNER, it must be accompanied by the required Construction Performance Bond and Construction Payment Bond on the forms included in this Project Manual. No exceptions will be made.

21.0 INSURANCE CERTIFICATES.

The successful BIDDER shall be required to furnish, with the executed Agreement, Insurance Certificates called for in the Supplementary Conditions.

22.0 UNEMPLOYMENT AND WORKERS' COMPENSATION INSURANCE

The successful BIDDER and all its subcontractors shall be required to furnish proof of registration with the Employment Security Commission and the Workers' Compensation Division as required by Wyoming Statutes, before a Notice to Proceed will be issued.

A current letter obtained directly from the Employment Security Commission and the Workers' Compensation Division shall be submitted as evidence of compliance with this requirement. Proof that the successful BIDDER and all Subcontractors are still registered at the time of completion of construction shall be submitted prior to Final Acceptance of the Project.

23.0 SIGNING OF AGREEMENT.

When the OWNER gives a Notice of Award to the successful BIDDER, it will be accompanied by the required number of unsigned counterparts of the Agreement with all other written Contract Documents attached. Within ten (10) days thereafter the CONTRACTOR shall sign and deliver the required number of counterparts of the Agreement and attached documents to the OWNER with the required Bonds. Within ten days thereafter, the OWNER shall deliver one fully signed counterpart to the CONTRACTOR and ENGINEER. No contract shall be considered as effective until it has been fully executed by all parties.

If the BIDDER to whom the Notice of Award is given does not properly execute the Agreement within the time allowed, the OWNER may withdraw the Notice of Award and the BIDDER will forfeit Bid Security.

Following the execution of the Contract by the OWNER and the CONTRACTOR, written Notice to Proceed with the Work shall be given by the OWNER to the CONTRACTOR. The Contract Time will commence to run with the Notice to Proceed. A Notice to Proceed may be given at any time within thirty days after the effective date of the Agreement.

24.0 PREBID CONFERENCE.

A prebid conference will be held at _____ on the _____ day of _____, 20____ in the Council Chambers on the 3rd floor of City Hall, Sheridan, Wyoming (unless another location is stated in the Special Provisions). Representatives of OWNER and ENGINEER will be present to discuss the project. The ENGINEER will transmit to all prospective Bidders of record, such Addenda as the ENGINEER considers necessary in response to questions arising at the conference.

25.0 SALES AND USE TAXES.

The CONTRACTOR must pay all State Sales and Use Tax on materials and equipment to be incorporated in the Work.

26.0 RETAINAGE.

Provisions concerning retainage are set forth in the Agreement.

27.0 STATE LAWS AND REGULATIONS.

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

1. The Bidder's attention is directed to Wyoming Statutes Annotated, 1977 republished edition, as amended to date, except on federally funded projects, or when in conflict with any Federal statutes, rules or regulations:
 - a. Section 16-6-101, defining a resident contractor.
 - b. Section 16-6-102, providing a preference of not more than five percent (5%) to the lowest responsible resident (Wyoming) Bidder (resident bidder's bid is not more than 5% higher than the lowest non-resident's bid).
 - c. Section 16-6-103, limiting subcontractors to non-resident contractors by a successful resident Bidder to thirty percent (30%) of the work.
 - d. Section 16-6-104, requiring preferences to Wyoming labor whenever possible, and Wyoming materials whenever of equal quality.
 - e. Section 16-6-110, limiting the employment of labor to eight hours in any calendar day or forty hours in any one week unless overtime is paid at the rate of one and one half times the hourly rate.
 - f. Section 16-6-201 through 206, the "Wyoming Preference Act of 1971", relating to the requirements and failure to employ state employees on public construction contracts, and providing a penalty for violation.

2. The BIDDER's attention is directed to Wyoming Statute 27-4-410, which requires CONTRACTOR and all Subcontractors to maintain accurate records of employee names, occupations and wages paid to employees. These records shall be sent to the Deputy Commissioner of Labor: 122 West 25th Street; Herschler Building; Cheyenne, Wyoming 82002, no later than thirty days after each pay period. Failure to comply with this section may result in the OWNER suspending all further payments until compliance is achieved. Violation of this section is subject to criminal sanctions.

28.0 FEDERAL REGISTRATION.

Bidders are advised that in addition to the proof of registration in the U.S. Government's System for Award Management (SAM) required at award, bidders will be required to provide proof of maintenance of said registration through the duration of the contract. Upon renewing the registration as required by SAM, proof of this renewal shall be provided to ENGINEER no later than thirty days after the renewal date.

END OF SECTION 00100

Project Identification: _____

CITY OF SHERIDAN, WYOMING

This Bid is submitted to:

CITY OF SHERIDAN
55 GRINNELL PLAZA
SHERIDAN, WYOMING 82801

1. The undersigned BIDDER proposes and agrees, if this Bid is accepted, to enter into an Agreement with the OWNER, in the form included in the Contract Documents, to perform and furnish all Work as specified or indicated in the Contract Documents for the Contract Price, and within the Contract Time indicated in this Bid, and in accordance with the other terms and conditions of the Contract Documents.
2. The BIDDER accepts all of the terms and conditions of the Advertisement for Bids, and Instructions to Bidders, including without limitation, those dealing with the disposition of Bid Security. This Bid will remain subject to acceptance for sixty (60) days after the day of the Bid Opening. The BIDDER will sign and submit the Agreement with the Construction Performance Bond and Payment Bond on the forms provided in this Project Manual, and other documents required by the Bidding Requirements, within fifteen days after the date of the OWNER'S Notice of Award.
3. In submitting this BID, BIDDER represents, as more fully set forth in the Agreement, that:
 - (a) BIDDER has examined copies of all the Bidding Documents, and of the following Addenda (receipt of all which is hereby acknowledged):

NUMBER	DATE
_____	_____
_____	_____
_____	_____

- (b) BIDDER has familiarized itself with the nature and extent of the Contract Documents, work, work site, locality, and all local conditions and Laws, Regulations, local laws or ordinances that in any manner may affect cost, progress, performance, or furnishing of the Work.
 - (c) BIDDER has given the ENGINEER written notice of all conflicts, errors, or discrepancies that it has discovered in the Contract Documents, and the written resolution thereof by the ENGINEER is acceptable to the BIDDER.
 - (d) This Bid is genuine and not made in the interest of, or on behalf of any undisclosed person, firm, or corporation, and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation; the BIDDER has not directly or indirectly induced or solicited any other BIDDER to submit a false or sham Bid; the BIDDER has not solicited or

PROJECT NAME

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

- 4. The BIDDER agrees to perform all the Work described in the Contract Documents and on the following Bid Schedule. The Method of Measurement and Basis of Payment shall be as specified in Section 01150 and the Project Manual.
- 5. The BIDDER hereby agrees to accept an award of a contract for the Bid Schedules as determined under Section 00100, paragraph 19.
- 6. The BIDDER agrees that the unit prices shall govern in checking the bid, and should a discrepancy exist in the sum of extended prices and Total Amount of Bid after extensions are checked and corrections made, if any, the sum of extended prices shall be used in considering the award of this Contract.
- 7. The BIDDER will complete the Work for the following unit or lump sum prices(s):
(insert bid schedule)
- 8. The BIDDER understands that the OWNER reserves the right to reject any or all bids or to waive any informality or technicality in any proposal in the interest of the OWNER. If an award is made, it will be made to the lowest bidder that is determined qualified and responsible at the sole discretion of the OWNER.
- 9. BIDDER agrees that the Work _____ for CITY OF SHERIDAN, WYOMING, will be substantially complete in accordance with paragraph 3.1 of the Agreement. BIDDER accepts the provisions of the Agreement as to liquidated damages, in the event of failure to complete the Work on time.
- 10. The following documents are attached to and made a condition of this bid:
 - (a) Required Bid Security in the form of _____
 - i. For bids less than \$100,000, a certified check, cashier's check or draft drawn on a State or National Bank in the amount of five percent (5%) of the total bid may be utilized.
 - ii. For bids greater than \$100,000, a Bid Bond, prepared on the form provided in the Project Manual, issued by a Surety authorized to do business in the State of Wyoming and acceptable to the OWNER in the amount of five percent (5%) of the total bid must be utilized.
 - (b) BIDDER'S list of construction equipment with hourly rates, owned or rented, that will be used in the performance of the Work.
 - (c) BIDDER'S list of hourly labor rates for construction personnel that will be in place during the performance of the Work.
 - (d) Proof of BIDDER'S registration in the U.S. Government's System for Award Management (SAM) is not required as an attachment to this bid, but will be required before award, within 48 hours of OWNER'S request.
- 11. Communications concerning this Bid shall be addressed to:

Contractor _____
 Address _____
 City/State/Zip _____

Phone _____

Fax _____

E-mail _____

12. The terms used in this Bid, which are defined in the General Conditions of the Construction Contract included as part of the Contract Documents, have the meanings assigned to them in the General Conditions.

SUBMITTED ON _____, 20____

BY _____
Name (Individual, Partnership, Corporation, or Joint Venture)

(State of Residency)

BY _____
(Name of Person Authorized to Sign) (Signature and Printed)

(Title)

Corporate Seal (If Applicable)

Attest _____
(Secretary)

Business Address: _____

Phone No.: _____ Fax No. _____

License No.: _____

Email Address: _____

ANTICIPATED SUBCONTRACTORS

- 1. Type of Work to be Sublet _____

 Approximate Dollar Amount of Subcontract \$ _____
 Probable Subcontractor _____
 Address _____

- 2. Type of Work to be Sublet _____

 Approximate Dollar Amount of Subcontract \$ _____
 Probable Subcontractor _____
 Address _____

- 3. Type of Work to be Sublet _____

 Approximate Dollar Amount of Subcontract \$ _____
 Probable Subcontractor _____
 Address _____

Statement of Qualifications: The CONTRACTOR shall submit a statement of each subcontractor's qualifications and shall obtain written permission from the OWNER prior to the actual subletting or assignment of any portion of the contract as per Section 7.06 of the General Conditions.

PREVIOUS EXPERIENCE OF BIDDER

SIMILAR PROJECTS COMPLETED (List at least three)

1. DATE_____ VALUE_____

 Name of Project, Address, Type of Improvement _____

Name/Phone of Owner _____

Name/Phone of Engineer _____

2. DATE_____ VALUE_____

 Name of Project, Address, Type of Improvement _____

Name/Phone of Owner _____

Name/Phone of Engineer _____

3. DATE_____ VALUE_____

 Name of Project, Address, Type of Improvement _____

Name/Phone of Owner _____

Name/Phone of Engineer _____

SIMILAR PROJECTS UNDER CONTRACT

DATE _____ VALUE _____

Name of Project, Address, Type of Improvement _____

Name/Phone of Owner _____

Name/Phone of Engineer _____

END OF SECTION 00300

PROJECT NAME
DIVISION 0 - BIDDING AND CONTRACT REQUIREMENTS
SECTION 00410 - BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, _____
_____ as BIDDER, and _____ as Surety, are
hereby held and firmly bound unto CITY OF SHERIDAN, WYOMING, as OWNER, in the penal sum
_____ for payment of which, well and truly to be
made, we hereby jointly and severally bind ourselves, successors and assigns.

The Condition of the above obligation is such that whereas the BIDDER has submitted to CITY OF
SHERIDAN, WYOMING a certain BID, attached hereto, and hereby made a part hereof, to enter into
a Contract in writing, for the construction of the **CITY OF SHERIDAN, WYOMING**, _____
_____ (Project).

NOW, THEREFORE,

- (a) If said BID shall be rejected, or
- (b) If said BID shall be accepted, and the BIDDER shall execute and deliver a Contract in the
Form of Contract attached hereto (properly completed in accordance with said BID), and
shall furnish a BOND for his or her faithful performance of said Contract, and furnish a
BOND for the payment of all persons performing labor or furnishing materials in connection
therewith, and shall in all other respects perform the agreement created by the acceptance
of said BID,

Then this obligation shall be void, otherwise the same shall remain in force and effect; it being
expressly understood and agreed that the liability of the Surety for any and all claims hereunder
shall, in no event, exceed the penal amount of this obligation as herein stated. The Bond shall be
forfeited as liquidated damages, if the Bidder, upon the award of the Contract to them, fails to enter
into the Contract within 15 (fifteen) days after it is presented to them for that purpose, or fails to
proceed with the performance of the Contract.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and
its BOND shall be in no way impaired or affected by any extension of the time within which the
OWNER may accept such BID; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the BIDDER and the Surety have hereunto set their hands and seals, and
such of them as are corporations have caused their corporate seals to be hereto affixed and these
presents to be signed by their proper officers.

Signed and sealed this _____ day of _____, 20_____.

_____(SEAL)
(BIDDER)

BY: _____
(Title)

(Witness)

(Surety)

BY: _____
(Attorney-in-Fact)

END OF SECTION 00410

PROJECT NAME
DIVISION 0 - BIDDING AND CONTRACT REQUIREMENTS
SECTION 00500 - AGREEMENT

THIS AGREEMENT is by and between the City of Sheridan (hereinafter called OWNER), and _____ (hereinafter called CONTRACTOR).

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

ARTICLE 1. WORK.

CONTRACTOR shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows:

ARTICLE 2. ENGINEER.

The Project has been designed by: _____ who is hereinafter called ENGINEER, and who is to act as the OWNER's representative, assume all duties and responsibilities, and have the rights and authority assigned to ENGINEER in the Contract Documents in connection with completion of the Work in accordance with the Contract Documents.

ARTICLE 3. CONTRACT TIME.

- 3.1 Substantial Completion of the Work will be completed within _____ calendar days after the Notice to Proceed. Final payment will be withheld until final completion and acceptance of the Work as stipulated in paragraph 5.2 of the Agreement and all project closeout paperwork is completed. Final completion is to be within _____ days of Substantial Completion.
- 3.2 Liquidated Damages. The OWNER and CONTRACTOR recognize that time is of the essence of this Agreement, and that the OWNER will suffer financial loss if the Work is not completed within the times specified in paragraph 3.1 above, plus any extensions thereof allowed, in accordance with Article 12 of the General Conditions. They also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by the OWNER if the Work is not completed on time.

Accordingly, instead of requiring any such proof, the OWNER and CONTRACTOR agree that, as liquidated damages for delay, (but not as a penalty), the CONTRACTOR shall pay the OWNER \$ _____, for each calendar day that expires after the time specified in paragraph 3.1 for Substantial Completion, until the Work is substantially complete. After Substantial Completion, if the CONTRACTOR shall neglect, refuse, or fail to complete the remaining Work within the Contract Time or any proper extension thereof granted by the OWNER, the CONTRACTOR shall pay the OWNER \$ _____, for each calendar day that expires after the time specified in paragraph 3.1 for final completion and readiness for final payment of all work.

ARTICLE 4. CONTRACT PRICE.

The OWNER shall pay the CONTRACTOR for completion of the Work, in accordance with the Contract Documents according to the Bid, which is attached as an Exhibit. The total awarded sum is \$ _____. The total price can vary due to the actual quantities of the unit price items installed, or due to Change Orders. Measurement and payment for bid items shall be per section 01150 and the Project Manual.

ARTICLE 5. PAYMENT PROCEDURES.

The CONTRACTOR shall submit Applications for Payment in accordance with Article 15 of the General Conditions. Applications for Payment will be processed by the ENGINEER, as provided in the General Conditions.

5.1 Progress Payments. OWNER will make progress payments based on the CONTRACTOR'S Applications for Payment as prepared by CONTRACTOR and recommended by the ENGINEER, based on work completed through the 20th (twentieth) day of each month during construction as provided below. All progress payments will be on the basis of the progress of the Work measured by the number of units of each bid item completed times the unit price bid in the Unit Price Schedule for that item. The number of units completed shall be measured in accordance with Section 01150 of the Contract Documents. The schedule of values is provided for in Article 14 of the General Conditions and Section 01300, in accordance with W.S. 16-6-702. Payments will be made according to the General Conditions and the Supplementary Conditions to the General Conditions.

5.1.1 The OWNER shall retain ten (10) percent of the amount of each payment until final completion and acceptance of all Work covered by the Contract Documents. The OWNER at any time, however, after fifty (50) percent of the Work has been completed, may eliminate retainage on the remaining estimates, as long as the character and progress of the work is satisfactory to the OWNER and ENGINEER. The OWNER also retains the right to reinstate 10% withholding.

5.1.2 Upon Substantial Completion, progress payments will be made in an amount sufficient to increase total payments to the CONTRACTOR to 95% of the Contract Price or actual work completed (if less than contract price) or as long as there are no outstanding change orders (not resolved), less such amounts as the ENGINEER shall determine, or the OWNER may withhold, in accordance with the General Conditions.

5.2 Final Payment. Upon final completion and acceptance of the Work in accordance with paragraph 14.07 of the General Conditions and Special Conditions 14.07 and the completion of all closeout paperwork, OWNER shall pay the remainder of the Contract Price as recommended by ENGINEER as provided in 14.07 in accordance with W.S. 16-6-116 and 16-6-117.

ARTICLE 6. INTEREST.

All moneys not paid when due, as provided in Article 14 of the General Conditions, shall bear interest at a maximum rate allowed by law, not to exceed 1% per month.

ARTICLE 7. CONTRACTOR'S REPRESENTATIVES.

In order to induce the OWNER to enter into this Agreement, the CONTRACTOR makes the following representations:

- 7.1 CONTRACTOR has familiarized itself with the nature and extent of the Contract Documents, Work, site, locality, and all local conditions and Laws and Regulations that in any manner may affect cost, progress, performance, or furnishing of the Work.
- 7.2 CONTRACTOR has studied carefully all reports of investigations and tests of latent physical conditions at the site or otherwise affecting cost, progress or performance of the Work which were relied upon by ENGINEER in the preparation of the Drawings and Specifications and which have been identified in the Contract Documents.
- 7.3 CONTRACTOR has made or caused to be made examinations, investigations and tests and studies of such reports and related data in addition to those referred to above as he or she deems necessary for the performance of the Work at the Contract Price, within the Contract Time, and in accordance with the other terms and conditions of the Contract Documents; and no additional examinations, investigations, tests, reports or similar data are or will be required by CONTRACTOR for such purposes.
- 7.4 CONTRACTOR has correlated the results of all such observations, examinations, investigations, tests, reports and data with the terms and conditions of the Contract Documents.
- 7.5 CONTRACTOR has carefully reviewed and checked all information and data shown or indicated on the Contract Documents, with respect to existing Underground Facilities at or contiguous to the site, and assumes responsibility for the accurate location of said Underground Facilities.
- 7.6 CONTRACTOR has given ENGINEER written notice of all conflicts, errors, or discrepancies that he or she has discovered in the Contract Documents, and the written resolution thereof by the ENGINEER is acceptable to the CONTRACTOR.

ARTICLE 8. CONTRACT DOCUMENTS.

The Contract Documents, which comprise the entire agreement between the OWNER and the CONTRACTOR concerning the Work, consists of the following:

- 8.1 This Agreement.
- 8.2 Performance Bond and Labor and Materials Payment Bond.
- 8.3 Notice of Award.
- 8.4 General Conditions and Supplementary Conditions to the General Conditions.
- 8.5 Technical Specifications, as listed in table of contents thereof, including Division 1, General Requirements.
- 8.6 Plans.

- 8.7 Addenda listed on the Bid forms.
- 8.8 Instructions to Bidders
- 8.9 CONTRACTOR'S executed Bid forms.
- 8.10 Documentation submitted by CONTRACTOR and accepted by the ENGINEER prior to Notice of Award.
- 8.11 Any Modification, including Change Orders, duly delivered after execution of Agreement.

There are no Contract Documents, other than those listed above, in this Article 8. The Contract Documents may only be amended, modified, or supplemented, as provided in article 3 of the General Conditions.

The Contract Documents listed above are intended to be complementary and to describe and provide for a complete work. The CONTRACTOR will not take advantage of an apparent error or omission in the plans and specifications. If the CONTRACTOR discovers such an error or omission, he or she will immediately notify the ENGINEER. The ENGINEER will then make such corrections and interpretations as may be deemed necessary for fulfilling the intent of the Contract Documents.

ARTICLE 9. MISCELLANEOUS.

- 9.1 Terms used in this Agreement which are defined in Article 1 of the General Conditions will have the meanings indicated in the General Conditions.
- 9.2 No assignment by a party hereto of any rights under, or interests in the Contract Documents will be binding on another party hereto without the written consent of the party sought to be bound; and specifically, but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.
- 9.3 The OWNER and the CONTRACTOR each binds itself, its partners, successors, assigns, and legal representatives to the other party hereto, its partners, successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.
- 9.4 The OWNER does not waive its sovereign immunity by entering into this Agreement, and specifically retains all immunities and defenses available to it as a sovereign pursuant to W.S. 1-39-104(a) and all other state laws.
- 9.5 Pursuant to the laws of the State of Wyoming, reference is hereby made to W.S. 15-1-113 which is made a part of this Agreement.
- 9.6 Resident Wyoming labor, workmen and mechanics shall be used upon work for the erection, construction, alteration or repair of any public building or other public structure or for making any addition thereto or for any public work or improvement, except other labors may be used when Wyoming labors may not be available for the employment from within the State or are not qualified to perform the work involved.
- 9.7 Wyoming materials and products of equal quality and desirability shall have preference over materials and products produced outside the State of Wyoming.

ARTICLE 10. OTHER PROVISIONS.

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

This Agreement is effective on the date of the last signature below.

CITY OF SHERIDAN, WY

CONTRACTOR _____

By: _____

By: _____

Print Name: _____

Print Name: _____

Title: _____

Title: _____

Date: _____

Date: _____

Attest: _____

Attest: _____

Address for giving notices:

Address for giving notices:

P.O. Box 848

Sheridan, WY 82801

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

END OF SECTION 00500

PROJECT NAME
DIVISION 0 - BIDDING AND CONTRACT REQUIREMENTS
SECTION 00610 - PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: that

(Name of Contractor)

(Address of Contractor)

a _____, hereinafter called CONTRACTOR and
(Corporation, Partnership, or Individual)

(Name of Surety)

(Address of Surety)

hereinafter called Surety, are held and firmly bound unto

City of Sheridan

(Name of Owner)

55 Grinnell Plaza, Sheridan, WY 82801

(Address of Owner)

hereinafter called OWNER, in the penal sum of _____
_____ Dollars, (\$_____)

in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the CONTRACTOR entered into a certain contract with the OWNER, dated the _____ day of _____, 20____, a copy of which is hereto attached and made a part hereof for the construction of: _____

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

PROVIDED, FURTHER, that the said Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or the Work to be performed thereunder or the specifications accompanying the same shall in any way affect its obligation on the BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the Work or to the specifications.

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

IN WITNESS WHEREOF, this instrument is executed in three (3) counterparts, each one of which shall be deemed an original, this the _____ day of _____ 20____.

ATTEST:

Witness as to CONTRACTOR

(SEAL)

(Address)

CONTRACTOR
By: _____

(Address)

ATTEST:

Witness as to Surety

(SEAL)

(Address)

Surety
By: _____
Attorney-In-Fact

(Address)

NOTE: Date of BOND must not be prior to date of Contract. If CONTRACTOR is Partnership, all partners shall execute BOND.

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the PROJECT is located.

END OF SECTION 00610

PROJECT NAME
DIVISION 0 - BIDDING AND CONTRACT REQUIREMENTS
SECTION 00620 - LABOR AND MATERIALS PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: that

(Name of Contractor)

(Address of Contractor)

a _____, hereinafter called CONTRACTOR and
(Corporation, Partnership, or Individual)

(Name of Surety)

(Address of Surety)

hereinafter called Surety, are held and firmly bound unto

City of Sheridan

(Name of Owner)

55 Grinnell Plaza, Sheridan, WY 82801

(Address of Owner)

hereinafter called OWNER, in the penal sum of _____
_____ Dollars, (\$ _____) in lawful money
of the United States, for the payment of which sum well and truly to be made, we bind ourselves,
successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the CONTRACTOR entered into a
certain contract with the OWNER, dated the _____ day of _____ 20____, a copy of
which is hereto attached and made a part hereof for the construction of: _____

NOW, THEREFORE, if the CONTRACTOR shall promptly make payment to all persons, firms,
subcontractors, and corporations furnishing materials for or performing labor in the prosecution of
the Work provided for in such contract, and any authorized extension or modification thereof,
including all amounts due for materials, lubricants, oil, gasoline, diesel, repairs on machinery,
equipment and tools, consumed or used in connection with the construction of such Work, and all
insurance premiums on said Work, and for all labor, performed in such Work whether by
subcontractor or otherwise, then this obligation shall be void; otherwise, it shall remain in full force
and effect.

PROVIDED, FURTHER, that the said Surety, for value received hereby stipulates and agrees that
no change, extension of time, alteration or addition to the terms of the contract or the Work to be
performed thereunder or the specifications accompanying the same shall in any way affect its
obligation on the BOND, and it does hereby waive notice of any such change, extension of time,
alteration or addition to the terms of the contract or to the Work or to the specifications.

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

IN WITNESS WHEREOF, this instrument is executed in three (3) counterparts, each one of which shall be deemed an original, this the _____ day of _____ 20_____.

ATTEST: _____
Witness as to CONTRACTOR

By: _____
CONTRACTOR

(SEAL)

(Address)

(Address)

ATTEST: _____
(Witness as to Surety)

By: _____
(Surety)
(Attorney-In-Fact)

(SEAL)

(Address)

(Address)

NOTE: Date of BOND must not be prior to date of Contract. If CONTRACTOR is Partnership, all partners shall execute BOND.

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the PROJECT is located.

END OF SECTION 00620

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by



Issued and Published Jointly by



These General Conditions have been prepared for use with the Agreement Between Owner and Contractor for Construction Contract (EJCDC® C-520, Stipulated Sum, or C-525, Cost-Plus, 2013 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other.

To prepare supplementary conditions that are coordinated with the General Conditions, use EJCDC's Guide to the Preparation of Supplementary Conditions (EJCDC® C-800, 2013 Edition). The full EJCDC Construction series of documents is discussed in the Commentary on the 2013 EJCDC Construction Documents (EJCDC® C-001, 2013 Edition).

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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.
 3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 5. *Bidder*—An individual or entity that submits a Bid to Owner.
 6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.
 7. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.
 8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.
 9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.
 10. *Claim*—(a) A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein: seeking an adjustment of Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract; or (b) a demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal; or seeking resolution of a contractual issue that Engineer

has declined to address. A demand for money or services by a third party is not a Claim.

11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to (a) the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§9601 et seq. (“CERCLA”); (b) the Hazardous Materials Transportation Act, 49 U.S.C. §§5101 et seq.; (c) the Resource Conservation and Recovery Act, 42 U.S.C. §§6901 et seq. (“RCRA”); (d) the Toxic Substances Control Act, 15 U.S.C. §§2601 et seq.; (e) the Clean Water Act, 33 U.S.C. §§1251 et seq.; (f) the Clean Air Act, 42 U.S.C. §§7401 et seq.; or (g) any other federal, state, or local statute, law, rule, regulation, ordinance, resolution, code, order, or decree regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.
12. *Contract*—The entire and integrated written contract between the Owner and Contractor concerning the Work.
13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.
14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents. .
15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.
16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.
17. *Cost of the Work*—See Paragraph 13.01 for definition.
18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.
19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.
20. *Engineer*—The individual or entity named as such in the Agreement.
21. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.
22. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated in the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, does not establish a Hazardous Environmental Condition.
23. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

24. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.
25. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date or by a time prior to Substantial Completion of all the Work.
26. *Notice of Award*—The written notice by Owner to a Bidder of Owner’s acceptance of the Bid.
27. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.
28. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.
29. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor’s plan to accomplish the Work within the Contract Times.
30. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.
31. *Project Manual*—The written documents prepared for, or made available for, procuring and constructing the Work, including but not limited to the Bidding Documents or other construction procurement documents, geotechnical and existing conditions information, the Agreement, bond forms, General Conditions, Supplementary Conditions, and Specifications. The contents of the Project Manual may be bound in one or more volumes.
32. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative or “RPR” includes any assistants or field staff of Resident Project Representative.
33. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.
34. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer’s review of the submittals and the performance of related construction activities.
35. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor’s Applications for Payment.
36. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.

37. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands furnished by Owner which are designated for the use of Contractor.
38. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.
39. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.
40. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion thereof.
41. *Successful Bidder*—The Bidder whose Bid the Owner accepts, and to which the Owner makes an award of contract, subject to stated conditions.
42. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.
43. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.
44. *Technical Data*—Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (a) subsurface conditions at the Site, or physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) or (b) Hazardous Environmental Conditions at the Site. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then the data contained in boring logs, recorded measurements of subsurface water levels, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical or environmental report prepared for the Project and made available to Contractor are hereby defined as Technical Data with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06.
45. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including but not limited to those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, fiber optic transmissions, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
46. *Unit Price Work*—Work to be paid for on the basis of unit prices.
47. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

48. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 Terminology

- A. The words and terms discussed in the following paragraphs are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. *Intent of Certain Terms or Adjectives:*
1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.
- C. *Day:*
1. The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.
- D. *Defective:*
1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - a. does not conform to the Contract Documents; or
 - b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 - c. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or 15.04).
- E. *Furnish, Install, Perform, Provide:*
1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
 2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
 4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.
- F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

- A. *Bonds*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.
- B. *Evidence of Contractor’s Insurance*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract), the certificates and other evidence of insurance required to be provided by Contractor in accordance with Article 6.
- C. *Evidence of Owner’s Insurance*: After receipt of the executed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or otherwise), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

- A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully executed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.
- B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

2.03 *Before Starting Construction*

- A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise specifically required by the Contract Documents), Contractor shall submit to Engineer for timely review:
 1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;
 2. a preliminary Schedule of Submittals; and

3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *Initial Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.03.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.
 1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
 2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
 3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

2.06 *Electronic Transmittals*

- A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may transmit, and shall accept, Project-related correspondence, text, data, documents, drawings, information, and graphics, including but not limited to Shop Drawings and other submittals, in electronic media or digital format, either directly, or through access to a secure Project website.
- B. If the Contract does not establish protocols for electronic or digital transmittals, then Owner, Engineer, and Contractor shall jointly develop such protocols.
- C. When transmitting items in electronic media or digital format, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the recipient's use of software application packages, operating systems, or

computer hardware differing from those used in the drafting or transmittal of the items, or from those established in applicable transmittal protocols.

ARTICLE 3 – DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents.
- C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic or digital versions of the Contract Documents (including any printed copies derived from such electronic or digital versions) and the printed record version, the printed record version shall govern.
- D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.
- E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.

3.02 *Reference Standards*

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

3.03 *Reporting and Resolving Discrepancies*

- A. *Reporting Discrepancies:*
 - 1. *Contractor's Verification of Figures and Field Measurements:* Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict,

error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.

2. *Contractor's Review of Contract Documents:* If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies:*

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

3.04 *Requirements of the Contract Documents*

- A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work thereunder.
- B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.
- C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly give written notice to Owner and Contractor that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

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

ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

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

4.02 *Starting the Work*

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

4.03 *Reference Points*

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

4.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.
 - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 11.
- B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

- A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Times and Contract Price. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.
- C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:
1. severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
 2. abnormal weather conditions;
 3. acts or failures to act of utility owners (other than those performing other work at or adjacent to the Site by arrangement with the Owner, as contemplated in Article 8); and
 4. acts of war or terrorism.
- D. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5.
- E. Paragraph 8.03 governs delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.
- F. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor.

- G. Contractor must submit any Change Proposal seeking an adjustment in Contract Price or Contract Times under this paragraph within 30 days of the commencement of the delaying, disrupting, or interfering event.

ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.
- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 *Use of Site and Other Areas*

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

- 1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.
- 2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.12, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or at law; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part

by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

- B. *Removal of Debris During Performance of the Work:* During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.
- C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.
- D. *Loading of Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

- A. *Reports and Drawings:* The Supplementary Conditions identify:
 - 1. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site;
 - 2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities); and
 - 3. Technical Data contained in such reports and drawings.
- B. *Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:
 - 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
 - 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
 - 3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

5.04 *Differing Subsurface or Physical Conditions*

- A. *Notice by Contractor:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site either:
1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate; or
 2. is of such a nature as to require a change in the Drawings or Specifications; or
 3. differs materially from that shown or indicated in the Contract Documents; or
 4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

- B. *Engineer's Review:* After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine the necessity of Owner's obtaining additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A above; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- C. *Owner's Statement to Contractor Regarding Site Condition:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.
- D. *Possible Price and Times Adjustments:*
1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, or both, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. such condition must fall within any one or more of the categories described in Paragraph 5.04.A;
 - b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,

- c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
 - a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise; or
 - b. the existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or
 - c. Contractor failed to give the written notice as required by Paragraph 5.04.A.
 3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
 4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

5.05 *Underground Facilities*

- A. *Contractor's Responsibilities:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or adjacent to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:
 1. Owner and Engineer do not warrant or guarantee the accuracy or completeness of any such information or data provided by others; and
 2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
 - a. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
 - b. locating all Underground Facilities shown or indicated in the Contract Documents as being at the Site;
 - c. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
 - d. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. *Notice by Contractor:* If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, then Contractor shall, promptly after

becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer.

- C. *Engineer's Review:* Engineer will promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the Underground Facility in question; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and advise Owner in writing of Engineer's findings, conclusions, and recommendations. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
- D. *Owner's Statement to Contractor Regarding Underground Facility:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question, addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.
- E. *Possible Price and Times Adjustments:*
 - 1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, or both, to the extent that any existing Underground Facility at the Site that was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated the existence or actual location of the Underground Facility in question;
 - b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;
 - c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times; and
 - d. Contractor gave the notice required in Paragraph 5.05.B.
 - 2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
 - 3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

5.06 *Hazardous Environmental Conditions at Site*

- A. *Reports and Drawings*: The Supplementary Conditions identify:
1. those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
 2. Technical Data contained in such reports and drawings.
- B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
 2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
 3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.
- D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.
- E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.

- F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
- G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off.
- H. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.
- I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6 – BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of all of Contractor's obligations under the Contract. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the Supplementary Conditions, or other specific provisions of the Contract. Contractor shall also furnish such other bonds as are required by the Supplementary Conditions or other specific provisions of the Contract.
- B. All bonds shall be in the form prescribed by the Contract except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (as amended and supplemented) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.
- C. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds in the required amounts.
- D. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or its right to do business is terminated in any state or jurisdiction where any part of the Project is located, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the bond and surety requirements above.
- E. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.
- F. Upon request, Owner shall provide a copy of the payment bond to any Subcontractor, Supplier, or other person or entity claiming to have furnished labor or materials used in the performance of the Work.

6.02 *Insurance—General Provisions*

- A. Owner and Contractor shall obtain and maintain insurance as required in this Article and in the Supplementary Conditions.
- B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.
- C. Contractor shall deliver to Owner, with copies to each named insured and additional insured (as identified in this Article, in the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Contractor has obtained and is

maintaining the policies, coverages, and endorsements required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

- D. Owner shall deliver to Contractor, with copies to each named insured and additional insured (as identified in this Article, the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Owner has obtained and is maintaining the policies, coverages, and endorsements required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Owner may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.
- E. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, shall not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.
- F. If either party does not purchase or maintain all of the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.
- G. If Contractor has failed to obtain and maintain required insurance, Owner may exclude the Contractor from the Site, impose an appropriate set-off against payment, and exercise Owner's termination rights under Article 16.
- H. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price shall be adjusted accordingly.
- I. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests.
- J. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner and other individuals and entities in the Contract.

6.03 *Contractor's Insurance*

- A. *Workers' Compensation:* Contractor shall purchase and maintain workers' compensation and employer's liability insurance for:
 - 1. claims under workers' compensation, disability benefits, and other similar employee benefit acts.
 - 2. United States Longshoreman and Harbor Workers' Compensation Act and Jones Act coverage (if applicable).
 - 3. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees (by stop-gap endorsement in monopolist worker's compensation states).

4. Foreign voluntary worker compensation (if applicable).
- B. *Commercial General Liability—Claims Covered:* Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against:
1. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees.
 2. claims for damages insured by reasonably available personal injury liability coverage.
 3. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.
- C. *Commercial General Liability—Form and Content:* Contractor's commercial liability policy shall be written on a 1996 (or later) ISO commercial general liability form (occurrence form) and include the following coverages and endorsements:
1. Products and completed operations coverage:
 - a. Such insurance shall be maintained for three years after final payment.
 - b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.
 2. Blanket contractual liability coverage, to the extent permitted by law, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.
 3. Broad form property damage coverage.
 4. Severability of interest.
 5. Underground, explosion, and collapse coverage.
 6. Personal injury coverage.
 7. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together); or CG 20 10 07 04 and CG 20 37 07 04 (together); or their equivalent.
 8. For design professional additional insureds, ISO Endorsement CG 20 32 07 04, "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.
- D. *Automobile liability:* Contractor shall purchase and maintain automobile liability insurance against claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy shall be written on an occurrence basis.
- E. *Umbrella or excess liability:* Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the paragraphs above. Subject to industry-standard exclusions, the coverage afforded shall follow form as to each and every one of the underlying policies.
- F. *Contractor's pollution liability insurance:* Contractor shall purchase and maintain a policy covering third-party injury and property damage claims, including clean-up costs, as a result

of pollution conditions arising from Contractor's operations and completed operations. This insurance shall be maintained for no less than three years after final completion.

- G. *Additional insureds*: The Contractor's commercial general liability, automobile liability, umbrella or excess, and pollution liability policies shall include and list as additional insureds Owner and Engineer, and any individuals or entities identified in the Supplementary Conditions; include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds; and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby (including as applicable those arising from both ongoing and completed operations) on a non-contributory basis. Contractor shall obtain all necessary endorsements to support these requirements.
- H. *Contractor's professional liability insurance*: If Contractor will provide or furnish professional services under this Contract, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance shall provide protection against claims arising out of performance of professional design or related services, and caused by a negligent error, omission, or act for which the insured party is legally liable. It shall be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. If such professional design services are performed by a Subcontractor, and not by Contractor itself, then the requirements of this paragraph may be satisfied through the purchasing and maintenance of such insurance by such Subcontractor.
- I. *General provisions*: The policies of insurance required by this Paragraph 6.03 shall:
1. include at least the specific coverages provided in this Article.
 2. be written for not less than the limits of liability provided in this Article and in the Supplementary Conditions, or required by Laws or Regulations, whichever is greater.
 3. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed, or renewal refused until at least 10 days prior written notice has been given to Contractor. Within three days of receipt of any such written notice, Contractor shall provide a copy of the notice to Owner, Engineer, and each other insured under the policy.
 4. remain in effect at least until final payment (and longer if expressly required in this Article) and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract Documents.
 5. be appropriate for the Work being performed and provide protection from claims that may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable.
- J. The coverage requirements for specific policies of insurance must be met by such policies, and not by reference to excess or umbrella insurance provided in other policies.

6.04 *Owner's Liability Insurance*

- A. In addition to the insurance required to be provided by Contractor under Paragraph 6.03, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.
- B. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.

6.05 *Property Insurance*

- A. *Builder's Risk*: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the full insurable replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:
 - 1. include the Owner and Contractor as named insureds, and all Subcontractors, and any individuals or entities required by the Supplementary Conditions to be insured under such builder's risk policy, as insureds or named insureds. For purposes of the remainder of this Paragraph 6.05, Paragraphs 6.06 and 6.07, and any corresponding Supplementary Conditions, the parties required to be insured shall collectively be referred to as "insureds."
 - 2. be written on a builder's risk "all risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire; lightning; windstorm; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; flood; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; water damage (other than that caused by flood); and such other perils or causes of loss as may be specifically required by the Supplementary Conditions. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; or flood, are not commercially available under builder's risk policies, by endorsement or otherwise, such insurance may be provided through other insurance policies acceptable to Owner and Contractor.
 - 3. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.
 - 4. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects).

5. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier).
 6. extend to cover damage or loss to insured property while in transit.
 7. allow for partial occupation or use of the Work by Owner, such that those portions of the Work that are not yet occupied or used by Owner shall remain covered by the builder's risk insurance.
 8. allow for the waiver of the insurer's subrogation rights, as set forth below.
 9. provide primary coverage for all losses and damages caused by the perils or causes of loss covered.
 10. not include a co-insurance clause.
 11. include an exception for ensuing losses from physical damage or loss with respect to any defective workmanship, design, or materials exclusions.
 12. include performance/hot testing and start-up.
 13. be maintained in effect, subject to the provisions herein regarding Substantial Completion and partial occupancy or use of the Work by Owner, until the Work is complete.
- B. *Notice of Cancellation or Change:* All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 6.05 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured.
- C. *Deductibles:* The purchaser of any required builder's risk or property insurance shall pay for costs not covered because of the application of a policy deductible.
- D. *Partial Occupancy or Use by Owner:* If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide notice of such occupancy or use to the builder's risk insurer. The builder's risk insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy; rather, those portions of the Work that are occupied or used by Owner may come off the builder's risk policy, while those portions of the Work not yet occupied or used by Owner shall remain covered by the builder's risk insurance.
- E. *Additional Insurance:* If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.05, it may do so at Contractor's expense.
- F. *Insurance of Other Property:* If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, such as tools, construction equipment, or other personal property owned by Contractor, a Subcontractor, or an employee of Contractor or a Subcontractor, then the entity or individual owning such property item will be responsible for deciding whether to insure it, and if so in what amount.

6.06 *Waiver of Rights*

- A. All policies purchased in accordance with Paragraph 6.05, expressly including the builder's risk policy, shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all Subcontractors, all individuals or entities identified in the Supplementary Conditions as insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.
- B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for:
 - 1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and
 - 2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06.
- C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 6.06.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them.
- D. Contractor shall be responsible for assuring that the agreement under which a Subcontractor performs a portion of the Work contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by builder's risk insurance and any other property insurance applicable to the Work.

6.07 *Receipt and Application of Property Insurance Proceeds*

- A. Any insured loss under the builder's risk and other policies of insurance required by Paragraph 6.05 will be adjusted and settled with the named insured that purchased the

policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.

- B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.05 shall distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.
- C. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the money so received applied on account thereof, and the Work and the cost thereof covered by Change Order, if needed.

ARTICLE 7 – CONTRACTOR'S RESPONSIBILITIES

7.01 *Supervision and Superintendence*

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

7.02 *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.
- B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.03 *Services, Materials, and Equipment*

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.
- B. All materials and equipment incorporated into the Work shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and

guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

- C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.04 "Or Equals"

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment, or items from other proposed suppliers under the circumstances described below.
 - 1. If Engineer in its sole discretion determines that an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer shall deem it an "or equal" item. For the purposes of this paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that:
 - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
 - 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
 - 3) it has a proven record of performance and availability of responsive service; and
 - 4) it is not objectionable to Owner.
 - b. Contractor certifies that, if approved and incorporated into the Work:
 - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.
- B. *Contractor's Expense:* Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.
- C. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal", which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.

- D. *Effect of Engineer's Determination:* Neither approval nor denial of an "or-equal" request shall result in any change in Contract Price. The Engineer's denial of an "or-equal" request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents.
- E. *Treatment as a Substitution Request:* If Engineer determines that an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer considered the proposed item as a substitute pursuant to Paragraph 7.05.

7.05 *Substitutes*

- A. Unless the specification or description of an item of material or equipment required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment under the circumstances described below. To the extent possible such requests shall be made before commencement of related construction at the Site.
 - 1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of material or equipment from anyone other than Contractor.
 - 2. The requirements for review by Engineer will be as set forth in Paragraph 7.05.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.
 - 3. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:
 - a. shall certify that the proposed substitute item will:
 - 1) perform adequately the functions and achieve the results called for by the general design,
 - 2) be similar in substance to that specified, and
 - 3) be suited to the same use as that specified.
 - b. will state:
 - 1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times,
 - 2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and
 - 3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.
 - c. will identify:
 - 1) all variations of the proposed substitute item from that specified, and

- 2) available engineering, sales, maintenance, repair, and replacement services.
 - d. shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.
- B. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.
- C. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- D. *Reimbursement of Engineer's Cost:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
- E. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute at Contractor's expense.
- F. *Effect of Engineer's Determination:* If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.05.D, by timely submittal of a Change Proposal.

7.06 *Concerning Subcontractors, Suppliers, and Others*

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner.
- B. Contractor shall retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of designated parts of the Work if required by the Contract to do so.
- C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against which Contractor has reasonable objection.
- D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable, during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within five days.

- E. Owner may require the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors, Suppliers, or other individuals or entities for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor, Supplier, or other individual or entity so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity.
- F. If Owner requires the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, or both, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.
- G. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.
- H. On a monthly basis Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.
- I. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions.
- J. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors, Suppliers, and all other individuals or entities performing or furnishing any of the Work.
- K. Contractor shall restrict all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed herein.
- L. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- M. All Work performed for Contractor by a Subcontractor or Supplier shall be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer.
- N. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor on account of Work performed for Contractor by the particular Subcontractor or Supplier.

O. Nothing in the Contract Documents:

1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier, or other individual or entity; nor
2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

7.07 *Patent Fees and Royalties*

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

7.08 *Permits*

- A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work

7.09 *Taxes*

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

7.10 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It shall not be Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.
- C. Owner or Contractor may give notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.11 *Record Documents*

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

7.12 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:
 - 1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify Owner; the owners of adjacent property, Underground Facilities, and other utilities; and other contractors and utility owners performing work at or adjacent to the Site, when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.
 - C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.
 - D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
 - E. All damage, injury, or loss to any property referred to in Paragraph 7.12.A.2 or 7.12.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
 - F. Contractor's duties and responsibilities for safety and protection shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 15.06.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).
 - G. Contractor's duties and responsibilities for safety and protection shall resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.13 *Safety Representative*

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

7.14 *Hazard Communication Programs*

- A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or

exchanged between or among employers at the Site in accordance with Laws or Regulations.

7.15 *Emergencies*

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

7.16 *Shop Drawings, Samples, and Other Submittals*

A. *Shop Drawing and Sample Submittal Requirements:*

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

- B. *Submittal Procedures for Shop Drawings and Samples:* Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals. Each submittal will be identified as Engineer may require.

1. *Shop Drawings:*

- a. Contractor shall submit the number of copies required in the Specifications.
- b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to

provide and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.D.

2. *Samples:*
 - a. Contractor shall submit the number of Samples required in the Specifications.
 - b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 7.16.D.
3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.
- C. *Other Submittals:* Contractor shall submit other submittals to Engineer in accordance with the accepted Schedule of Submittals, and pursuant to the applicable terms of the Specifications.
- D. *Engineer's Review:*
 1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
 2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction or to safety precautions or programs incident thereto.
 3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
 4. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order.
 5. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 7.16.A and B.
 6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, shall not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.
 7. Neither Engineer's receipt, review, acceptance or approval of a Shop Drawing, Sample, or other submittal shall result in such item becoming a Contract Document.

8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.D.4.

E. *Resubmittal Procedures:*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.
2. Contractor shall furnish required submittals with sufficient information and accuracy to obtain required approval of an item with no more than three submittals. Engineer will record Engineer's time for reviewing a fourth or subsequent submittal of a Shop Drawings, sample, or other item requiring approval, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.
3. If Contractor requests a change of a previously approved submittal item, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

7.17 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on Contractor's warranty and guarantee.
- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 2. normal wear and tear under normal usage.
- C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
 1. observations by Engineer;
 2. recommendation by Engineer or payment by Owner of any progress or final payment;
 3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
 4. use or occupancy of the Work or any part thereof by Owner;
 5. any review and approval of a Shop Drawing or Sample submittal;
 6. the issuance of a notice of acceptability by Engineer;
 7. any inspection, test, or approval by others; or
 8. any correction of defective Work by Owner.

- D. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract shall govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable.
- B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.
- C. The indemnification obligations of Contractor under Paragraph 7.18.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
 - 1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
 - 2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

7.19 *Delegation of Professional Design Services*

- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable Laws and Regulations.
- B. If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, and other submittals prepared by such professional. Shop

Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

- C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
- D. Pursuant to this paragraph, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 7.16.D.1.
- E. Contractor shall not be responsible for the adequacy of the performance or design criteria specified by Owner or Engineer.

ARTICLE 8 – OTHER WORK AT THE SITE

8.01 *Other Work*

- A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.
- B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any utility work at or adjacent to the Site, Owner shall provide such information to Contractor.
- C. Contractor shall afford each other contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.
- D. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 8, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

8.02 *Coordination*

- A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:
 - 1. the identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;
 - 2. an itemization of the specific matters to be covered by such authority and responsibility; and
 - 3. the extent of such authority and responsibilities.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

8.03 *Legal Relationships*

- A. If, in the course of performing other work at or adjacent to the Site for Owner, the Owner's employees, any other contractor working for Owner, or any utility owner for whom the Owner is responsible causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment shall take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract. When applicable, any such equitable adjustment in Contract Price shall be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due to Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this paragraph.
- C. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due to Contractor.

- D. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9 – OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

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

9.02 *Replacement of Engineer*

- A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents shall be that of the former Engineer.

9.03 *Furnish Data*

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

9.04 *Pay When Due*

- A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

9.05 *Lands and Easements; Reports, Tests, and Drawings*

- A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.
- B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.
- C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

9.06 *Insurance*

- A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 *Change Orders*

- A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

9.08 *Inspections, Tests, and Approvals*

- A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *Limitations on Owner's Responsibilities*

- A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

9.10 *Undisclosed Hazardous Environmental Condition*

- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 *Evidence of Financial Arrangements*

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

9.12 *Safety Programs*

- A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.
- B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10 – ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *Owner's Representative*

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

10.02 *Visits to Site*

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.
- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.08. Particularly, but without limitation, during

or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Project Representative*

- A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 10.08. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent, or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

10.04 *Rejecting Defective Work*

- A. Engineer has the authority to reject Work in accordance with Article 14.

10.05 *Shop Drawings, Change Orders and Payments*

- A. Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, are set forth in Paragraph 7.16.
- B. Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, are set forth in Paragraph 7.19.
- C. Engineer's authority as to Change Orders is set forth in Article 11.
- D. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.06 *Determinations for Unit Price Work*

- A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

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

- A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.08 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 15.06.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 10.08 shall also apply to the Resident Project Representative, if any.

10.09 *Compliance with Safety Program*

- A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs (if any) of which Engineer has been informed.

ARTICLE 11 – AMENDING THE CONTRACT DOCUMENTS; CHANGES IN THE WORK

11.01 *Amending and Supplementing Contract Documents*

- A. The Contract Documents may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.
 1. *Change Orders:*
 - a. If an amendment or supplement to the Contract Documents includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order. A Change Order also may be used to establish amendments and supplements of the Contract Documents that do not affect the Contract Price or Contract Times.
 - b. Owner and Contractor may amend those terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, without the recommendation of the Engineer. Such an amendment shall be set forth in a Change Order.
 2. *Work Change Directives:* A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.04 regarding change of Contract Price. Contractor must submit any Change Proposal seeking an

adjustment of the Contract Price or the Contract Times, or both, no later than 30 days after the completion of the Work set out in the Work Change Directive. Owner must submit any Claim seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 60 days after issuance of the Work Change Directive.

3. *Field Orders*: Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.02 *Owner-Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Such changes shall be supported by Engineer's recommendation, to the extent the change involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters. Such changes may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work shall be performed under the applicable conditions of the Contract Documents. Nothing in this paragraph shall obligate Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.03 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.

11.04 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment of Contract Price shall comply with the provisions of Article 12.
- B. An adjustment in the Contract Price will be determined as follows:
 1. where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03); or
 2. where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.04.C.2); or
 3. where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on

the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.04.C).

- C. *Contractor's Fee*: When applicable, the Contractor's fee for overhead and profit shall be determined as follows:
1. a mutually acceptable fixed fee; or
 2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. for costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee shall be 15 percent;
 - b. for costs incurred under Paragraph 13.01.B.3, the Contractor's fee shall be five percent;
 - c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.04.C.2.a and 11.04.C.2.b is that the Contractor's fee shall be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.A.1 and 13.01.A.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of five percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted work the maximum total fee to be paid by Owner shall be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the work;
 - d. no fee shall be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;
 - e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
 - f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 11.04.C.2.a through 11.04.C.2.e, inclusive.

11.05 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment in the Contract Times shall comply with the provisions of Article 12.
- B. An adjustment of the Contract Times shall be subject to the limitations set forth in Paragraph 4.05, concerning delays in Contractor's progress.

11.06 *Change Proposals*

- A. Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; appeal an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; contest a set-off against payment due; or seek other relief under

the Contract. The Change Proposal shall specify any proposed change in Contract Times or Contract Price, or both, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents.

1. *Procedures:* Contractor shall submit each Change Proposal to Engineer promptly (but in no event later than 30 days) after the start of the event giving rise thereto, or after such initial decision. The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal. The supporting data shall be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event. Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal.
 2. *Engineer's Action:* Engineer will review each Change Proposal and, within 30 days after receipt of the Contractor's supporting data, either deny the Change Proposal in whole, approve it in whole, or deny it in part and approve it in part. Such actions shall be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.
 3. *Binding Decision:* Engineer's decision will be final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.
- B. *Resolution of Certain Change Proposals:* If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice shall be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

11.07 Execution of Change Orders

- A. Owner and Contractor shall execute appropriate Change Orders covering:
1. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;
 2. changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;
 3. changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.02, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters; and
 4. changes in the Contract Price or Contract Times, or other changes, which embody the substance of any final and binding results under Paragraph 11.06, or Article 12.

- B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of this Paragraph 11.07, it shall be deemed to be of full force and effect, as if fully executed.

11.08 *Notification to Surety*

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

ARTICLE 12 – CLAIMS

12.01 *Claims*

- A. *Claims Process:* The following disputes between Owner and Contractor shall be submitted to the Claims process set forth in this Article:
 - 1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;
 - 2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents; and
 - 3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters.
- B. *Submittal of Claim:* The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim shall rest with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, or both, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.
- C. *Review and Resolution:* The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim shall be stated in writing and submitted to the other party, with a copy to Engineer.
- D. *Mediation:*
 - 1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate shall stay the Claim submittal and response process.
 - 2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process shall resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim

submittal and decision process shall resume as of the date of the conclusion of the mediation, as determined by the mediator.

3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.
- E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action shall be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.
- F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim shall be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.
- G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim shall be incorporated in a Change Order to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 *Cost of the Work*

- A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:
 1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or
 2. To determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.
- B. *Costs Included*: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 13.01.C, and shall include only the following items:
 1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, and vacation and holiday pay applicable

thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.
3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.
4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
5. Supplemental costs including the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
 - c. Rentals of all construction equipment and machinery, and the parts thereof, whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
 - d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
 - e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
 - f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 6.05), provided such losses and damages have resulted from causes

other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

- g. The cost of utilities, fuel, and sanitary facilities at the Site.
- h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.
- i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

- C. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:
- 1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.
 - 2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
 - 3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
 - 4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
 - 5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.
- D. *Contractor's Fee:* When the Work as a whole is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 11.04.C.
- E. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

13.02 Allowances

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

- B. *Cash Allowances*: Contractor agrees that:
 - 1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
 - 2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.
- C. *Contingency Allowance*: Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

13.03 *Unit Price Work*

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of the following paragraph.
- E. Within 30 days of Engineer's written decision under the preceding paragraph, Contractor may submit a Change Proposal, or Owner may file a Claim, seeking an adjustment in the Contract Price if:
 - 1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement;
 - 2. there is no corresponding adjustment with respect to any other item of Work; and
 - 3. Contractor believes that it is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price, and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 14 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

14.01 *Access to Work*

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

14.02 *Tests, Inspections, and Approvals*

- A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.
- B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work shall be governed by the provisions of Paragraph 14.05.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.
- D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:
 - 1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;
 - 2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;
 - 3. by manufacturers of equipment furnished under the Contract Documents;
 - 4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
 - 5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests shall be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

- E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.
- F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering shall be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to

cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 *Defective Work*

- A. *Contractor's Obligation:* It is Contractor's obligation to assure that the Work is not defective.
- B. *Engineer's Authority:* Engineer has the authority to determine whether Work is defective, and to reject defective Work.
- C. *Notice of Defects:* Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.
- D. *Correction, or Removal and Replacement:* Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.
- E. *Preservation of Warranties:* When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.
- F. *Costs and Damages:* In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work shall be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 *Uncovering Work*

- A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.

- B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.
- C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.
 - 1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.
 - 2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 *Owner May Stop the Work*

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

14.07 *Owner May Correct Defective Work*

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, then Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.
- C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will

include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 Progress Payments

- A. *Basis for Progress Payments:* The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.
- B. *Applications for Payments:*
1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens, and evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.
 2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
 3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.
- C. *Review of Applications:*
1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
 2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

- a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or
 - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
 4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. to supervise, direct, or control the Work, or
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
 - d. to make any examination to ascertain how or for what purposes Contractor has used the money paid on account of the Contract Price, or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
 5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.
 6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
 - a. the Work is defective, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or

- e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Payment Becomes Due:*

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

E. *Reductions in Payment by Owner:*

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
 - a. claims have been made against Owner on account of Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages on account of Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;
 - b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
 - c. Contractor has failed to provide and maintain required bonds or insurance;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
 - e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
 - f. the Work is defective, requiring correction or replacement;
 - g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - h. the Contract Price has been reduced by Change Orders;
 - i. an event that would constitute a default by Contractor and therefore justify a termination for cause has occurred;
 - j. liquidated damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
 - k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
 - l. there are other items entitling Owner to a set off against the amount recommended.
2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount

remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed shall be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 15.01.C.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than seven days after the time of payment by Owner.

15.03 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which shall fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.

- E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.
- F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 *Partial Use or Occupancy*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:
 - 1. At any time Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through E for that part of the Work.
 - 2. At any time Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
 - 3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
 - 4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.05 regarding builder's risk or other property insurance.

15.05 *Final Inspection*

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

15.06 *Final Payment*

- A. *Application for Payment:*
 - 1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of

inspection, annotated record documents (as provided in Paragraph 7.11), and other documents, Contractor may make application for final payment.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents;
 - b. consent of the surety, if any, to final payment;
 - c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.
 - d. a list of all disputes that Contractor believes are unsettled; and
 - e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

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

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the Application for Payment to Owner for payment. Such recommendation shall account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to the provisions of Paragraph 15.07. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. *Completion of Work:* The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment.

D. *Payment Becomes Due:* Thirty days after the presentation to Owner of the final Application for Payment and accompanying documentation, the amount recommended by Engineer (less any further sum Owner is entitled to set off against Engineer's recommendation,

including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions above with respect to progress payments) will become due and shall be paid by Owner to Contractor.

15.07 *Waiver of Claims*

- A. The making of final payment will not constitute a waiver by Owner of claims or rights against Contractor. Owner expressly reserves claims and rights arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 15.05, from Contractor's failure to comply with the Contract Documents or the terms of any special guarantees specified therein, from outstanding Claims by Owner, or from Contractor's continuing obligations under the Contract Documents.
- B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted or appealed under the provisions of Article 17.

15.08 *Correction Period*

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

- E. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16 – SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

- A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension. Any Change Proposal seeking such adjustments shall be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:
 - 1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule);
 - 2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
 - 3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
 - 4. Contractor's repeated disregard of the authority of Owner or Engineer.
- B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) ten days written notice that Owner is considering a declaration that Contractor is in default and termination of the contract, Owner may proceed to:
 - 1. declare Contractor to be in default, and give Contractor (and any surety) notice that the Contract is terminated; and
 - 2. enforce the rights available to Owner under any applicable performance bond.
- C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.
- D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within seven days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.
- E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses,

and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

- F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.
- G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond shall govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate For Convenience*

- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and
 - 3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.
- B. Contractor shall not be paid on account of loss of anticipated overhead, profits, or revenue, or other economic loss arising out of or resulting from such termination.

16.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for

expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

- A. *Disputes Subject to Final Resolution:* The following disputed matters are subject to final resolution under the provisions of this Article:
 - 1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full; and
 - 2. Disputes between Owner and Contractor concerning the Work or obligations under the Contract Documents, and arising after final payment has been made.
- B. *Final Resolution of Disputes:* For any dispute subject to resolution under this Article, Owner or Contractor may:
 - 1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions; or
 - 2. agree with the other party to submit the dispute to another dispute resolution process; or
 - 3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18 – MISCELLANEOUS

18.01 *Giving Notice*

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

18.02 *Computation of Times*

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

18.03 *Cumulative Remedies*

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

18.04 *Limitation of Damages*

- A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

- A. A party's non-enforcement of any provision shall not constitute a waiver of that provision, nor shall it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

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

18.07 *Controlling Law*

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

18.08 *Headings*

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

DIVISION 0 – BIDDING AND CONTRACT DOCUMENTS
SECTION 00810 – SUPPLEMENTARY CONDITIONS TO THE GENERAL CONDITIONS

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract, EJCDC® C-700, 2013 Edition (Section 00700). All provisions that are not so amended or supplemented remain in full force and effect.

SC-1.01 Defined Terms

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

The address system used in these Supplementary Conditions is the same as the address system used in the General Conditions, with the prefix “SC” added thereto.

Add the following language at the end of the definition of “Agreement”:

The definition of the word “Contract” is synonymous with the word “Agreement” and is used interchangeably in the Contract Documents.

Add the following language at the end of the definition of “Drawings”:

The definition of the word "plans" is synonymous with the word "drawings" and is used interchangeably in the Contract Documents.

Delete the definition of “Engineer” and use the following definition instead:

Engineer – Office of the City Engineer, or its agent.

SC-2.01 Delivery of Bonds and Evidence of Insurance

Delete paragraph 2.01.A in its entirety and insert the following in its place:

Engineer shall furnish to Contractor two (2) copies of the Agreement and other Contract Documents bound therewith. Contractor shall execute the Agreement, insert executed copies of the required Bonds and power of attorney and certificate of insurance and submit all copies to Owner. Owner shall execute all copies and return one copy to the Contractor, who shall promptly deliver one copy to its surety.

Delete paragraph 2.01.B in its entirety and insert the following in its place:

Before Owner will execute the Agreement, and before any Work at the Site is started, Contractor shall deliver to Owner, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which Owner or any additional insured may reasonably request) which Contractor is required to purchase and maintain in accordance with Article 6.

Delete paragraph 2.01C in its entirety.

SC-2.02 Copies of Documents

Delete paragraph 2.02A and insert the following in its place:

OWNER shall furnish to CONTRACTOR up to three (3) printed copies of the Contract Documents as are reasonably necessary for the execution of the Work. Additional copies will be furnished, upon request, for the cost of reproduction.

SC-2.03 Before Starting Construction

Add the following paragraphs immediately after paragraph 2.03.A.3:

2.03.A.4. CONTRACTOR shall submit a list of construction equipment with hourly rates, owned or rented by the CONTRACTOR and all Subcontractors that will be used in the performance of the Work. The equipment list will include information necessary to confirm the hourly rates per Paragraph 13.01.B.5.c of the General Conditions and these Supplementary Conditions including: make, model, and year of manufacture, as well as the horsepower, capacity or weight, and accessories. These rates must comply with General Conditions 11 and 13, as amended by these Supplementary Conditions. These rates must be approved prior to beginning work.

2.03.A.5. Preliminary progress schedule shall be prepared in accordance with the General Conditions and the General Requirements. The progress schedule shall be CPM form or other acceptable format that shows estimated time for each work item and starting and completion dates for each part of the Work. The Schedule shall show the Critical Path for the work. Acceptance of these schedules and documents by either ENGINEER or OWNER will neither impose on ENGINEER or OWNER responsibility for the sequencing, scheduling or progress of the Work and will not interfere with or relieve CONTRACTOR from CONTRACTOR's full responsibility therefore.

SC-2.04 Preconstruction Conference, Designation of Authorized Representatives

Delete paragraph 2.04.B in its entirety and insert the following in its place:

- B. A list of supervisory and responsible-in-charge personnel working on the project shall be provided by the CONTRACTOR.

The CONTRACTOR shall also submit at least one name who will be the CONTRACTOR's representative to respond to emergency conditions. CONTRACTOR shall provide the ENGINEER with the representative's telephone number prior to commencement of construction.

SC-2.05 Initial Acceptance of Schedules

Delete the first two sentences of 2.05.A in its entirety and insert the following in their place:

Prior to the first application for payment, all schedules and documents identified in paragraph 2.05 shall be finalized and acceptable to the ENGINEER and OWNER. No progress payment shall be made to CONTRACTOR until the schedules are submitted to and acceptable to ENGINEER and OWNER.

Delete the first sentence of 2.05.A.1 in its entirety and insert the following in its place:

1. The Progress Schedule will be acceptable to Engineer if it is in CPM form or other format that provides an orderly progression of the Work to completion within the Contract Times.

SC-3.01 Intent:

Add the additional paragraphs to 3.01.A:

The Contractor shall not take advantage of an apparent error or omission in the Contract Documents. If a discrepancy is discovered, the CONTRACTOR is to notify the ENGINEER for an interpretation and correction. The following will be the governing order for conflicts discrepancies:

1. Plans (Details over other plans)
2. Specifications (Divisions in order)

Any Work that may reasonably be inferred from the Specifications or Drawings as being required to produce the intended result shall be supplied whether or not it is specifically called for. Work, materials, or equipment described in words which so applied have a well-known technical or trade meaning shall be deemed to refer to such recognized standards.

Delete paragraph 3.01.C in its entirety and insert the following in its place:

- C. If Drawings exist, each sheet will bear a general title matching the title on the cover of this document. These Drawings are a part of this contract.

SC-4.01 Commencement of Contract Times; Notice to Proceed

Delete the last sentence of paragraph 4.01.A.

SC-4.04 Progress Schedule

Delete paragraph 4.04.A.1. and insert the following in its place:

1. CONTRACTOR shall submit to ENGINEER with each application for payment an updated progress schedule reflecting the amount of work completed and adjustments to future work. Such adjustments will be acceptable to ENGINEER as providing an orderly progression of the Work to completion within any specified milestones and the Contract Time. No progress payment will be made to CONTRACTOR until the updated schedules are submitted to and acceptable to ENGINEER and OWNER. Review and acceptance of progress schedules by the ENGINEER will neither impose on ENGINEER responsibility for the sequencing, scheduling or progress of the Work, nor interfere with or relieve CONTRACTOR from CONTRACTOR'S full responsibility therefore. If the CONTRACTOR is behind schedule, he shall submit a plan for getting back on schedule.

Add the following sentence to the end of paragraph 4.04.B.:

The provisions of this paragraph do not limit the right of the OWNER to order additions, deletions or revisions in the Work per the General Conditions including additions, deletions or revisions to the Work affected by the disputes or disagreements.

SC-5.01 Availability of Lands

Delete paragraph 5.01.A in its entirety and insert the following in its place:

The CONTRACTOR shall confine his construction operations to the immediate vicinity of the location shown on the drawings, and shall use due care in placing construction tools, equipment, excavated materials, and materials to be installed, and supplies, so as to cause the least possible damage to property and interference with traffic and property, and to stay within the OWNER's property or easements obtained for the project.

If it is necessary or desirable that the CONTRACTOR use land outside of the OWNER's easement, the CONTRACTOR shall obtain consent from the OWNER and tenant of the land. The CONTRACTOR shall not enter for materials delivery or occupy for any other purpose with men, tools, equipment, construction materials, or with materials excavated from the site, any private property outside the designated construction easement boundaries without written permission from the landowner.

Add the following sentence to the end of paragraph 5.01.C:

If it is necessary or desirable that Contractor use land outside the Owner's easement or right-of-way for materials delivery, or occupy for any other purpose with men, tools, equipment, construction materials, or excavated materials, Contractor shall obtain written consent from the property owner and tenant of the land.

SC-5.03 Subsurface and Physical Conditions

Delete paragraph 5.03 in its entirety and insert the following in its place:

5.03.A Reports and/or Drawings

In preparation of the Drawings and Specifications, the ENGINEER relied upon the following reports and/or drawings of explorations and test of subsurface conditions at the site:

(State name of geotechnical report and any other related reports or drawings of explorations)

Other documents used during the design include:

(State name of any other documents used during the design)

5.03.B Reliance by Contractor on Reports and/or Drawings

Technical data on which the contractor may rely includes the general accuracy of soil logs of the borings and test pits, and the laboratory analyses of the materials, which identify hazardous materials at the specific location of boring or test pits. References made to groundwater levels and quantities of water are observations made at the time the field exploration was performed. These conditions are variable and subject to change.

The above documents can be viewed at the office of the ENGINEER. These reports and drawings were prepared and /or utilized for the purpose of Engineering Design and may not contain complete information necessary for the CONTRACTOR's purposes, including but not limited to any aspect of the means, methods, techniques, sequences or procedures of construction and safety precautions and programs incident thereto. **These reports and drawings are not part of the Contract Documents.** CONTRACTOR may not rely upon or make any claim against the OWNER, ENGINEER or any of ENGINEER's Consultants with respect to:

1. Completeness of such reports and drawings for CONTRACTOR's purposes; or
2. Other data, interpretations, opinions, and information contained in such reports outside of the "technical data" identified above; or
3. Any CONTRACTOR interpretation of or conclusion drawn from any "technical data" or any other data interpretations, opinions, or information.

SC-5.04 Differing Site Conditions

In the first sentence of paragraph 5.04.A – Notice by Contractor, delete the word "promptly" and insert the words "within 15 days".

Insert the following sentence at the end of paragraph 5.04.A – Notice by Contractor:

No claim for an adjustment in the Contract Price or Contract Times (or milestones) will be valid for differing subsurface or physical conditions if the procedures of paragraph 5.04.A are not followed.

SC-5.05 Underground Facilities

In the second sentence of paragraph 5.05.A – Contractor's Responsibilities, delete the words "Supplementary Conditions" and insert the words "Special Provisions".

Insert the following at the end of 5.05.A.2:

- e. Notify all owners of underground utilities and coordinate the Work with the owners of such underground utilities, within at least two, but not more than ten, working days prior to any excavation.

SC-5.06 Hazardous Environmental Conditions at Site

Delete paragraphs 5.06A and B in their entirety and insert the following in their place:

A. Reports and Drawings

In the preparation of the Drawings and Specifications, the Engineer or Engineer's Consultants relied upon the following reports and/or explorations and tests for hazardous materials:

(State name of applicable reports and/or explorations and tests)

B. Reliance by Contractor on Reports and/or Explorations and Tests for Hazardous Materials

Technical data on which the contractor may rely includes the general accuracy of soil logs of the borings and test pits, and the laboratory analyses of the materials, which identify hazardous materials at the specific location of boring or test pits. References made to groundwater levels and quantities of water are observations made at the time the field exploration was performed. These conditions are variable and subject to change.

The above documents can be viewed at the office of the ENGINEER. These reports and drawings were prepared and /or utilized for the purpose of Engineering Design and may not contain complete information necessary for the CONTRACTOR's purposes, including but not limited to any aspect of the means, methods, techniques, sequences or procedures of construction and safety precautions and programs incident thereto. **These reports and drawings are not part of the Contract Documents.** CONTRACTOR may not rely upon or make any claim against the OWNER, ENGINEER or any of ENGINEER's Consultants with respect to:

1. Completeness of such reports and drawings for CONTRACTOR's purposes; or
2. Other data, interpretations, opinions, and information contained in such reports outside of the "technical data" identified above; or
3. Any CONTRACTOR interpretation of or conclusion drawn from any "technical data" or any other data interpretations, opinions, or information.

SC-6.02 Insurance – General Provisions

Delete paragraph 6.02.B in its entirety and insert the following in its place:

All insurance required by the Contract to be purchased and maintained by the Contractor shall be obtained from insurance companies that are duly licensed or authorized in the State of Wyoming to issue insurance policies and coverages. All companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A or better.

In paragraph 6.02.C, delete the word "Owner" and replace it with "Engineer".

SC-6.03 Contractor's Insurance

Delete paragraph 6.03.F – Contractor's Pollution Liability Insurance in its entirety, as well as any language in Article 6 – Bonds and Insurance that requires procurement of Contractor's Pollution Liability Insurance.

Add the following new paragraph immediately after paragraph 6.03.J:

The limits of liability for the insurance required by Paragraph 6.03 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by law or regulations:

1. Workers' Compensation under paragraphs 6.03.A.1 and 6.03.A.2 of the General Conditions:

- | | | |
|----|---|-------------|
| A. | State | Statutory |
| B. | Applicable Federal (e.g. Longshoreman's) | Statutory |
| C. | Employer's Liability | \$1,000,000 |
| D. | Workers Compensation Insurance shall include an "All States" endorsement. | |

2. Commercial General Liability under 6.03.B and 6.03.C of the General Conditions:

- | | | |
|----|---|--------------------|
| A. | GENERAL AGGREGATE | <u>\$2,000,000</u> |
| B. | Products – Completed Operations (Aggregate) | <u>\$2,000,000</u> |
| C. | Bodily Injury and Property Damage | |
| | <u>\$1,000,000</u> | Each Occurrence |
| | <u>\$2,000,000</u> | Annual Aggregate |

D. Coverage will Include:

1. Premises - Operations
2. Operations of Independent Contractors
3. Products and Completed Operations
4. Contractual
5. Personal Injury
6. Broad Form Property Damage will include explosion, collapse and underground coverages where applicable.

E. Commercial General Liability Insurance may be satisfied by primary insurance or a combination of primary and excess or "umbrella" insurance. Primary occurrence limit cannot be less than \$2,000,000.

F. Include umbrella liability coverage for \$1,000,000 (may include with E above, if umbrella policy is used there).

G. Blanket contractual liability coverage shall provide for not less than the following limits:

\$1,000,000	Each Occurrence
\$2,000,000	Annual Aggregate

3. Automobile Liability under 6.03.D (include "all owned", "hired" and "non-owned"):

Bodily Injury:

<u>\$1,000,000</u>	Each Person
<u>\$1,000,000</u>	Each Occurrence

Property Damage:

<u>\$1,000,000</u>	Each Occurrence
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or a combined single limit of \$1,000,000

4. Add a new paragraph at the end of paragraph 6.03.G as follows:

The CONTRACTOR'S insurance coverage shall name the OWNER, and ENGINEER and ENGINEER's Consultants as an additional insured under Commercial General Liability, Automobile Liability, Excess or Umbrella policies.

In addition to being named as an additional insured on the above policies the CONTRACTOR shall purchase and maintain a separate \$1,000,000 protective liability policy covering OWNER and ENGINEER.

SC-6.03.I General Provisions

Amend paragraph 6.03.I.3 by deleting the words "10 days" and replacing them with the words "45 days" and as so amended paragraph 6.03.I.3 remains in effect.

SC-6.04 Owner's Liability Insurance

Delete paragraph 6.04 in its entirety and insert the following in its place:

In addition to the insurance required to be provided by Contractor under paragraph 6.03, the CONTRACTOR shall obtain and pay the entire premium for Owners Protective Liability Coverage to protect the OWNER, ENGINEER, and ENGINEER'S Consultants for their liability against claims that may arise from operations under this Agreement.

SC-6.05 Property Insurance

Delete Paragraph 6.05.A in its entirety and insert the following in its place:

- A. CONTRACTOR shall purchase and maintain property insurance upon the work at the site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in these Supplementary Conditions or required by Laws and Regulations). This insurance shall:
1. include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants, and any other persons or entities identified in the Supplementary Conditions, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured;
 2. be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss and damage to the Work, temporary buildings, falsework, materials and equipment, and Work in transit and shall insure against at least the following perils: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage, and other perils as may be specifically required by the Supplementary Conditions.
 3. include expenses incurred in the repair or replacement of any insured property (including but not limited to the fees and charges of engineers and architects);

4. cover materials and equipment in transit for incorporation in the Work or stored at the site or at another location prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by ENGINEER; and
5. be endorsed to allow occupancy and partial utilization of the Work by OWNER;
6. include testing and start-up; and
7. be maintained in effect throughout the life of the Agreement unless otherwise agreed to in writing by OWNER, CONTRACTOR, and ENGINEER with 45-days written notice to each other additional insured to whom a certificate of insurance has been issued.

SC-6.05.D Partial Occupancy or Use by Owner

Delete Paragraph 6.05.D in its entirety and insert the following in its place:

- D. Partial Occupancy or Use by Owner: Owner may occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 15.04. If Owner occupies or uses such Work, the builder's risk insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy; rather, those portions of the Work that are occupied or used by Owner may come off the builder's risk policy, while those portions of the Work not yet occupied or used by Owner shall remain covered by the builder's risk insurance.

SC-6.06 Waiver of Rights

Delete paragraphs 6.06B and C in their entirety.

SC-7.02 Labor; Working Hours

Add the following language at the end of the last sentence of paragraph 7.02.B:

Regular working hours are defined as 7:00 AM to 5:30 PM. Owner's legal holidays are New Year's Day, President's Day, Memorial Day, July 4th Holiday, Labor Day, Thanksgiving and Christmas. Contractor shall be responsible for the cost of any overtime pay or other expense incurred by the Owner for Engineer's services (including those of the Resident Project Representative, if any), Owner's representative, and construction observation services, occasioned by the performance of Work on Saturday, Sunday or any legal holiday. If Contractor is responsible but does not pay, or if the parties are unable to agree as to the amount owed, then Owner may impose a reasonable set-off against payments due under Article 15.

SC-7.06 Concerning Subcontractors, Suppliers and Others

Add the following two new paragraphs after paragraph 7.06.O:

- P. It shall be specifically understood that not more than 50 percent of the work awarded under this one construction contract shall be subcontracted or otherwise sublet.
- Q. Any subcontractor or material man entitled to the protection of a bond or other form of guarantee approved by the OWNER under W.S. 16-6-112 shall give notice of his right to that protection to the prime CONTRACTOR under W.S. 16-6-121. Failure to give notice to a prime CONTRACTOR who has complied with subsections (e) and (f) of this article waives the subcontractor or material man's protection under the bond or guarantee and waives any right to a lien for materials or services provided.
- (a) The notice shall be given no later than sixty (60) days after the date on which services or materials are first furnished.
 - (b) The notice shall be sent to the prime CONTRACTOR by certified mail or delivered to and receipted by the prime CONTRACTOR or his agent. Notice by certified mail is effective on the date the notice is mailed.
 - (c) The notice shall be in writing and shall state that it is a notice of a right to protection under the bond or guarantee. The notice shall be signed by the subcontractor or material man and shall include the following information.
 - (i) The subcontractor or material man's name, address and phone number and the name of a contact person;
 - (ii) The name and address of the subcontractor's or material man's vendor; and
 - (iii) The type or description of the materials or services provided.
 - (d) This section shall only apply where the prime CONTRACTOR's contract is for fifty thousand dollars (\$50,000) or more.
 - (e) The prime CONTRACTOR shall post on the construction site a prominent sign citing W.S. 16-6-121 and stating that any subcontractor or material man shall give notice to the prime CONTRACTOR of a right to protection under the bond or guarantee and that failure to provide this notice shall waive the subcontractor or material man's protection under the bond or guarantee and shall waive any right to a lien for materials or services provided.
 - (f) The OWNER or his agent shall provide written notice of the information required by this section in the project specifications.

Delete paragraph 7.06.D in its entirety and insert the following in its place:

The Bidder to whom the Contract may be awarded shall submit to OWNER and ENGINEER a list of all proposed subcontractors, manufacturers and suppliers of principal items of equipment and materials, as detailed herein, within 5 days after the day of the Bid Opening. The list shall identify all proposed Subcontractors and which items of work, or components of the project, on which that Subcontractor will work. CONTRACTOR shall submit to OWNER, upon request, a copy of all appropriate agreements between CONTRACTOR and its Subcontractors. Said agreements are to be provided to OWNER, who assumes no responsibility for the form and content of subcontract agreements.

SC-7.08 Permits

Delete the first two sentences of paragraph 7.08.A and insert the following in their place:

Any necessary permits, licenses, agreements, insurance, and approvals required by any governmental agency for the performance of this Work shall be obtained by the Contractor at his own expense.

SC-7.12 Safety and Protection

Add the following new paragraph to the end of paragraph 7.12.A as follows:

4. Contractor shall notify all owners/operators of utility companies immediately of any damage. Such owners or operators shall determine the appropriate repair. If the damage results in a release of natural gas or other hazardous substances, or potentially endangers life, health or property, the Contractor shall immediately contact the utility owner/operator, call 911 and take immediate action to protect the public and property.

Add the following new paragraphs to the end of paragraph 7.12 as follows:

- H. It is expressly understood by the parties to this Agreement that the CONTRACTOR is solely responsible for initiating, maintaining, and supervising safety precautions and programs in connection with the Work. The right of the OWNER and ENGINEER to observe or otherwise review the Work and operations shall not relieve the CONTRACTOR from any of his covenants and obligations hereunder. CONTRACTOR shall incorporate all safety requirements into his construction progress and work schedules including preconstruction and scheduled safety meetings, posted safety rules, tailgate meetings, and site inspections by safety and other inspectors employed by the CONTRACTOR.

The CONTRACTOR shall be responsible for and shall take necessary precautions and provide all material and equipment to protect, shore, brace, support and maintain all underground pipes, conduits, drains, sewers, water mains, gas mains, cables, etc., and other underground construction uncovered in the proximity, or otherwise affected by the construction work performed by him or her. All pavement, surfacing, driveways, curbs, walks, buildings, grass areas, trees, utility poles or guy wires damaged by the CONTRACTOR's operations in the performance of this work shall be repaired and/or replaced to the satisfaction of the OWNER, ENGINEER, and affected property owner at the CONTRACTOR's expense. The CONTRACTOR shall also be responsible for all damage to streets, roads, highways, shoulders, ditches, embankments, culverts, bridges, or other public or private property or facility, regardless of location or character, which may be caused by moving, hauling, or otherwise transporting equipment, materials, or men to and from the work or any part of site thereof; whether by the CONTRACTOR or the subcontractors. The CONTRACTOR shall make satisfactory and acceptable arrangements with owner of, or the agency or authority having jurisdiction over, the damaged property or facility concerning its repair or replacement or payment of costs incurred in connection with said damage.

The CONTRACTOR shall conduct his work so as to interfere as little as possible with public travel, whether vehicular or pedestrian. Whenever it is necessary to cross, obstruct, or close roads, driveways, and walks, whether public or private, the CONTRACTOR shall obtain approval from the governing party and shall, at his own expense, provide and maintain suitable and safe bridges, detours, and other

temporary expedients for the accommodation of public and private drives before interfering with them. The provisions for temporary expedients will not be required when the CONTRACTOR has obtained permission from the owner and tenant of the private property, or from the authority having jurisdiction over public property involved, to obstruct traffic at the designated point.

Safety provisions must be entirely adequate and meet with City or State and Federal regulations to protect the public on these streets and roads.

- I. The CONTRACTOR shall install where necessary in his work bracing to resist wind or other loads. The CONTRACTOR shall perform the work with the explicit understanding that the design of the Project is based on all parts of the work having been completed; therefore, each part of the work shall be constructed accordingly.

Temporary items such as, but not limited to, scaffolding, staging, lifting and hoisting devices, shoring, excavation barricades, and safety and construction procedures necessary to complete the project shall be the responsibility of the CONTRACTOR and its subcontractors, and shall comply with all applicable codes and regulations. Wyoming Occupational Health and Safety Rules and Regulations shall be complied with in their entirety. It shall not be the responsibility of the OWNER or ENGINEER to determine if the CONTRACTOR, subcontractors or their representatives are in compliance with the aforementioned regulations.

SC-7.18 Indemnification

Add a new paragraph immediately after paragraph 7.18.A which reads as follows:

It is expressly understood and agreed that while OWNER and ENGINEER may have the right under this Contract to observe or otherwise review the work, progress and operations of the CONTRACTOR, it is expressly understood and agreed that such observation shall not relieve the CONTRACTOR from any of its covenants and obligations hereunder. The CONTRACTOR shall be solely responsible and save the OWNER and ENGINEER and their consultants, agents and employees harmless from all suits, actions or claims of any character brought on account of any injuries or damages sustained by any person or property in consequence of any neglect in safeguarding the work, observing safety standards or regulations, or otherwise. This indemnification would include the use of unsafe or unacceptable materials in the construction or completion of the project, or the CONTRACTOR's failure to comply with any law, ordinance, or regulation, even though such act, omission, or work was done under the direct or indirect review of, or was observed by the OWNER or ENGINEER.

Add the following language at the end of paragraph 7.18.B:

Nor shall the CONTRACTOR'S obligations under Section 7.18 be in any way limited by any insurance coverage which the CONTRACTOR may have or which may insure to his benefit.

Add the following language at the end of paragraph 7.18.C:

If legal action shall be commenced to enforce the terms and provisions of this Agreement, the prevailing party shall be entitled to reasonable costs incurred as allowed by Wyoming law.

SC-9.02 Replacement of Engineer

Add the following sentence to the end of paragraph 9.02.A:

Work shall stop and will not be resumed until the new ENGINEER is on site.

SC-10.03 Project Representative

Add a new paragraph after paragraph 10.03.A as follows:

B. The Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative (RPR) to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work. The RPR is the Engineer's Agent at the site and will act as directed by and under the supervision of the Engineer. RPR's dealings in matters pertaining to the CONTRACTOR's work in progress shall in general be with ENGINEER and CONTRACTOR, keeping the OWNER informed as necessary. RPR's dealings with subcontractors shall be through or with the full knowledge and approval of the CONTRACTOR.

RPR shall not:

1. Authorize any deviation from the Contract Documents or substitution of materials or equipment (including "or-equal" items).
2. Exceed limitations of Engineer's authority as set forth in the General Conditions.
3. Undertake any of the responsibilities of Contractor, subcontractors, suppliers, or Contractor's superintendent.
4. Advise on, issue directions relative to or assume control over any aspect of the means, methods, techniques, sequences or procedures of Contractor's Work unless such advice or directions are specifically required by the Contract Documents.
5. Advise on, issue directions regarding or assume control over safety precautions and programs in connection with the activities or operations of OWNER or CONTRACTOR.
6. Participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically authorized by ENGINEER.
7. Accept Shop Drawings or Samples submittals from anyone other than the CONTRACTOR.
8. Authorize OWNER to occupy the Project in whole or part.

RPR may do the following:

1. Schedules. Review the progress schedule, schedule of Shop Drawing submittals and schedule of values prepared by the CONTRACTOR and consult with the ENGINEER concerning acceptability.
2. Conferences and Meetings. Attend meetings with the CONTRACTOR, such as Pre-Construction Conference, progress meetings, job conferences, and other project-related meetings, and prepare and circulate copies of minutes thereof.
3. Liaison. Serve as the ENGINEER'S liaison with the CONTRACTOR, working principally through the CONTRACTOR's superintendent, and assist in understanding the intent of the Contract Documents; and assist the ENGINEER in serving as the OWNER's liaison with the CONTRACTOR when the CONTRACTOR's operations affect the OWNER's on-site operations. Assist in obtaining, from the OWNER, additional details or information, when required, for proper execution of the Work.
4. Communications with Subcontractors. RPR's dealings with Subcontractors shall only be through or with the full knowledge and approval of Contractor.
5. Shop Drawings. Receive and keep record of Shop Drawings, submittals and samples. Advise ENGINEER and CONTRACTOR of Work that may be commencing that does not have approved submittals.
6. Review of Work, Rejection of Defective Work, Inspections and Tests.
 - a. Conduct on-site observations of the Work in progress to assist the ENGINEER in determining if the Work is, in general, proceeding in accordance with the Contract Documents.
 - b. Report to the ENGINEER whenever the RPR believes that any Work is unsatisfactory, faulty, or defective, or does not conform to the Contract Documents, or has been damaged, or does not meet the requirements of any inspection, test or approval required to be made; and advise the ENGINEER of Work that the RPR believes should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection, or approval.
 - c. Verify that tests, equipment and systems start-up and operating and maintenance training are conducted in the presence of appropriate personnel, and that the CONTRACTOR maintains adequate records thereof, and observe, record and report to the ENGINEER appropriate details relative to the test procedures and start-ups.
 - d. Accompany visiting inspectors representing public or other agencies having jurisdiction over the Project, record the results of these inspections and report to the ENGINEER.
7. Interpretation of Contract Documents. Report to ENGINEER when clarifications and interpretations of the Contract Documents are needed; transmit to the CONTRACTOR clarifications and interpretations as issued by the ENGINEER.
8. Modifications. Consider and evaluate the CONTRACTOR's suggestions for modifications in Drawings or Specifications, and report with RPR's recommendations to the ENGINEER. Transmit to the CONTRACTOR decisions issued by the ENGINEER.

9. Records.
 - a. Maintain orderly files for correspondence, reports of job conferences, Shop Drawings and samples, re-productions of original Contract Documents, including all Work Directive Changes, Addenda, Change Orders, Field Orders, additional Drawings issued subsequent to the execution of the Contract, the ENGINEER's clarifications and interpretations of the Contract Documents, progress reports, and other Project related documents.
 - b. Keep a diary or log book, recording the CONTRACTOR hours on the job site, weather conditions, data relative to questions of Work Directive Changes, Change Orders or changed conditions, list of job site visitors, daily activities, decisions, observations in general, and specific observations in more detail, as in the case of observing test procedures; and send copies to the ENGINEER.

10. Reports.
 - a. Furnish the ENGINEER periodic reports, as required, on progress of the Work and of the CONTRACTOR's compliance with the progress schedule and schedule of Shop Drawing and sample submittals.
 - b. Consult with the ENGINEER, in advance of scheduled major tests, inspections or start of important phases of the Work.
 - c. Draft proposed Change Orders and Work Directive Changes, obtaining backup material from the CONTRACTOR and recommend to the ENGINEER Change Orders, Work Directive Changes, and Field Orders.
 - d. Report immediately to the ENGINEER and OWNER, upon the occurrence of any accident.

11. Payment Requests. Review applications for payment with the CONTRACTOR for compliance with the established procedure for their submission, and forward with recommendations to the ENGINEER, noting particularly the relationship of the payment requested to the schedule of values, Work completed, and materials and equipment delivered at the site, but not incorporated in the Work.

12. Certificates, Maintenance and Operation Manuals: During the course of the Work, verify that certificates, maintenance and operating manuals, and other data required to be assembled and furnished by the CONTRACTOR are applicable to the items actually installed and in accordance with the Contract Documents, and have this material delivered to the ENGINEER for review and forwarded to the OWNER prior to final payment for the Work.

13. Completion:
 - a. Before the ENGINEER issues a Certificate of Substantial Completion, submit to the CONTRACTOR a list of observed items requiring completion or correction.
 - b. Conduct final inspection in the company of the ENGINEER, OWNER, and CONTRACTOR, and prepare a final list of items to be completed or corrected.
 - c. Observe that all items on a final list have been completed or corrected, and make recommendations to the ENGINEER concerning acceptance.

SC-11.01 Amending and Supplementing Contract Documents

Add the following paragraph at the end of paragraph 11.01 which reads as follows:

- B. A Change Order or Written Amendment, when executed, constitutes a modification to the Agreement, and all provisions of the Agreement, except as modified by Written Amendment or Change Order, shall apply to said documents. The CONTRACTOR accepts a Written Amendment or Change Order as full compensation, both time and cost for the additional work and any delays caused thereby.

SC-11.05 Change in Contract Time

Add a new paragraph immediately after paragraph 11.05.B. to read as follows:

- C. The CONTRACTOR shall schedule the work to be completed within the Contract Time stipulated in the Agreement including an allowance for time lost due to rain, snow, cold weather or other natural phenomenon. A natural phenomenon is defined as a weather event that prohibits work from progressing in a satisfactory manner. Such events will not constitute justification for an extension of the contract time unless agreed upon by the engineer during the event, and the total of time lost to such events exceeds 5% of the contract time.

SC-11.09 Liquidated Damages

Add the following new paragraph as paragraph 11.09:

11.09 Liquidated Damages

Provisions for liquidated damages are set forth in the Agreement. The liquidated damages identified therein include, among the other costs to the OWNER, an amount for maintaining the necessary engineering forces engaged beyond the time identified in the Agreement for Substantial Completion. The liquidated damages will be deducted from the CONTRACTOR's progress estimates and/or final payment and the engineering fees shall be paid by the OWNER to the ENGINEER from the monies withheld.

SC-12.01 Claims

Delete paragraph 12.01.D – Mediation in entirety and insert the following in its place:

- D. Final Resolution
Should the Claims process described above be unsuccessful in resolving the claim, the methods and procedures described in Article 17 – Final Resolution of Disputes shall be followed.

Add new paragraphs at the end of paragraph 12.01 which read as follows:

- H. The CONTRACTOR agrees to make no claim for damages for delay in the performance of this contract caused by any act or failure to act by the OWNER, ENGINEER or designated agents or representatives, whether such delays are avoidable or unavoidable, where the CONTRACTOR agrees that such delay can be solely and fully compensated for by an extension of time to complete performance of the work as provided herein. This includes any delays attributable to actions or lack of action by utility owners to locate or move their utilities.

If the CONTRACTOR makes a claim for additional time, he shall demonstrate to the satisfaction of the ENGINEER how the delay impacted the Critical Path.

- I. Any claim for an increase or decrease in the Contract Price originated by a Subcontractor shall be evaluated by the CONTRACTOR. The CONTRACTOR shall determine the validity of said claim, and if the CONTRACTOR determines that said claim is valid, the CONTRACTOR shall so state in writing to the OWNER in accordance with all the requirements of the General Conditions.

SC-13.01 Cost of the Work

Delete paragraph 13.01.B.5.c in its entirety and insert the following in its place:

13.01.B.5.c The cost for the use of all construction equipment and machinery and parts thereof whether owned by the CONTRACTOR or rented from others. The cost shall be calculated as follows, and will include the costs of transportation, loading, unloading, assembly, dismantling and removal thereof for equipment involved only in the changed portion of the work covered under the cost of the Work method. Transportation, loading and assembly costs will not be included for equipment already on the site which is being used for other portions of the Work. The cost of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work. Hourly equipment and machinery rates shall be calculated from the latest edition of the Rental Rate Blue Book for Construction Equipment, and the Equipment List submitted according to SC-2.03, and as follows:

1. For working equipment, the hourly rate shall be the monthly rental rate divided by 176 hours per month plus the hourly operating cost.
2. For equipment on standby, the hourly rate shall be 50% of the monthly rental rate divided by 176 hours per month, and the hourly operating cost shall not be applied.
3. For specialized equipment rented for a short duration used for change order work or additional work not part of the scope of work bid, the equipment rental rates will be negotiated prior to the work being performed.
4. Equipment and machinery rates shall be provided and approved prior to commencing work. Blue Book rates shall apply without CONTRACTOR fee, per the General Conditions.

Add a new paragraph immediately after paragraph 13.01.B.5,i to read as follows:

13.01.B.5.j. For Force Account work (if any), if requested to be performed a time-and-materials basis by the ENGINEER, it shall be performed using the approved rates for labor and equipment.

SC-13.03 Unit Price Work

Delete paragraph 13.03.E.1 and 2 in their entirety and insert the following in their places:

1. The quantity of a particular item of Unit Price Work performed by CONTRACTOR differs by more than 25% from the estimated quantity of such item indicated in the Agreement, and
2. the total cost of the particular individual item of Unit Price Work amounts to 10% or more of the Contract Price which is the total sum of all schedules (if any), and

SC-15.01.B Applications for Payments

Add the following new sentences to the end of paragraph 15.01.B.3:

Retainage may be used by the Owner to offset costs for any of the losses enumerated in paragraphs 15.01.C.6, 15.01.E, or 16.02. In addition, retainage may be used by the Owner to protect against loss from failure by the Contractor to complete necessary work and to offset any liquidated damages due Owner.

Add the following new paragraphs to paragraph 15.01.B. as subsections 4, 5 and 6:

4. Each application for progress payment shall be accompanied by the CONTRACTOR's updated Progress Schedule in accordance with Articles GC 4.04 and SC 4.04, shop drawing schedule, procurement schedule, and other data specified herein or reasonably required by Owner or Engineer. The OWNER reserves the right to require submission of monthly certified payrolls from the CONTRACTOR.
5. The CONTRACTOR shall make his books and records relating to the items used for the determination of billings available for review by the Legislative Auditor and OWNER or his representatives. After resolution of any billing dispute where OWNER is due a refund, such refund shall be made to OWNER including interest. Interest shall be compounded monthly.
6. If the CONTRACTOR desires to receive payment for materials in storage for any assembly or lump sum bid item, the CONTRACTOR shall provide a breakout of all materials and their actual costs for that item. This breakout shall be in spreadsheet or database form showing "period" and "to date" totals of materials in storage and materials incorporated into work. The CONTRACTOR shall attach invoices relating to the breakout to verify all materials being requested for payment under that item.

Add the following language at the end of paragraph 15.01.B.1:

Payments for materials in storage shall be based only upon the actual cost of the materials and equipment to CONTRACTOR and shall not include any overhead or profit. Bill of Sale, invoice or other document warranting clear title for materials in storage will be waived for the material in storage included in the first progress payment application. However, proof of payment and clear title must be submitted with Application No. 2 for all material included in Application No. 1. Without such documentation amounts paid for materials in storage will be deducted from subsequent payments. Beginning with the second application, all requests for payment for materials in storage shall be accompanied by Bill of Sale, invoice or other document warranting clear title as required above.

SC-15.01.D Payment Becomes Due

Delete paragraph 15.01.D.1 in its entirety and insert the following in its place:

The OWNER will, upon presentation to him or her of the CONTRACTOR's Application for Payment with ENGINEER's recommendation and OWNER's approval of said application, pay the CONTRACTOR the amount approved for payment by the OWNER within thirty (30) days following approval and acceptance of said Application for Payment, subject to retainage provisions as identified in the Agreement Form.

SC-15.02 Contractor's Warranty of Title

Add the following language at the end of paragraph 15.02.A:

Neither recommendation of any progress payment by ENGINEER nor payment by the OWNER to CONTRACTOR, nor any use or occupancy of the Work or any part thereof, will release the CONTRACTOR from complying with the Contract Documents. Specifically, the CONTRACTOR shall maintain in accordance with Article 6, property insurance on all Work, materials, and equipment whether incorporated in the project or not and whether included in an application for payment or not, for the full insurable value thereof. Passing title to OWNER for materials and equipment included in an application for payment does not relieve the CONTRACTOR of the CONTRACTOR's obligation to provide insurance (including property insurance), as required in Article 6 of the General Conditions and these Supplementary Conditions. All insurance shall remain in effect as provided in Article 6.

SC-15.03 Substantial Completion

Delete paragraph 15.03 in its entirety and insert the following in its place:

When Contractor considers the work ready for utilization by Owner, Contractor shall declare in writing to Owner and Engineer that the work is substantially complete and request the Engineer issue a Notice of Substantial Completion therefore. Within a reasonable time thereafter, Owner, Contractor and Engineer shall make an inspection of the work to determine the status of completion. If Engineer does not consider the work substantially complete, Engineer shall notify Contractor in writing giving reasons therefore. If Engineer considers the work substantially complete, Engineer shall prepare and deliver to Owner and Contractor a tentative Notice of Substantial Completion, which will fix the date of substantial completion and the responsibilities between Owner and Contractor for operation and maintenance. The notice shall include a tentative list of items to be completed or corrected before final acceptance. Owner shall have ten days after receipt of the tentative notice during which to make written objection to Engineer as to any provisions of the notice or list. If, after considering such objections, Engineer concludes the work is not substantially complete, Engineer shall notify Contractor in writing stating reasons therefore. If after ten days and after consideration of Owner's objection, Engineer considers the work substantially complete, Engineer shall execute and deliver to Owner and Contractor a definitive Notice of Substantial Completion, with a revised list of items to be completed or corrected, reflecting such changes from the tentative notice as Engineer believes justified after consideration of any objections from Owner.

SC-15.04 Partial Use or Occupancy

Delete paragraph 15.04.A.1 in its entirety and insert the following in its place:

1. At any time, Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner and Engineer will follow the procedures of Paragraph 15.03 for that part of the Work. Owner has the right to take possession of or use any completed or substantially completed portions of the work at any time, but such taking possession or use will not be deemed an acceptance of any work not completed in accordance with the Contract Documents. Owner's use of any facilities so identified in the Contract Documents will not be grounds for extension of the contract time or change in the contract price. Owner's use of any facilities not specifically identified in the Contract Documents will be in accordance with conditions agreed to prior to such use, and any extra costs or delays in completion incurred and properly claimed by the Contractor will be equitably adjusted with a Change Order. Facilities substantially completed in accordance with the Contract Documents which are occupied or used by Owner prior to substantial completion of the entire work will be done in accordance with General Conditions 15.03. Guarantee periods for accepted or substantially completed work including mechanical and electrical equipment will commence upon the start of continuous use by Owner. All tests and instruction of Owner's personnel must be satisfactorily completed, and Owner shall assume responsibility for and operation of all facilities occupied or used except as may arise through portions of work not yet completed by Contractor.

SC-15.05 Final Inspection

Insert the following sentence at the end of paragraph 15.05.A:

After Contractor has remedied all deficiencies to the satisfaction of the Engineer and delivered all construction records, maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, and other documents (all as required by the Contract Documents), Owner and Contractor shall be promptly notified in writing by Engineer that the work is acceptable.

SC-15.06 Final Payment

Delete paragraph 15.06.D and insert the following in its place:

- D. The OWNER shall not be required to make final payment (including retainage release) to the CONTRACTOR until such time as the provisions of Wyoming Statutes 16-6-116 and 16-6-117 have been fulfilled. If no claims or liens have been filed within the forty (40) day advertisement period stipulated in the above-referenced statutes, retainage will be paid (along with the final Progress Payment) on the 41st day, provided the items noted below are completed. Should any liens or claims be filed, retainage equal to the amount of the liens or claims will be held until satisfactory agreement is reached between the OWNER, CONTRACTOR and CONTRACTOR's surety.

All warranties and guarantees from the CONTRACTOR, Subcontractors, Suppliers, Manufacturers, etc., shall be delivered to the OWNER and be of acceptable form and content as determined by the OWNER before final payment is made. All closeout requirements and documents (see Sections 00500 and 01700) shall also be completed and/or provided to the ENGINEER in an acceptable form prior to the release of retainage. If any deficiencies are found after completion of the punch list at the time of Final Completion (warranty items), these shall also be corrected prior to retainage release.

SC-15.08 Correction Period

Add the following new paragraph at the end of paragraph 15.08.A:

Nothing in Article 15 of the General Conditions concerning the correction period shall establish a period of limitation with respect to any other obligation which Contractor has under the Contract Documents. The establishment of time periods relates only to the specific obligations of Contractor to correct the Work and has no relationship to the time within which Contractor's obligations under the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish Contractor's liability with respect to Contractor's obligations other than to specifically correct the Work.

Add the following new paragraph as paragraph 15.08.F.

All costs incurred by the OWNER for the inspection and documentation of warranty repairs shall be the responsibility of the CONTRACTOR. Such costs shall include, but are not limited to all fees and charges of inspectors, testing and testing personnel, engineers, and other professionals as determined by the ENGINEER. The costs incurred shall be deducted from monies due the CONTRACTOR.

Prior to commencing warranty repair work, the CONTRACTOR shall provide submittals to the ENGINEER detailing repair procedures for each separate type of repair, if requested by the ENGINEER.

SC-16 SUSPENSION OF WORK AND TERMINATION

Delete paragraph 16.03 and insert the following in its place:

16.03 Owner May Terminate for Acts of God or OWNER's Convenience

1. Should an act of God result in substantial damage to all or a portion of the Work, or should the OWNER'S convenience necessitate termination, the OWNER shall have the option of terminating the Agreement. If the OWNER exercises the option to terminate, a Notice to Terminate so providing will be issued. Such Notice to Terminate may provide for the CONTRACTOR to perform any work deemed by the OWNER as necessary to put the project in satisfactory condition for the termination of all work. The CONTRACTOR shall be relieved of further responsibilities for damage to the Work (excluding materials not already incorporated into the Work) which responsibilities are specified in the General Conditions, and will not be required to perform any further Work on the project other than that specified in the Notice of Termination.

2. When the ENGINEER determines that the Work specified in the Notice of Termination has been completed, the ENGINEER shall accept the project, and immediately upon such acceptance, the CONTRACTOR will not be required to perform any further Work thereon, and shall be relieved of his responsibility for injuries to persons or property.
3. After acceptance of the Work pursuant to the General Conditions, the CONTRACTOR will be paid for the Work done prior to termination. The OWNER will determine the value of the partially completed Work as follows: The CONTRACTOR will be paid for all Work to the date of the Notice of Termination in accordance with the General Conditions. This amount shall be computed by determining the percentage of the total contract Work completed prior to termination and multiplying that percentage against the total contract amount. The amount to be paid shall not exceed the amounts previously paid or due the CONTRACTOR from the amounts retained. The CONTRACTOR shall not be entitled to his anticipated profits for the Work, which would have been performed, but for termination.
4. If the CONTRACTOR has placed an order, prior to such termination, for materials specially manufactured for the project, which materials are not suitable for use in other projects of the OWNER or sale to others in the ordinary course of the vendors' business, the CONTRACTOR will be paid the actual cost to the CONTRACTOR or the cancellation charges, if any, assessed by the vendor. The determination of whether the order shall be completed or canceled shall be made by the OWNER. Any material paid for shall become the property of the OWNER and the actual cost of the any further handling will be paid for by the OWNER.
5. No payment will be made to vendor for materials which have been damaged and are not acceptable for incorporation in the work in accordance with the requirements of the Agreement. The CONTRACTOR shall reimburse the OWNER for any amounts previously paid by the OWNER for such unacceptable material, and agrees that the OWNER may deduct the amount of such previous payments made by the OWNER from any monies due or which may become due the CONTRACTOR. If the OWNER has paid for acceptable materials not incorporated into the Work under the General Conditions, the OWNER will have the option of taking title to all or any portion of such materials or of receiving reimbursement from the CONTRACTOR for any amounts previously paid to the CONTRACTOR. The CONTRACTOR agrees to pay to the OWNER upon demand any amounts previously paid for such materials, and agrees that the OWNER may deduct the amount of such previous payments from any monies due or which become due the CONTRACTOR.

Add the following new paragraphs as 16.05, 16.06 and 16.07:

16.05 CONTRACTOR's Responsibility on Receipt of Notice of Termination.

On receipt of a notice of termination from the OWNER, whether for cause or convenience of the OWNER, the CONTRACTOR shall:

1. Stop all Work under the Agreement on the date of and to the extent specified in the Notice of Termination;
2. Place no further orders or subcontracts for materials, equipment or services except as may be necessary for completion of such portions of the work expressly excluded under the Notice of Termination;
3. Cancel or terminate all orders of subcontracts to the extent that they relate to the performance of Work covered by the Notice of Termination; and,
4. Comply with all other requirements of the OWNER as may be specified in the Notice of Termination.

16.06. Subcontract Provision.

The CONTRACTOR shall insert in all subcontracts a provision that the Subcontractor shall stop all work on the date of or to the extent specified in a Notice of Termination from the OWNER and shall require the Subcontractors to insert the same provision in their subcontracts.

16.07. Duty To Notify Subcontractors.

The CONTRACTOR shall immediately, upon receipt, communicate any Notice of Termination issued by the OWNER to the affected Subcontractors and Sub-subcontractors.

SC-17 Final Resolution of Disputes

Delete paragraph 17.01 – Methods and Procedures and in its entirety and insert the following in its place:

17.01 Methods and Procedures

A. Either Owner or Contractor may request mediation of any Claim submitted to Engineer for a decision under Paragraph 12.01 before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the contract. If Owner or Contractor does not accept the action taken on a claim by the other party as stipulated in Paragraph 12.01.C, it shall stay the effect of Paragraph 10.05.E.

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

C. If the Claim is not resolved by mediation, the action taken by the other party shall become final and binding 30 days after termination of mediation unless, within that time period, Owner or Contractor:

1. Agrees with the other party to submit the Claim to another dispute resolution process, or

2. Gives written notice to the other party of their intent to submit the Claim to a court of competent jurisdiction.

D. Notwithstanding any applicable statute of limitations, a party giving notice under Paragraph 17.01.C.2 shall commence an action on the Claim within one year of giving such notice. Failure to do so shall result in the Claim being time-barred, and ENGINEER's action or denial shall become final and binding.

SC-18 Miscellaneous

Add the following new paragraph as 18.01.A.3:

3. The mailing address for giving notices to Contractor given in the Agreement is hereby designated as the place to which all notices, letters, and other communication to Contractor will be mailed or delivered. The mailing address for giving notices to Owner given in the Agreement is hereby designated as the place to which all notices, letters, and other communication to Owner shall be mailed or delivered. Either party may change the mailing address at any time by an instrument in writing delivered to the Engineer and to the other party.

END OF SECTION 00810

DIVISION 1
GENERAL
REQUIREMENTS

PART 1 - GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS:

The intent of the contract is to provide for the construction and completion in every detail of the Work described. The Contractor shall furnish all labor, materials, equipment, tools, transportation and supplies required to complete work in accordance with the Plans, Specifications, and terms of the Contract and provide a complete and satisfactorily operating system.

1.02 CONTRACTOR USE OF PREMISES:

The CONTRACTOR shall confine his or her operations to the site of the proposed Work or within the right-of-way or construction easements provided and shown in the Plans.

It shall be understood that the responsibility for protection and safekeeping of equipment and materials on or near the site will be entirely that of the CONTRACTOR and that no claim shall be made against the OWNER by reason of any act of an employee or trespasser. It shall be further understood that should any occasion arise necessitating access by the OWNER to the sites occupied by these stored materials and equipment, the CONTRACTOR owning or responsible for the stored materials or equipment shall immediately remove same. No materials or equipment may be placed upon the property of the OWNER until the OWNER has agreed to the location contemplated by the CONTRACTOR to be used for storage.

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

The OWNER, ENGINEER, representatives of funding agencies, and others designated by the OWNER shall have access to work sites.

CONTRACTOR's use of premises shall comply with all applicable local, state and federal laws.

1.03 PROTECTION OF EXISTING UTILITIES:

Existing underground installations such as water mains, gas mains, sewers, telephone lines, power lines, and buried structures in the vicinity of the Work to be done hereunder are indicated in the Plans only to the extent such information has been made available to or discovered by the ENGINEER in preparing the Plans. There is no guarantee as to the accuracy or completeness of such information, and all responsibility for the accuracy and completeness thereof is expressly disclaimed. The CONTRACTOR is required to comply with the terms of the Wyoming Statute W.S. 37-12-30 through W.S. 37-12-305, "Wyoming Underground Facilities Notification Act." This includes calling "One-Call of Wyoming" (1-800-849-2476).

Utility service connections are generally shown in the Plans, but the CONTRACTOR shall be solely responsible for locating all existing underground installations, including service connections, in advance of excavating or trenching, by contacting the owners thereof and prospecting. The CONTRACTOR shall use his/her own information and shall not rely solely upon information shown in the Plans concerning existing underground installations. The CONTRACTOR shall repair all damage to existing utilities or property at his/her own expense. The CONTRACTOR shall anticipate additional time may be required to locate curb stops, service saddles and sewer services.

Whenever buried utilities or other obstacles are expected to be encountered, the CONTRACTOR shall excavate ahead to determine the location of the obstacle. Appropriate design modifications, as approved by the ENGINEER, shall be made to avoid the utility or obstacle. Backfill of excavations shall comply with Section 02221.

If any existing underground facility not shown in the Plans is located so that it interferes with the Work in either alignment or grade and if determined by the ENGINEER that it has to be moved or otherwise modified, such work shall be done by the CONTRACTOR, after consulting with the ENGINEER and agreeing on work to be performed. The ENGINEER will then issue a Construction Field Order or Work Directive to the CONTRACTOR, and the CONTRACTOR will furnish a detailed cost breakout to perform the Work (if additional work is involved). The ENGINEER will review the costs, and if found acceptable, will include the Work in a Change Order. CONTRACTOR's reimbursed costs will be limited to the actual field time required to complete the Work. If bid Unit Prices apply to the Work, they shall be used if requested by the ENGINEER.

The CONTRACTOR shall also use appropriate means to protect overhead utilities, including poles, wires, guy wires, and other facilities. The CONTRACTOR shall arrange for the utility company to hold poles and relocate guy wires or other facilities when needed. The CONTRACTOR shall pay the utility owner for any damage to overhead utilities.

1.04 PROTECTION OF EXISTING STRUCTURES:

Where excavation will be required adjacent to existing structures, the CONTRACTOR shall be solely responsible to maintain the structural integrity of the existing structures. The CONTRACTOR shall take whatever means necessary to ensure that the existing structure is not damaged. The CONTRACTOR shall repair all damage to the existing structures at his/her own expense; any foundations, walls, fences, sidewalks, trees, hedges, road surfacing, drainage ways, landscaping, overhead utilities, poles or guy wires or the like destroyed or damaged during construction shall be repaired to the satisfaction of the property owner. Any delay, additional work, or extra cost to the CONTRACTOR caused by existing structures shall not constitute a claim for extra work, additional payment or damages. Unless otherwise noted in the Plans, all existing ditches disturbed by construction shall be restored to their original size, line, and grade.

1.05 FIELD CHECK OF EXISTING STRUCTURES:

The dimensions and elevations of existing structures and locations of existing fences, pipelines, conduits, cables, roads, buildings, and equipment shown in the Plans were taken from available records and survey data and are not guaranteed for accuracy. It shall be the responsibility of the CONTRACTOR to check all dimensions and elevations of existing structures, pipelines, conduits, cables, equipment, or other existing items, both above and below ground, affected by or affecting the Work under this contract, prior to the start of construction or ordering materials and equipment affected thereby.

The CONTRACTOR is required to visit the site of the Work to familiarize himself or herself with the arrangement and condition of existing construction that is to be connected to or that is to remain in place prior to submitting their bid.

1.06 PROTECTION OF EXISTING MAILBOXES, SIGNS, CURBS, GUTTERS, DRIVEWAYS:

The CONTRACTOR shall take whatever means necessary to ensure that the existing mailboxes, signs, curbs and gutters, sidewalks, driveways, irrigation facilities, roads, fences and landscaping are not damaged during construction. If it is necessary to remove or disturb

mailboxes during construction, the CONTRACTOR shall repair and restore the damaged facilities, whether or not shown in the Plans, at his or her own expense to the satisfaction of the property owner. Any curb, gutter, sidewalks or driveways damaged during construction, not noted to be replaced in the Plans, shall be replaced by the CONTRACTOR at his or her own expense.

1.07 PROTECTION OF EXISTING PAVEMENT:

CONTRACTOR shall be responsible for protecting existing paved surfaces adjacent to the Work, or where the CONTRACTOR'S equipment might be present but is not scheduled to be repaved. Any damaged areas not noted to be replaced in the Plans shall be repaired by the CONTRACTOR to pre-existing or better conditions, at no cost to the OWNER. Any mud or soil tracked onto existing roads is to be removed daily.

1.08 ADJUSTMENT TO UTILITIES:

All valve boxes and manholes shall be installed at grade. Final vertical adjustment of valve boxes and manhole castings in areas to be paved shall be made after the asphalt surface course is constructed. The CONTRACTOR shall include the price for final adjustment of these valve boxes and manholes in his or her contract price. No additional payment will be made for these final adjustments, unless otherwise agreed to by the ENGINEER and OWNER.

All water mains shall be installed with a minimum cover of 6.0 feet unless shown otherwise in the Plans. All water service lines shall be installed with a minimum cover of 7.0 feet unless shown otherwise in the Plans. The minimum cover shall be measured from the existing grade or from future street grade lines as shown in the Plans, whichever is lower. The water lines shall be laid in such a manner as to avoid high points in the line not shown in the Plans. All high points in the water lines shall occur at fire hydrants or air release valves. The ENGINEER is to be consulted for any changes in pipeline grades.

CONTRACTOR may use a maximum of 8 inches of adjusting rings, including existing adjusting rings in place, to raise existing manhole castings to grade. Where adjustments to raise existing manhole castings will require more than 8 inches of adjusting rings total, and where adjustments to lower existing manhole castings cannot be made by simply removing existing adjusting rings, the CONTRACTOR shall install or remove barrel sections or reconstruct the manhole as directed by the ENGINEER to bring the manhole to grade.

1.09 SURFACE DRAINAGE:

Water from such sources as surface runoff, dewatering and flushing of water lines or other project components during project construction shall not be allowed to enter into drainage ways or open areas that will cause flooding of existing structures, street intersections, or lawn areas, or violate State Water Quality Regulations. See requirements of Sections 01060 and 01560.

1.10 RELATED WORK AND HEADINGS:

The Related Work sub-sections and the headings for sections in the specification section is a guide only and does not necessarily include all work that might be related to that particular section.

1.11 WORK SEQUENCE:

The CONTRACTOR shall schedule the Work to minimize inconvenience to the OWNER and to adjacent property owners and to minimize interruptions to utility service. This shall include minimizing obstructions to local traffic. Work shall be scheduled so as to minimize disruptions to local mail and parcel delivery, emergency vehicles, school buses, and garbage collection and shall make immediate arrangements to allow these types of vehicles access through the project. Close coordination will be required between the CONTRACTOR, OWNER, ENGINEER, and utility service companies. The utility service companies such as power, gas, telephone, video and City of Sheridan shall be contacted at least 48 hours in advance (or at least two business days) of when locating of services will be required.

A proposed project schedule is to be provided and updated as required by Sections 00700, 00810, 01040, and 01300.

Persons and telephone numbers to be contacted by CONTRACTOR for utility coordination or emergencies include those listed on the following pages. Additional contacts may be required on some projects. Also, numbers may periodically be changed.

FOR UTILITY CLEARANCES OR EMERGENCIES CONTACT:

WATER AND SEWER: CITY OF SHERIDAN		
FIRST PRIORITY	SECOND PRIORITY	THIRD PRIORITY
One Call: 1-800-849-2476	During business hours: Utilities Maintenance Shop: (307) 672-0129 Service Center: (307) 674-4112	After Hours Emergency: Sheridan Police Department (307) 672-2413 Ask dispatcher to page #205, leave information.

GAS AND ELECTRICAL: MONTANA-DAKOTA UTILITIES		
One Call: 1-800-849-2476	Local phone:(307) 673-3140	After Hours Emergency: 1-800-638-3278

TELEPHONE: CENTURY LINK		
One Call: 1-800-849-2476	Local Phone:(307) 672-0370	Repair (24 Hours): 1-800-573-1311

CABLE TELEVISION: CHARTER	
One Call: 1-800-849-2476	Local Phone: (307) 672-5841

CITY OF SHERIDAN:		
ENGINEER (307) 674-6483	SERVICE CENTER (307) 674-4112	POLICE (307) 672-2413

WYOMING DEPARTMENT OF TRANSPORTATION:		
ENGINEER (307) 674-2305	MAINTENANCE (307) 674-2307	HIGHWAY PATROL (307) 674-8569

END OF SECTION 01010

PART 1 - GENERAL

1.01 GENERAL:

The CONTRACTOR shall familiarize himself or herself with all items of the Project requiring coordination and plan the Work to ensure orderly progress and completion within the Contract Time. The CONTRACTOR shall coordinate the Work of all subcontractors.

1.02 CONSTRUCTION OF WATER AND SEWER LINES:

The CONTRACTOR shall coordinate all connections to existing lines, and all testing, cleaning and disinfection of water line and sewer systems with the ENGINEER.

Only City of Sheridan personnel shall operate existing water valves. The CONTRACTOR shall give 48 hours' notice (two business days) of the need to operate these valves.

1.03 EXISTING UTILITIES:

The CONTRACTOR shall coordinate closely his or her construction activities with the utility service companies. The CONTRACTOR shall give at least 48 hours' notice (or at least two business days) to the utility service companies prior to the time when field location of existing services will be required. The times and dates of major connections to the OWNER's facilities shall be approved by the OWNER. This includes tie-ins that temporarily disrupt service, or require OWNERS's personnel on site.

CONTRACTOR shall provide at least seven (7) days' notice to utility companies to relocate overhead or underground services that will be disturbed by construction activities or for installing underground utilities. In those cases where these utilities are relocating their lines and equipment into dry utility trenches provided by CONTRACTOR, the CONTRACTOR will notify these utility companies seven (7) days in advance that the trenches will be available, and the utility companies will then have three (3) days to install their lines and equipment after the trenches are available.

CONTRACTOR shall be responsible for the removal and disposal of any poles within the project area once they are no longer needed by the affected utilities. The CONTRACTOR shall remove these poles from the project site within seven (7) days from the time that they are provided notification that they are no longer needed. No additional compensation will be provided the CONTRACTOR if these utility poles are in the way of construction prior to their removal.

1.04 NOISE IMPACT:

To minimize construction noise impacts on the local residents, no construction activities will be allowed between the hours of 8 p.m. and 7 a.m. unless explicitly allowed by the ENGINEER. Special arrangements can be made on any special connections that may be required after hours.

All pumps used shall have adequate muffler and exhaust systems that meet current air pollution and noise regulations. Noise levels from any pump shall not exceed 90 dBA, or the most current OSHA Part 1910.95(b)(2) regulations.

1.05 WORKING HOURS:

The time provided for construction completion of this project assumes the CONTRACTOR working 5 days a week, 10 hours per day. Should the CONTRACTOR or the subcontractors desire to work more than 5 days per week or 10 hours per day or on designated off-days, a written request for approval must be submitted to the ENGINEER and the OWNER. The designated off-days shall be all weekends and holidays. The approval of additional working hours or days may include payment of the engineer's and inspector's time.

Night work will be allowed only with written approval of OWNER. Emergency work may be done without prior permission. Work shifts of the prime contractor and subcontractors shall coincide with each other to prevent extending the total hours of work in a single day.

1.06 SCHEDULING REQUIREMENTS:

A. Monthly Work Plan and Progress Schedule

Prior to beginning any work, the CONTRACTOR shall submit a Work Plan and Progress Schedule which is sufficiently detailed to show the sequence of each component of work as outlined in the Contract Documents to complete the project within the contract time period, and in the manner specified in the Contract Documents. Items to be shown include the beginning and ending dates of each component of work, the relationship of the time required for completion of each component to the overall duration of the project, and the production rates used to estimate the time required. Major components of work that are not contract pay items shall also be shown. An updated schedule shall be submitted the first working day of each month, or at more frequent intervals as directed by the ENGINEER, showing the original schedule, changes that have been made, and the progress to date for each component.

The work plan to be updated monthly shall generally follow sequencing identified in the Contract Documents, although the CONTRACTOR may submit an alternative sequencing method for consideration by the ENGINEER.

B. Weekly Sequence of Work Schedule

A detailed Sequence of Work Schedule that coincides with the monthly Work Plan and Progress Schedule and shows the order in which work shall be undertaken shall be updated and submitted weekly (at a minimum) by the CONTRACTOR.

C. The CONTRACTOR is advised that any or all monthly partial payments will be withheld until the CONTRACTOR complies with the requirements specified herein for submission of current work schedules to the satisfaction of the ENGINEER.

1.07 SURFACE RESTORATION:

All road surfaces disturbed by excavation are to be maintained according to Section 01560, Article 3.09. Clean-up of construction areas shall be completed within 21 days of the construction activities.

1.08 LOCAL PHONES:

The CONTRACTOR shall maintain a local cell phone and fax number. The cell phone contact shall be available 24 hours per day, including weekends and holidays.

PART 2 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT

2.01 METHOD OF MEASUREMENT

A. Standard Items:

01040.10 SEQUENCE OF WORK SCHEDULE AND COORDINATION

This item shall be measured as a percentage of the contract completed and shall be paid as a lump sum.

2.02 BASIS OF PAYMENT

A. Standard Items:

01040.10 SEQUENCE OF WORK SCHEDULE AND COORDINATION

Payment shall be as a lump sum and shall be considered full compensation for furnishing all effort and incidentals necessary to complete this item. Effort includes preparation of a detailed Sequence of Work Schedule that coincides with the project Work Plan and Progress Schedule and shows the order in which work shall be undertaken.

CONTRACTOR shall coordinate on a weekly basis (at a minimum) with all subcontractors and all dry utility companies, as well as any other parties affected, including but not limited to contractors on different projects nearby and owners, regarding to the sequencing of all work to be performed within the Project area by all parties. The purpose of this Sequence of Work Schedule is to plan accordingly that the work of multiple contractors and third party interests in the relatively small work area proceeds in an orderly and efficient manner to the benefit of all parties, including work required to resolve utility conflicts. CONTRACTOR shall designate a point of contact that shall be in charge of this sequencing of work. No claims will be considered for delays, lack of access, or any other item that can be avoided with proper coordination.

END OF SECTION 01040

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. ENGINEER will establish necessary vertical and horizontal surveying control and stationing consistent with the requirement of the Contract Documents. This control shall consist of control points at a frequency of approximately one per block. A listing of the coordinates and elevations of these points will be provided to CONTRACTOR. From the control surveying provided, the CONTRACTOR shall provide what additional surveying he or she deems necessary to control the alignment, grades, and elevations of the work.

CONTRACTOR'S staking for the water lines shall include as a minimum offset staking at all even numbered stations (200-foot intervals). These stakes shall be preserved during construction so they are available for making measurements relating to the development of record drawings. Stakes and the installed water line shall be within 0.20 foot of their true position.

CONTRACTOR'S staking for sanitary or storm sewer system shall consist of an appropriate number of stakes to layout the line and grade of the system components. Line and grade of the completed sewers shall be within the tolerances stated in the appropriate section. All manholes and inlets shall be staked, including offset stakes, to allow confirmation of alignment and elevations.

CONTRACTOR'S staking for the subgrade and base course shall consist of blue tops set at maximum 50-foot stations along centerline. Five blue tops shall be set for each station, one at centerline, one at each edge of the roadway, and one at each mid-point between centerline and edge of roadway.

CONTRACTOR'S staking for the back of curb shall consist of an appropriate number of stakes to layout the line and grade of the curb. At a maximum the stakes shall include the beginning and end of all curve radii, any low or high point on the curb, and a maximum spacing of 50 feet. Curb and gutter shall be set within the allowable tolerances.

The CONTRACTOR shall not install valves, fire hydrants, manholes, or services until the staking has been reviewed by the ENGINEER. This review is for general location and not the accuracy of the staking.

- B. The CONTRACTOR'S surveyor that provides line and grade is to use techniques acceptable to the ENGINEER, and establish line and grade for the work involved within the tolerances specified.

- C. All construction staking and surveys shall be performed by or under the direct supervision of a licensed land surveyor registered in the State of Wyoming.

1.02 PRESERVATION OF REFERENCE POINTS AND PROPERTY CORNERS:

The CONTRACTOR shall carefully preserve bench marks, reference points, lot corners, section corners and other stakes, and in case of destruction he or she shall be charged for the resetting of such points and shall be responsible for any mistakes that may be caused by their

unnecessary loss or disturbance. Price for resetting such points will be deducted from CONTRACTOR'S monthly pay request. Resetting of property or section corners shall be by a surveying licensed to practice in Wyoming.

1.03 SURVEY NOTES:

CONTRACTOR shall maintain survey notes in standard survey notebooks in a neat and legible format. CONTRACTOR shall provide a duplicate set of survey notes for all staking operations to the ENGINEER for record purposes no later than twenty-four hours after the stakes are set. The ENGINEER reserves the right to monitor the work of survey crews as judged necessary to show conformance with this Specification. However, such monitoring shall in no way relieve the CONTRACTOR of the responsibility for survey accuracy and adequacy to obtain a finished product fully conforming to the Plans and Specifications. Failure to provide adequate notes in the time specified shall be justification for immediate suspension of all work.

1.04 ENGINEER'S SURVEYING:

The CONTRACTOR shall allow access to the work area for the ENGINEER to conduct any surveying he or she determines necessary.

PART 2 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT

2.01 METHOD OF MEASUREMENT

A. Standard Items:

01050.10 CONSTRUCTION STAKING

This item shall be measured as a percentage of the contract completed and shall be paid as a lump sum.

2.02 BASIS OF PAYMENT

A. Standard Items:

01050.10 CONSTRUCTION STAKING

Payment shall be as a lump sum and shall be considered full compensation for furnishing all stakes, equipment, labor and other items required to complete all construction staking as required by the contract documents.

END OF SECTION 01050

PART 1 - GENERAL

The CONTRACTOR shall be responsible for obtaining all permits and licenses, except as noted below, necessary for the completion of this Work. This refers to all permits that are required as of the date of the bid opening. Any costs associated with these permits shall be included as part of the Contract Price. No separate payment shall be made for compliance with permits.

The CONTRACTOR is to abide by all permit conditions of OWNER obtained permits, as well as his or her own permits. The OWNER will provide the CONTRACTOR copies of permits he or she obtains. The CONTRACTOR shall provide the ENGINEER copies of all permits he or she obtains.

The CONTRACTOR's superintendent, or the owner of the contracting company, shall be licensed through the City of Sheridan to perform utility construction as outlined in the Sheridan City Code, Section 7-11 and 7-12. The CONTRACTOR shall provide a copy of the license as part of the submittal process.

END OF SECTION 01060

PART 1 - GENERAL

1.01 COORDINATION OF CONTRACT DOCUMENTS:

A. The various portions of the Contract Documents, of which these Specifications are a part, are essential parts of the Agreement, and a requirement occurring in any portion or part is as binding as though occurring in all. All portions are intended to be complementary and to describe and provide for a complete work. In case of discrepancy, the following hierarchy shall be observed:

1. Special Provisions will govern over
2. Supplementary Specifications, which will govern over
3. Project Plans, which will govern over
4. These Specifications and Standard Details

B. CONTRACTOR shall not take advantage of any apparent error or omission in the Contract Documents. If CONTRACTOR discovers an error or omission, CONTRACTOR shall immediately notify ENGINEER. ENGINEER will pursue such corrections and interpretations as may be necessary for fulfilling the intent of the Contract Documents. CONTRACTOR shall not proceed with the work until the correction is made.

1.02 DEFINITIONS:

A. These Specifications use "Article 1 - Definitions" of the Standard General Conditions of the Construction Contract, Form No. 1910-8, prepared and issued by the Engineers Joint Contract Documents Committee (EJCDC), as the basis for the definition of terms herein. Changes in these definitions shall be made either by substitution for that article or as Supplementary Conditions.

B. Additional definitions and clarification of terms:

1. Provide: Furnish and install, complete with all necessary ancillary items, ready for intended use. Pay for all related costs.
2. Approved: Acceptance of an item submitted for approval. Not a limitation or release for compliance with the Contract Documents or any regulatory requirements. Refer to limitations of "Approved" in the EJCDC General Conditions, Paragraph 3.4, if used.
3. Match Existing: Construct new work to conform to the existing lines and grades of the site and facilities as acceptable to OWNER.
4. Supplementary Specifications: Permanent additions to and revisions of these Specifications, covering conditions which are not unique to any one project. Supplementary Specifications will govern over these Specifications, including the Standard Details, when in conflict therewith.

5. Special Provisions: Additional and revisions to these Specifications covering special conditions on an individual project. Special Provisions will govern over Project Plans and supplementary documents, Supplementary Specifications, Standard Details, and these Specifications when in conflict therewith.

END OF SECTION 01090

PART 1 - GENERAL

1.01 SCOPE:

The Method of Measurement and Basis of Payment is described in Subsection 1.04 of this Section.

1.02 GENERAL:

The total bid price for each item of the Contract shall cover all Work shown in the Plans and required by the Specifications and other Contract Documents. All costs in connection with the Work, including furnishing all materials, equipment, supplies and appurtenances; providing all construction plant, equipment, and tools; and performing all necessary labor and supervision to fully complete the Work, shall be included in the unit and lump sum prices bid. No item that is required by the Contract Documents for the proper and successful completion of the Work will be paid for outside of or in addition to the prices submitted in the bid. All work not specifically set forth as a pay item in the Bid Form shall be considered a subsidiary obligation of the CONTRACTOR and all costs in connection therewith shall be included in the prices bid.

All work completed under the Contract will be measured by the ENGINEER according to the United States Standard Measure. The method of measurement and computations to be used in determination of quantities of material furnished and of Work performed under the Contract will be those methods generally recognized as conforming to good engineering practice.

Unless otherwise specified, longitudinal measurements for area computations will be made horizontally, and no deductions will be made for individual fixtures having an area of nine square feet or less. Unless otherwise specified, transverse measurements for area computations will be the neat dimensions shown in the Plans or ordered in writing by the ENGINEER.

All items which are measured by the linear foot (LF), such as pipe culverts, water lines, sanitary sewers, storm drain or curb and gutter, will be measured parallel to the base or foundations upon which structures are placed, unless otherwise shown in the Plans. A station when used as a definition or term of measurement will be 100 linear feet measured horizontally, unless otherwise specified.

In computing volumes of excavation, the average end area method will be used, unless indicated otherwise.

The term gage, when used in connection with the measurement of plates, will mean U.S. Standard Gage. When reference is made to the measurements of galvanized sheets used in the manufacture of cribbing, the term "gage" will be as defined in AASHTO M36. When the term gage refers to corrugated steel pipe, it will be defined as specified in AASHTO M167, and when it refers to corrugated aluminum pipe it will be as defined in AASHTO M197. When the term gage refers to the measurement of wire, it will mean the wire gage specified in AASHTO M32.

The term "ton", will mean the short ton consisting of 2,000 pounds avoirdupois.

All materials which are measured or proportioned by weight shall be weighed on accurate scales that have been approved by the appropriate state agency.

Materials to be measured by volume in the hauling vehicle shall be hauled in approved vehicles and accepted as to quantity at the point of delivery. Vehicles for this purpose may be of any size or type acceptable to the ENGINEER, provided that the body is of such shape that the actual contents may be readily and accurately determined. All vehicles shall be loaded to at least their struck capacity.

At the request of the CONTRACTOR and with written approval of the ENGINEER, material specified to be measured by the cubic yard (CY) may be weighed, and such weights converted to cubic yards for payment purposes.

Materials specified to be measured by weight may, with written approval of the ENGINEER, be measured by volume and such volumes will be converted to weight for payment purposes. The factor for conversion from weight measurement to volume measurement will be determined by the ENGINEER and shall be agreed to by the CONTRACTOR before such method of measurement of pay quantities is used.

The term lump sum (LS), when used as an item of payment, will mean payment for the complete Work described in the Contract. No adjustment, other than approved changes, will be made in the lump sum payment for items designated to be paid by lump sum, even though the actual quantities may deviate from the estimated quantities shown in the Plans. Except as indicated otherwise in the Specifications, any adjustment in a lump sum payment due to approved changes that result in a significant change in the quantity of a lump sum item, will be based on agreed prices that are representative of the increased or decreased cost of the lump sum item.

When a complete structure or structural unit (in effect, "lump sum" work) is specified as the unit of measurement, the unit will include all necessary fittings and accessories for a satisfactorily operable unit.

When standard manufactured items are specified such as fence, wire, plates, rolled shapes, pipe conduit, etc., and these items are identified by gage or thickness, unit weight, section dimensions, etc., such identification will be considered to be nominal weights or dimensions. Unless more stringently controlled in cited specifications, manufacturing tolerances established by the industries involved will be accepted.

1.03 ESTIMATED QUANTITIES:

All estimated quantities stipulated in the Bid Form or other Contract Documents are approximate and are to be used only (a) as a basis for estimating the probable cost of the Work and (b) for the purpose of comparing the bids submitted for the Work. The actual amounts of Work done and materials furnished under unit price items may differ from the estimated quantities. The basis of payment for work and materials will be the actual amount of work done and materials furnished. The CONTRACTOR agrees that he will make no claim for damages, anticipated profits, or otherwise on account of any difference between the amounts of work actually performed and materials actually furnished and the estimated amounts herein, except as follows. Either the OWNER or the CONTRACTOR may demand in writing that a supplemental agreement or Change Order be prepared to authorize an adjustment in the unit price of any contract item if the quantity of said contract item increases or decreases by more than 25 percent from that shown in the Contract Documents, if the extended price for that contract item represented at least 10 percent of the total price for that particular schedule.

1.04 METHOD OF MEASUREMENT AND BASIS OF PAYMENT:

"The OWNER or ENGINEER shall be responsible for the creation of Bid Items and their individual Method of Measurement and Basis of Payment separately for each project."

END OF SECTION 01150

PART 1 - GENERAL

1.01 DESCRIPTION: The following Specification includes the procedures for submitting "Shop Drawings" as is required in these Specifications. Items which need to be reviewed by the ENGINEER are included with this Section.

1.02 DEFINITIONS:

- A. Shop Drawings: The term "Shop Drawings" includes drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, and similar materials requested by the ENGINEER to be furnished by the CONTRACTOR to explain in detail specific portions of the Work required by the Contract.
- B. CONTRACTOR's Review and Approval: The CONTRACTOR shall coordinate all submittals and review them for accuracy, completeness, and compliance with contract requirements and shall indicate his or her approval thereon as evidence of such coordination and review. All submittals shall be attached to the "Transmittal of Shop Drawings" Form that is included in this Section. The form shall be filled out, signed and approved by the CONTRACTOR. Items submitted to ENGINEER without this form or CONTRACTOR'S approval will be returned for resubmission. By attaching this form to the submittal, the CONTRACTOR is representing that he or she has reviewed the entire submittal, that the submittal is in compliance with the Contract Documents, except as noted, and that the cover form applies to all documents that are attached to the form.

1.03 EFFECT OF REVIEW OF CONTRACTOR'S SUBMITTAL:

Review of the Plans, methods of work, or information regarding materials or equipment the CONTRACTOR proposes to provide, shall not relieve the CONTRACTOR of his or her responsibility for errors therein and shall not be regarded as an assumption of risks or liability by the ENGINEER or the OWNER, or by the officer or employee thereof, and the CONTRACTOR shall have no claim under the contract on account of the failure, or partial failure, of the method of work, material, or equipment so reviewed. A mark of "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED" shall mean that the OWNER has no objection to the CONTRACTOR, upon his or her own responsibility, using the plan or method of work proposed, or providing the materials or equipment proposed.

1.04 REPETITIVE REVIEW:

Shop Drawings and O&M manuals submitted for each item will be reviewed no more than twice at the OWNER'S expense. All subsequent reviews will be performed at times convenient to the ENGINEER and at the CONTRACTOR'S expense, based on the ENGINEER'S prevailing rates. The CONTRACTOR shall reimburse the OWNER for all such fees invoiced to the OWNER by the ENGINEER.

Any need for more than one resubmission, or any other delay in obtaining ENGINEER'S review of submittals, will not entitle CONTRACTOR to an extension of the Contract Time.

PART 2 - PRODUCTS None

PART 3 - EXECUTION

3.01 SUBMITTAL PROCEDURE:

Shop Drawings shall be submitted as follows:

- A. Date and Number: CONTRACTOR shall forward to ENGINEER all items required by the individual sections of the specifications at least 30 days prior to the need of approval. All submittals shall be returned to CONTRACTOR within 21 days of their initial receipt. If follow-up reviews are required by the ENGINEER, they shall be completed within 14 days. Unless hard copies are called for in the individual sections, submit all documents electronically, as well as four specimens of each sample requested. The documents shall be returned to the CONTRACTOR electronically along with the ENGINEER's comments.
- B. Cover Letter: All submittals shall be forwarded with the cover letter included in this Section from the CONTRACTOR, identifying the project and the portion of the project to which it applies. Submittals that are related to or affect each other shall be forwarded simultaneously as a package to facilitate a coordinated review. Uncoordinated submittals will be rejected.
- C. Modifications: Any modifications to the design proposed by the CONTRACTOR, shall be fully explained in the submittal. All necessary calculations and supporting documentation shall be included. If requested by the ENGINEER, the CONTRACTOR shall provide design drawings of the modification stamped by a professional engineer licensed to practice in the State of Wyoming.

3.02 ENGINEER'S APPROVAL:

The ENGINEER will indicate his or her approval or disapproval of each submittal and, if he or she does not approve the submittal as submitted, will indicate his or her reasons therefore. Any work done prior to approval shall be at the CONTRACTOR's own risk. Neither approvals nor lack of reviews or approval shall relieve the CONTRACTOR from responsibility for supplying materials and performing all work in accordance with the requirements of these Contract Documents. If submittals show variations from the Contract requirements, the CONTRACTOR shall describe such variations in writing, on the before mentioned form at the time of submission. Approval of such variation(s) shall be accompanied with a Contract Change Order. Minor variations not involving a change in price or time of performance will not be issued a modification.

3.03 REQUIRED SUBMITTALS:

- A. Permits: Submit to the ENGINEER at the Preconstruction Conference a copy of all permits required by the governing authorities, for which the CONTRACTOR is responsible.
- B. Subcontractors and Suppliers: At or before the Preconstruction Conference, the CONTRACTOR shall supply a complete list of all suppliers and subcontractors to be used on the project. The ENGINEER reserves the right to approve any proposed changes from those listed at the time of bidding.

C. Certificates: For those items called for in individual sections, furnish certificates from manufacturers, suppliers, or others certifying that materials or equipment being furnished under the Contract comply with the requirements of these specifications.

D. Shop Drawings: Required for all materials supplied on the project. See the individual specification sections for specific requirements. If an alternate is proposed, explain fully and if approved, make all necessary adjustments needed to accommodate any differences in the product.

E. Progress Schedule, Sequence of Work Schedule, Progress Payment Schedule: The CONTRACTOR shall submit to the OWNER, with the completed Agreement a Progress Schedule, Sequence of Work Schedule, and an estimated Progress Payment Schedule. The Sequence of Work Schedule shall show the order in which work shall be undertaken by the CONTRACTOR and shall show which items of Work shall be going on simultaneously. The progress schedule shall be in bar chart or Critical Path Method (CPM) form and show estimated starting and completion dates for each part of the Work. The CONTRACTOR's schedule shall show the Critical Path for the work. The Progress Payment Schedule shall show the monthly progress payment requests that are estimated to be made through the duration of the Contract. Both the Progress Schedule and Schedule of Payments shall be revised monthly to show project progress and revisions to the schedules. The revised schedules shall be submitted with the monthly progress payment request. No monthly progress payment request shall be accepted from the CONTRACTOR and processed for payment unless accompanied by a current schedule.

If the CONTRACTOR is behind schedule, he or she shall also submit a plan as to how he or she will get back on schedule.

F. Operation and Maintenance Instructions: Manufacturer's printed instructions shall include complete installation instructions, operating instructions, maintenance literature, lubrication requirements, and parts lists. Operation and maintenance instructions shall be provided on all pertinent materials and systems installed, or if requested by the ENGINEER.

G. Traffic Control Program: CONTRACTOR to provide as required in Section 02060.

H. Material Samples: CONTRACTOR shall submit all samples required by the Contract Documents to ENGINEER for review and approval with such promptness as to cause no delay in Work. All samples will be checked by and accompanied by a specific written indication that CONTRACTOR has checked and satisfied CONTRACTOR responsibilities under the Contract Documents with respect to the review of the submission and will be identified clearly as to material, Supplier, pertinent data such as catalog numbers and the use for which intended.

I. Weekly Schedule: At the weekly construction meetings (if held) the CONTRACTOR shall update the ENGINEER on construction plans for that week.

- J. Labor and Equipment Rates: At or prior to the pre-construction conference, the CONTRACTOR shall submit a list of labor rates and equipment rates that comply with the Contract Documents. Rates for equipment and machinery shall be hourly rates as contained in the latest edition of the Blue Book, Tables one and two, per the Supplemental Conditions. These hourly rates will be used for any additional work performed on a time and materials basis. Only hours actually worked shall be counted. The ENGINEER shall determine the number of hours counted for the task. Labor rates are to be calculated per General Condition 11.01A1 and the Supplemental Conditions. The ENGINEER shall approve all rates prior to the contractor commencing work.
- K. Water Main Testing: Provide a plan for testing, flushing and disinfecting any water lines installed under this project. This plan must be submitted 7 days prior to any testing, flushing and disinfecting being performed.
- L. Temporary Water: Provide a plan for providing temporary water service to residents, if pertinent to this project. This plan must be submitted 7 days prior to temporary water being used. The plan shall also be approved by the ENGINEER prior to commencing work associated with temporary water service.
- M. Storm Water Pollution Prevention Plan: Provide a plan to the ENGINEER for review and approval. All maintenance shall be provided by the CONTRACTOR as directed by the ENGINEER.
- N. Material and Supplier Installation Procedures: When requested by the ENGINEER, the CONTRACTOR shall secure from the supplier or manufacturer, and provide recommended procedure for installation repairs or start-up of materials or equipment.
- O. Closeout Submittals: CONTRACTOR to provide all required closeout submittals per Section 01700.

END OF SECTION 01300

TRANSMITTAL OF SHOP DRAWINGS

DATE:		NEW SUBMITTAL		RESUBMITTAL
TO:	FROM:			
PROJECT:				

ITEM NO.	DESCRIPTION OF ITEM SUBMITTED (Type, size, model number, etc.)	MANUFACTURER OR SUPPLIER	NO. OF COPIES	SPECIFICATION PARAGRAPH & PAGE NO.	SPECIFICATION REQUIREMENTS		BID ITEM NO.
					Meets	Does Not Meet	
1							
2							
3							
4							
5							
6							
7							
8							

LIST ALL VARIANCES FROM CONTRACT DOCUMENT REQUIREMENTS

I hereby certify that all Contractor's responsibilities under the Contract Documents with respect to review and submission of the above Shop Drawings have been satisfied and that each shop drawing has been stamped and/or marked to indicate Contractor's compliance with the Shop Drawing review requirements.

SIGNED _____ NAME (printed) & TITLE _____

PART 1 - GENERAL

1.01 QUALITY ASSURANCE:

The ENGINEER will provide quality assurance sampling and testing on a random basis to spot check compaction densities, aggregate gradation or quality, Atterberg limits, and quality of asphaltic concrete and Portland cement concrete. These tests will be done at no cost to the CONTRACTOR. Any tests which do not meet the Specifications and require re-testing shall be re-tested and charged to the CONTRACTOR.

Any retests will be deducted by the OWNER from the CONTRACTOR'S monthly progress payments according to invoicing submitted by the Testing Laboratory. CONTRACTOR will be notified prior to a retest and will be provided copies of the invoice with locations of the retests.

1.02 QUALITY CONTROL:

CONTRACTOR is responsible for and shall employ at his or her expense a testing laboratory acceptable to the ENGINEER to perform any testing to determine product quality and characteristics, job mix formulas or any other internal quality control testing as needed to ensure delivery and installation of an acceptable product at the job site, per these Contract Documents. Copies of all test results shall be provided to the ENGINEER as further defined in these specifications. CONTRACTOR is also responsible for all materials testing during construction for quality control including, by not limited to, compaction density tests of backfill, subgrade, crushed base, asphaltic concrete, and Portland cement concrete testing. Copies of all test results shall be provided to the ENGINEER in a timely manner as follows:

1. Compaction test results – 2 days.
2. Proctor test results – 2 days.
3. Asphalt pavement test results – 1 day, or before the next day's paving begins--whichever occurs first.
4. Concrete test results – 7 days.

Employment of agency in no way relieves CONTRACTOR of obligation to perform work in accordance with the requirements of the contract documents.

The CONTRACTOR'S testing agency shall provide documentation to the ENGINEER that the laboratory operates in accordance with the following specifications:

ASTM C1077- Minimum requirements for agencies engaged in the testing of concrete and concrete aggregates.

ASTM D3666 – Minimum requirements for agencies engaged in the testing of road and paving materials.

ASTM D3740 – Minimum requirements for agencies engaged in the testing of soil and rock.

Testing technicians shall be certified by NICET (Level II minimum), for the area of testing being performed, or some other nationally recognized certification organization, acceptable to the ENGINEER.

1.03 PROJECT INSPECTION:

The ENGINEER will furnish a Resident Project Representative to observe the performance of the Work. The Resident Project Representative, as the ENGINEER'S Representative, shall have the authority specified in the Contract Documents.

END OF SECTION 01400

PART 1 - GENERAL

1.01 SUMMARY:

A. Furnish temporary services and utilities, including use fees and operation costs:

1. Potable and non-potable water
2. Lighting and power
3. Material storage

B. Furnish construction facilities, including utility costs:

1. Construction equipment
2. Dewatering and pumping

C. Furnish security and protection requirements:

1. Fire extinguishers
2. Site enclosure fence, barricades, warning signs, and lights
3. Snow and ice removal, if applicable

D. Furnish personnel support facilities:

1. Sanitary facilities
2. Drinking water
3. First aid facilities
4. Coordinate emergency medical services
5. Trash removal

END OF SECTION 01505

PART 1 – GENERAL

1.01 CONTRACTOR RESPONSIBILITY:

CONTRACTOR shall be responsible for the security of all materials, equipment, tools, etc. used on the job. This includes all materials already included in a Progress Payment, whether as materials-in-storage or installed. All materials which can be easily removed shall be stored in a locked building provided by the CONTRACTOR. CONTRACTOR shall be responsible for the security of OWNER'S existing facilities which are accessed or otherwise exposed as a result of the commencement of this contract. Insurance coverage shall be maintained on all materials, whether in storage or incorporated into the work.

END OF SECTION 01540

PART 1 - GENERAL

1.01 All vehicles belonging to CONTRACTOR'S employees shall be parked in an area arranged for by the CONTRACTOR. Vehicles shall not be randomly parked around the construction site or on any land not owned by the OWNER without permission of the property owner. Vehicles cannot be parked where they are a hazard to traffic. Any vehicle parked in undesignated areas will be towed away at the vehicle owner's expense if it is not moved upon request.

PART 2 – PRODUCTS None

PART 3 - EXECUTION None

END OF SECTION 01550

PART 1 - GENERAL

1.01 DESCRIPTION:

The following Specification includes certain features which require special consideration during construction. Among these items are safety related features, air and water pollution control, and general construction items not covered within other sections.

PART 2 - EXECUTION

3.01 PRESERVATION OF EXISTING FEATURES:

CONTRACTOR shall confine all operations to within the work limits of the project. CONTRACTOR shall exercise special care to maintain all existing surroundings, that is, buildings, trees, etc., undamaged unless noted to be removed In the Plans. CONTRACTOR shall not use the existing features as anchors to fasten ropes, chains, or guys without prior written approval. All damages to existing features shall be restored as nearly as possible to the original condition and to satisfaction of the OWNER, ENGINEER and affected property owner at no additional expense to the OWNER.

3.02 CONSTRUCTION:

A. Trenches: Open trenches during non-working periods shall be minimized. Not more than two hundred feet of trench shall be open at one time. At end of shift, the remaining trench must be backfilled to finished grade or suitably protected, including compliance with traffic control barricading described in Section 02060. If necessary to protect either the installed pipe and appurtenances or the public, the trench shall be backfilled at the end of the day.

CONTRACTOR shall be responsible for strict compliance with all current Federal and State trenching requirements and laws as defined by Standards of the OSHA.

B. Street, Road and Approach Closures: Where the construction activity crosses or extends along a roadway, not more than one block shall be closed off at any one time. Access to any house shall not be closed for longer than 8 hours at one time. This assumes the homeowner has acceptable parking within one block of their house. In unusual circumstances and if approved by the ENGINEER, access may be closed for up to 48 hours at one time. The CONTRACTOR shall notify those affected by road closures the day prior to the closure.

For a road crossing or work immediately adjacent to a road, the CONTRACTOR shall comply with the permit obtained for the construction. Also, delays shall be limited to no more than 30 minutes. The CONTRACTOR shall either construct a temporary detour, or make provisions for vehicles to pass through the work site at times not to exceed 30 minutes, unless other provisions are approved by the ENGINEER.

C. Notification of Utility Companies: Where the construction activities cross utility lines, the owners of such utility lines shall be notified at least 48 hours prior to the construction at such utility line crossing.

D. Temporary Service: Temporary service shall be provided by the CONTRACTOR during any period when utility lines are disturbed, unless the CONTRACTOR makes other arrangements with the OWNER. Service of domestic water lines and sewer lines shall not be interrupted for a period of more than four (4) hours, unless otherwise approved by the ENGINEER in writing. The interruption of water or sewer service to a user shall not occur on more than two occasions, not occur on the weekend, and not occur before 9:00 a.m. Twenty-four hours' notice to the user is required to interrupt service. CONTRACTOR shall be solely responsible for notification of those individuals affected by being out of service and for temporary connections, if needed. If any unscheduled, unannounced, or unapproved water outages occur as a result of the CONTRACTOR's activities, he or she cannot continue Work until water service is restored to the satisfaction of the ENGINEER.

E. Disposal of Excavated Material: The excavation, disposal of the excavated material, and backfill operations shall be performed in such a manner that lands and improvements can be restored as nearly as practicable to their original conditions, as approved by the ENGINEER. Disposal site shall be at the borrow site, unless another site is requested by the CONTRACTOR and approved by the ENGINEER. The OWNER reserves the right to obtain excess material. The OWNER will use his or her trucks for this purpose, and the CONTRACTOR shall load the trucks, as he or she moves the excess material. If required by the project Special Provisions or Project Manual, the CONTRACTOR shall haul excess material to a location designated by the OWNER.

At the ENGINEER's discretion, the property owner is to receive any rock or excess material produced from his or her property. This material shall be stockpiled at the location designated by the ENGINEER, at no additional cost to the OWNER.

F. Damage to Existing Property: The CONTRACTOR will be held strictly responsible for all damages to persons or property that occur as a result of his or her fault or negligence. The CONTRACTOR shall promptly notify the ENGINEER and the property owner of any damage which is his or her responsibility. In order to adequately protect the OWNER against claims, demands, or liabilities arising out of the CONTRACTOR's construction operations under this contract, the ENGINEER may withhold such sums as he or she may deem appropriate from progress payments due the CONTRACTOR until the matter is settled. The OWNER may withhold final payment until the CONTRACTOR presents evidence which is satisfactory to the OWNER that all proper claims which are the responsibility of the CONTRACTOR have been settled. All damage to existing property shall be repaired to the satisfaction of the ENGINEER, at no cost to the OWNER.

Private bridges may only be used with written permission of the property owner.

G. Parked Vehicles: The CONTRACTOR shall notify the owners of parked vehicles that must be moved because of construction activities.

3.03 HOUSEKEEPING:

A. Rubbish: Keep Project neat, orderly, and in a safe condition at all times. Immediately remove all hazardous rubbish. Do not allow rubbish to accumulate. Provide on-site containers for collection of rubbish and dispose of it at frequent intervals during progress of Work.

B. Dust Control: Wet down dry materials and rubbish to prevent blowing dust. All roads being used by the CONTRACTOR (including detours or roads being used that are not under construction), or the public because of construction activities must have dust control.

C. Volatile Wastes: Keep volatile wastes in covered containers.

D. Equipment and Refueling Areas: Comply with all applicable local, state, and federal laws, including those for water pollution.

E. Tracking of Soil or Mud: Cleaning of soil or mud tracked onto existing roads shall take place on a daily basis or when required as directed by the ENGINEER or OWNER. CONTRACTOR shall utilize street sweepers or other applicable equipment to maintain clean existing roads to the satisfaction of the ENGINEER.

F. Road Conditions: Roads (including alleys that are traveled) impacted by construction shall be maintained so they are readily drivable with 2-wheel drive vehicles and emergency vehicles. Temporary gravel surfacing shall be placed as determined by the ENGINEER, at no cost to the OWNER.

G. Miscellaneous Waste: The CONTRACTOR shall keep the site clean of debris, rubble and paper.

3.04 DISPOSAL OF RUBBISH:

Any stones, trees, brush, or other deleterious material left by construction operations shall be disposed of legally at a permitted landfill or private disposal facilities if arrangements are made by the CONTRACTOR and approved by the ENGINEER.

3.05 AIR AND WATER POLLUTION CONTROL:

A. Prevention Procedures: CONTRACTOR shall take all necessary reasonable measures to reduce air and water pollution by any material or equipment used during construction as well as pollution from the construction sites and equipment storage and service areas. Measures to be used include providing dust abatement measures for construction activity.

Disturbance of existing vegetation is to be minimized by construction activity. Reclamation of disturbed surfaces is to comply with Section 02480.

CONTRACTOR shall comply with all applicable water pollution control regulations that are in effect at the time of the Bid Opening. Required water pollution control measures include applying for and securing approval for a Wyoming Department of Environmental Quality (DEQ) GENERAL PERMIT for STORM WATER DISCHARGES ASSOCIATED WITH CONSTRUCTION

ACTIVITIES and, where necessary, INDUSTRIAL ACTIVITIES; developing, implementing and monitoring a STORM WATER POLLUTION PREVENTION PLAN for the project including all temporary erosion control measures necessary, and all associated labor, materials, equipment and incidentals necessary to fully implement the plan and comply with all rules, regulations and restrictions imposed by DEQ as part of the GENERAL PERMIT PROGRAM.

DEQ General Permit applications and information can be secured by contacting:

Wyoming Department of Environmental Quality
Water Quality Division Permit
122 West 25th Street
Herschler Building, 4th Floor-West
Cheyenne, WY 82002
Phone: (307)777-7781

The CONTRACTOR shall provide a copy of the approved GENERAL PERMIT and STORM WATER POLLUTION PREVENTION PLAN to the ENGINEER prior to commencing any work on the project. As the work progresses, the CONTRACTOR shall provide the ENGINEER with copies of all required monitoring reports and necessary plan revisions. The information submitted is not for approval by the ENGINEER, but is informational. The CONTRACTOR shall implement and modify, where necessary, the Storm Water Pollution Prevention Plan as the work progresses. Upon completion of the project, the CONTRACTOR shall remove and dispose of those temporary soil erosion control measures not otherwise designated by the ENGINEER, to remain in place as permanent erosion control measures. Upon acceptance of the project, the CONTRACTOR shall submit a Notice of Termination (NOT) or request a permit transfer to the OWNER from DEQ or EPA, or both as determined by the ENGINEER. In either case the Owner will, upon approval of the termination or transfer, accept responsibility for storm water control on the project.

The cost of all Pollution Control measures shall be paid under the "Mobilization" bid item.

Disturbance of existing vegetation is to be minimized by construction activity. Reclamation of disturbed surfaces is to comply with Section 02480.

- B. Burning of Debris: No burning of debris will be permitted inside the City limits. Burning is only allowed with proper permits.
- C. Volatile Material: CONTRACTOR shall not dispose of volatile wastes or oils in storm or sanitary drains, nor allow such materials to reach natural waters. Do not allow waste materials to be washed into the bed of a stream or dumped in trench or on ground. Contaminated soil shall be disposed of properly.
- D. Excess Material: When excavations are made, CONTRACTOR shall immediately utilize resultant loose earth by backfilling and compacting in place, or dispose of it off the site.
- E. Straw Bales: CONTRACTOR shall place straw bales around inlets and roadside swales and other drainage courses disturbed by construction at 500-foot intervals or as deemed necessary by the CONTRACTOR, or as directed by

the ENGINEER to control erosion and water pollution until ground cover is established.

F. Other: CONTRACTOR shall utilize straw bales, silt fences, run-on and run-off control berms or ditches, or other measures as necessary to comply with his or her Pollution Prevention Plan, and other applicable regulations.

3.06 FIRE PREVENTION AND PROTECTION:

A. Hazard Control: CONTRACTOR shall take all necessary precautions to prevent fire during construction. Provide adequate ventilation during use of volatile or noxious substances.

B. Spark Arresters: CONTRACTOR shall equip all gasoline or diesel powered equipment used in potential fire locations with spark arresters.

C. Building Safety: Smoking within buildings or temporary storage sheds is prohibited. No welding or cutting by torch shall be performed unless adequate fire protection is provided and maintained for the duration of the Work in the area of operations.

D. Protection Equipment Required: Provide and maintain suitable fire protection equipment. Furnish a minimum of one UL Class 2A, 2-1/2 gallon water type, pressure extinguisher, and one UL Class 10, Type I, 15-pound B:C carbon dioxide extinguisher.

3.07 CONSTRUCTION AT EXISTING WATERCOURSES AND UTILITIES:

Where the Work to be performed under these Specifications crosses or otherwise interferes with water, sanitary sewer, or storm drain pipelines, buried cable, or other public or private utilities, or with artificial or natural watercourses, the CONTRACTOR shall plan ahead for such activities during the progress of the Work so that no damage will result to either public or private interests.

Utility crossings, including underground lines, are shown in the Plans (unless noted otherwise). However, the ENGINEER does not represent that the locations of utility crossings shown in the Plans are exact.

It shall be the responsibility of the CONTRACTOR to determine the actual locations of and make provisions for crossing all watercourses and utilities.

Also see Subsection 3.05 of this Section.

Before any utility is taken out of service, permission shall be obtained from the ENGINEER. The CONTRACTOR shall be liable for all damage that may result from failure to provide for such utilities during the progress of the Work.

3.08 CONSTRUCTION IN STREETS, ROADS OR ALLEYS:

Roadway crossings may be constructed by trenching as provided in the Specifications, if shown on the Plans.

The portion of the roadways disturbed by the crossings but not scheduled to be resurfaced shall be kept as small as practicable in accordance with safety requirements. Asphalt roadway surfacing shall be cut or trimmed in a straight line. All roadway surfacing cut, removed, and damaged by the CONTRACTOR's operations shall be reconstructed to the dimensions in accordance with the Plans or as approved by the ENGINEER. The CONTRACTOR's method of restoring the roadway surfacing shall be per City of Sheridan Standard Details, or as approved by the ENGINEER.

The CONTRACTOR shall be responsible for all damage to streets, roads, highways, shoulders, ditches, embankments, culverts, bridges, or other public or private property or facility, regardless of location or character, which may be caused by moving, hauling, or otherwise transporting equipment, materials, or employees, to and from the work site or any part thereof, whether by him or her or the subcontractors. The CONTRACTOR shall make satisfactory and acceptable arrangements with owner of, or the agency or authority having jurisdiction over, the damaged property or facility concerning its repair or replacement or payment of costs incurred in connection with said damage.

3.09 ROAD MAINTENANCE DURING SHUTDOWNS:

The CONTRACTOR shall be responsible to maintain all roads as specified in subsection 3.03F of this section, and other areas disturbed by construction activities. This includes control of dust due to construction activities, or due to final surfacing not yet being in place. This also includes road and trench maintenance during shutdown periods such as inclement weather, winter shutdown, weekends, or shutdowns for any other reasons. All disturbed areas located within road right-of-way shall be maintained in such a manner that there are no ruts, pot holes, loose gravel, or any other disturbances which impede traveling on the road. All costs associated with road maintenance during construction are to be included in the Contract price. The Contractor shall provide the name and telephone number of a person that can be contacted at all times regarding road or traffic issues.

END OF SECTION 01560

PART 1 - GENERAL

1.01 CONTRACTOR'S OFFICE AND STORAGE SHEDS:

The CONTRACTOR shall be responsible for supplying his or her own office and staging area for any storage sheds required for storage of material and equipment. The CONTRACTOR is responsible for making arrangements for the location of the sheds and storage space, and also for necessary site security. These facilities shall be located so as to cause no interference to the work to be performed on the Site. The CONTRACTOR shall obtain written approval from the OWNER prior to installing temporary facilities. All expenses for connection of electrical service, telephone or other temporary services will be the responsibility of the CONTRACTOR. CONTRACTOR shall maintain a local mailing address and phone number at which he or she can be reached. CONTRACTOR shall provide the name and phone number of an individual who may be contacted after hours in case of emergencies.

The CONTRACTOR shall furnish, install, and maintain ample sanitary facilities for its workers. As the needs arise, a sufficient number of enclosed temporary toilets shall be conveniently placed as required by the sanitary codes of the state and local government. All such facilities must comply with all applicable state and local regulations.

END OF SECTION 01590

PART 1 - GENERAL

1.01 COMPLETION OF WORK:

It is understood that, except as otherwise specifically stated in the Contract Documents, the CONTRACTOR shall provide and pay for all materials, labor, tools, equipment, water, light, power, transportation, supervision, temporary construction of any nature, and all other services and facilities of any nature whatsoever necessary to execute, complete, and satisfactorily deliver the Work within the specified contract time.

1.02 CONTRACTOR RESPONSIBILITY:

Materials and equipment shall be so stored and stockpiled in an orderly manner and protected against damage so as to ensure the preservation of their quality and fitness for the Work. Stored materials and equipment to be incorporated in the Work shall be located so as to facilitate prompt inspection. The CONTRACTOR shall be responsible for the condition of all materials which he or she has furnished, and shall replace at his or her own expense all such material found to be defective or which has been damaged. This includes the replacement of material which is found to be defective at any time prior to expiration of the warranty period.

Storage areas for all material and equipment shall be furnished on the job, within the site's approved traffic control area, unless other provisions are made by the CONTRACTOR. CONTRACTOR shall notify the ENGINEER of other provisions and provide a copy of any lease or other agreements to the ENGINEER. All CONTRACTOR'S equipment, including refueling and service areas, are to comply with all applicable local, state and federal regulations, including those relating to water pollution. No volatiles or oils are to reach a surface water or leave the CONTRACTOR'S work site. Berms, straw bales, or other necessary protection methods may be required to control both run-on and run-off.

1.03 MANUFACTURER'S RECOMMENDATIONS:

Manufactured articles, materials and equipment shall be applied, installed, connected, erected, used, cleaned, conditioned and repaired as directed by the manufacturer. If there is any conflict between the manufacturer's recommendations and these specifications, the ENGINEER shall resolve the issue. The CONTRACTOR shall provide manufacturer's recommendations as needed or as requested by the ENGINEER. The ENGINEER may also contact the manufacturer, fabricator or their representatives directly.

All suppliers of material and equipment shall review the Plans and Specifications regarding the use of the proposed material or equipment. If the supplier believes the material or equipment is not being used correctly or believes additional considerations are required for its use, they shall notify the ENGINEER in writing of such concerns. If no concerns are raised, it is assumed the supplier agrees with the proposed use.

The CONTRACTOR shall make arrangements whenever required, to have manufacturer's representatives on-site to assure proper installation, operation and start-up of all components.

1.04 SAMPLES:

Materials, supplies and equipment shall be in accordance with samples submitted by the CONTRACTOR and approved by the ENGINEER.

END OF SECTION 01600

PART 1 - GENERAL

1.01 DESCRIPTION:

The following specifications include all work involved in final closeout of this Project. Included are items such as post-construction inspection, acceptance of the Work, closeout records, cleaning, and Project Record Drawings.

1.02 RELATED WORK:

- A. Section 01300 - Submittals
- B. Section 00700 - General Conditions
- C. Section 00810 - Supplementary Conditions to the General Conditions

1.03 SUBMITTALS:

All required closeout submittals shall be received, reviewed, and found to be acceptable by the ENGINEER prior to final payment. Items to be submitted are:

- A. Project Record Drawings: CONTRACTOR shall maintain an accurate record of the construction and a marked-up drawing of all construction modifications. At completion of project, the CONTRACTOR shall provide a copy of the marked-up construction drawings to the ENGINEER.
- B. Guarantees and Bonds: Provide guarantees and bonds as required herein and as provided by manufacturers of all products and equipment.
- C. Operation and Maintenance Manuals: Furnish in triplicate, complete manufacturer's literature, operating instructions, installation instructions, maintenance instructions, parts lists, and technical data on all items furnished and installed on this project, or required by the ENGINEER.
- D. Post-Construction Maintenance Personnel: CONTRACTOR shall submit plans for maintenance of the system during the one-year correction period and shall name the individual who will have the power and responsibility to act for the CONTRACTOR in this regard.
- E. Consent of Surety for Final Payment.
- F. Contractor's Certification of Completion: Certifying completion of construction, compliance with the Contract Documents, and waiver of any claims.
- G. Insurance Certificate: Certificate to indicate which insurance coverage(s) required by Sections 00700 and 00810 that are to remain in effect after project is completed.
- H. Lien Releases: An Affidavit of Release Liens, accompanied by lien releases from all subcontractors, suppliers, or others that may have provided labor, materials or services for the project. Also, provide a lien release from the CONTRACTOR, and an Affidavit on Behalf of Contractor which certifies your payment of all subcontractors, workmen, material men, etc., and releases the owner from all claims.

I. Other Certificates: Certificate of Substantial Completion, Certificate of Final Completion and Warranty Certificate.

J. Other Documents: Other documents to be processed at closeout include a final Change Order to reconcile all quantities and establish the final contract amount, and the final Progress Payment.

PART 2 - PRODUCTS

2.01 CLEANING PRODUCTS:

Use cleaning materials recommended by the manufacturer of the surface to be cleaned. Follow the instructions on the container.

PART 3 - EXECUTION

3.01 CLEANING:

Clean sweep or rake all areas used by the CONTRACTOR during the course of construction. The cleaning and reclamation of these areas shall be to the satisfaction of the OWNER.

3.02 PROJECT RECORD DRAWINGS:

CONTRACTOR'S Responsibility: The CONTRACTOR shall provide Project Record Drawings by complying with the surveying requirements as outlined in Section 01050 and keeping records of any changes and revisions made to the original design. Records of changes and revisions are to be maintained by the CONTRACTOR on a set of Construction Drawings. These Construction Drawings are to be delivered to the ENGINEER at the time of Substantial Completion.

3.03 SUBSTANTIAL COMPLETION AND FINAL INSPECTION:

Submit written certification that the project, or designated portion of Project, is substantially complete and request, in writing, a final inspection. The ENGINEER, OWNER, and representatives of funding agencies will make an inspection within 10 days of receipt of request. Should the ENGINEER determine the Work is substantially complete, a punch list of deficiencies that need to be corrected before final acceptance will be prepared and a Notice of Substantial Completion with the deficiencies noted will be issued.

Should the ENGINEER determine the Work is not substantially complete, the ENGINEER will immediately notify the CONTRACTOR in writing, stating reasons for this determination. After the CONTRACTOR completes the Work, CONTRACTOR shall submit certification and request a second inspection.

After substantial completion and before final acceptance and final payment, the CONTRACTOR shall restore and replace in a suitable manner all public and private site property, which has been damaged or removed in performance of the Work.

3.04 ACCEPTANCE OF THE WORK:

After all deficiencies have been corrected, a Letter of Final Acceptance will be issued. If only designated portions of the project have been inspected, a Letter of Partial Acceptance will be issued for that portion corrected.

Acceptance may be given prior to correction of deficiencies which do not preclude operation and use of the facility; however, final payment will be withheld until all deficiencies are corrected. Until receipt of the Letter of Final Acceptance, the CONTRACTOR shall be responsible for the Work completed under this Contract.

3.05 POST-CONSTRUCTION INSPECTION:

Prior to expiration of one year from date of final acceptance, the ENGINEER and OWNER will inspect the project to determine whether corrective work is required. The CONTRACTOR will be notified in writing of all deficiencies. Notices of deficiencies can be presented to the CONTRACTOR any time during the warranty period, as necessary. Corrective work must start on noted deficiencies within 10 days of receipt of notification to CONTRACTOR. CONTRACTOR shall work expeditiously to complete the corrective work.

END OF SECTION 01700

PART 1 - GENERAL

1.01 SCOPE:

Operation and maintenance (O&M) instructions shall be provided in accordance with this Section and as required in the technical sections of this Project Manual. O&M information shall be provided for each maintainable piece of equipment, equipment assembly or subassembly, and material provided or modified under this contract.

O&M instructions must be submitted and accepted before on-site training may start.

1.02 TYPES OF INFORMATION REQUIRED

A. General:

O&M information shall contain the names, addresses, and telephone numbers of the manufacturer, the nearest representative of the manufacturer, and the nearest supplier of the manufacturer's equipment and parts. In addition, one or more of the following items of information shall be provided as applicable.

B. OPERATING INSTRUCTIONS:

Specific instructions, procedures, and illustrations shall be provided for the following phases of operations:

1. SAFETY PRECAUTIONS: List personnel hazards for equipment and list safety precautions for all operating conditions.
2. OPERATOR PRESTART: Provide requirements to set up and prepare each system for use.
3. START-UP, SHUTDOWN, AND POST-SHUTDOWN PROCEDURES: Provide a control sequence for each of these operations.
4. NORMAL OPERATIONS: Provide control diagrams with data to explain operation and control of systems and specific equipment.
5. EMERGENCY OPERATIONS: Provide emergency procedures for equipment malfunctions to permit a short period of continued operation or to shut down the equipment to prevent further damage to systems and equipment. Include emergency shutdown instructions for fire, explosion, spills, or other foreseeable contingencies. Provide guidance on emergency operations of all utility systems including valve locations and portions of systems controlled.
6. OPERATOR SERVICE REQUIREMENTS: Provide instructions for services to be performed by the operator such as lubrication, adjustments, and inspection.

7. ENVIRONMENTAL CONDITIONS: Provide a list of environmental conditions (temperature, humidity, and other relevant data) which are best suited for each product or piece of equipment and describe conditions under which equipment should not be allowed to run.

1.03 TRANSMITTAL PROCEDURE:

Only complete sets of O&M instructions will be reviewed for acceptance.

One electronic copy of the specified O&M information shall be provided, as well as one hard copy in a binder. For ease of identification, each manufacturer's brochure and manual shall be appropriately labeled with the equipment name and equipment number as it appears in the project manual. The information shall be organized in the binder in numerical order by the equipment numbers assigned in the project manual. The binder shall be provided with a table of contents and tab sheets to permit easy location of desired information.

If manufacturers' standard brochures and manuals are used to describe O&M procedures, such brochures and manuals shall be modified to reflect only the model or series of equipment used on this project. Extraneous material shall be crossed out neatly or otherwise annotated or eliminated.

1.04 PAYMENT

Acceptable O&M information for the project must be delivered to the ENGINEER prior to the project being substantially complete. Progress payments for work after Substantial Completion will not be made until the specified acceptable O&M information has been delivered to the ENGINEER.

1.05 FIELD CHANGES

Following the acceptable installation and operation of an equipment item, the item's instructions and procedures shall be modified and supplemented by the Contractor to reflect any field changes or information requiring field data.

END OF SECTION 01730

SPECIAL PROVISIONS

These Special Provisions amend or supplement the Technical Specifications of the Construction Contract, and other provisions of the Contract Documents as may be indicated below. All Technical Specifications so referenced that are not so amended or supplemented remain in full force and effect.

1. SPECIAL REQUIREMENTS

[INSERT SPECIAL REQUIREMENTS]

END OF SECTION 01750

DIVISION 2
SITE WORK

PART 1 - GENERAL

1.01 DESCRIPTION:

Payment will be made for mobilization to cover the costs of preparatory work and operations, including but not limited to those necessary for the movement of personnel, equipment, supplies, materials and incidentals to the project site; for the establishment of all offices, buildings and other facilities necessary for the Work on the project; for Contractor overhead relating to the project; and for all other work and operations which must be performed or cost(s) incurred including project closeout, final cleanup, moving off of project site upon completion of Work, any costs associated with winter shutdown, costs relating to fees, permits (including the Pollution Prevention Plan), licenses, insurance, contract bonds and taxes which the CONTRACTOR is to obtain or pay, to perform work, and all submittals required by Section 01300 that are not paid for under other items.

PART 2 – PRODUCTS None

PART 3 – EXECUTION None

PART 4 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Unless stated otherwise in the Special Provisions, the following table will be used to make partial payments for Mobilization in the project periodic Progress Payments.

COLUMN 1	COLUMN 2
Percentage of Original Contract Amount	Percentage of Lump Sum Price for Mobilization
EARNED	TO BE PAID
0	5*
5	25
25	40
50	60
75	80
100	100

* For 5% of the mobilization line item to be paid, prior to any work being completed, the CONTRACTOR shall make a formal request to the OWNER in writing after the Notice to Proceed has been issued.

END OF SECTION 02000

PART 1 - GENERAL

1.01 WORK INCLUDED:

The work covered by this Section of the Specifications consists of furnishing, placing, maintaining and removing the various temporary traffic control setups in accordance with the Plans and this Specification.

The CONTRACTOR shall submit a Traffic Control Plan for each street closing to be approved by the ENGINEER and OWNER.

PART 2 - PRODUCTS

2.01 MATERIALS:

All barricades, warning signs, lights, temporary signals, and other protective devices shall conform to the provisions for Construction Signing as indicated in the "Manual on Uniform Traffic Control Devices for Streets and Highways" (MUTCD), current edition, published by the Federal Highway Administration. Materials used for the fabrication or erection of such devices shall be approved by the ENGINEER before use on the project. Traffic control devices not approved by the ENGINEER will not be allowed to be used on the project and their use may justify suspension of Work.

2.02 FLAGGING:

- A. Flagging shall be used to control traffic as required by the CONTRACTOR submitted traffic control plans for the Project. Flaggers shall be furnished at each authorized station necessary to safely and efficiently control traffic in and around the work area.
- B. When flagging is required, it shall be performed by trained, competent, properly equipped flaggers supplied by the CONTRACTOR. All flaggers shall have completed and passed a Flagger Training Program, such as the flagger training program administered by the Associated General Contractors of Wyoming, prior to performing any flagging on the Project. A one day's grace period will be allowed for this requirement. The approved training and testing may be administered by the CONTRACTOR. Compliance with the MUTCD, current edition, standards is required, more specifically Part 6, Chapter 6E.

2.03 TRAFFIC CONTROL MAINTAINER:

The CONTRACTOR shall designate an individual(s) who will be responsible at all times to see that all necessary maintenance of traffic control devices is performed. The name of this individual(s) and the telephone number where this person(s) can be contacted at any time will be submitted to the ENGINEER before implementing any temporary traffic control on the project.

This individual(s) hereinafter entitled "TRAFFIC CONTROL MAINTAINER" will be responsible at all times to see that all necessary maintenance of traffic control devices is performed.

Maintenance will include, but will not be limited to, the following:

1. Clean all devices.
2. Repair, reset or replace any damaged devices.
3. Reset undamaged devices knocked or blown down.
4. Replace batteries, light bulbs, control panels, and other components of electrical devices.
5. Add fuel and motor oil to engines of power generating units for electrical devices, and maintain them in good operating condition.
6. Insure that all devices remain in their proper locations and are properly positioned in accordance with the Traffic Control Plan in use.
7. Implement and enforce a system of relief flagging in which every flagger is relieved for at least fifteen (15) minutes every four hours for the duration of their shift.

Failure of CONTRACTOR to implement a TRAFFIC CONTROL MAINTAINER or failure of Maintainer to comply with the above stipulations will be considered just cause to suspend Work. The cost for a TRAFFIC CONTROL MAINTAINER is subsidiary to other bid items.

PART 3 - EXECUTION

3.01 REQUIREMENTS:

At least two weeks prior to commencement of Work, the CONTRACTOR shall coordinate a kick-off meeting with the ENGINEER and OWNER to discuss traffic control plans for the project. CONTRACTOR is responsible for preparing the traffic control plans, which shall be submitted to the ENGINEER at least two weeks prior to the beginning of each construction phase. The traffic control plans must maintain adequate traffic lanes throughout the area adjacent to construction and be conducive to the safety of motorists and workers. Work cannot begin until the traffic control plan has been accepted and approved by the ENGINEER and OWNER. Construction shall not commence on the portions of the project requiring traffic control until necessary construction warning signs are in place and approved by the ENGINEER.

The CONTRACTOR shall continuously adjust the temporary traffic control based on changes in work and as requested by the ENGINEER and/or OWNER. No separate payment will be made for this work.

The CONTRACTOR shall provide signs indicating the businesses affected by the Work. These signs shall be mounted along with detour signs indicating the direction of the detour, also supplied by the CONTRACTOR.

No traffic control will be paid for outside of the project limits which results from the haul of CONTRACTOR-secured material sources. Such traffic control shall be approved by the ENGINEER and adhere to the provisions for Construction Signing as indicated in the MUTCD, current edition. This additional control will be considered subsidiary to other bid items.

The CONTRACTOR shall notify appropriate authorities in advance of any street closure. This includes notifying the City of Sheridan, local media, all emergency services, school districts, project engineer and all affected residents and businesses at least forty eight (48) hours prior to closing any streets. All notification methods shall be approved by the ENGINEER and OWNER prior to notices being completed. WYDOT shall be notified if the project includes or is adjacent to a road under their jurisdiction. Highways and/or streets closed to traffic shall be protected by barricades and obstructions shall be reflectorized and illuminated during hours of darkness. All flagging stations shall be fully illuminated, if they are providing traffic control during hours of darkness.

Reasonable access shall be maintained to each lot. Collector and arterial streets shall provide local access and emergency traffic flow.

Portable signs may be mounted on stands, skids, or on WC-4 Barricades at the option of the CONTRACTOR. When not in use, however, signs and all mounting hardware shall be removed and not cause damage to any property or right of way.

PART 4 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.01 METHOD OF MEASUREMENT:

A. Standard Items:

1. 02060.01 TEMPORARY TRAFFIC CONTROL

This item shall be measured on a Lump Sum (LS) basis for the furnishing, installation and maintenance of all signing and flagging necessary to safely and efficiently control traffic in and around the work area.

4.02 BASIS OF PAYMENT:

A. Standard Items:

1. 02060.01 TEMPORARY TRAFFIC CONTROL

Payment shall include full compensation for furnishing all temporary traffic control plan submittals, labor, equipment, flaggers, signs, sign lettering, transportation and maintenance of all signs; and furnishing, placing, maintenance and all other incidentals necessary for temporary traffic control.

END OF SECTION 02060

PART 1 - GENERAL

1.01 WORK INCLUDED:

The work covered by this Section of the Specifications consists of clearing, grubbing, removing and disposal of all trees, shrubs, brush, and similar vegetation or other debris within the limits of the construction area(s), as shown on the plans or as directed by the ENGINEER. Any tree or stump with a diameter that measures 6” or smaller, measured 24” above the existing ground surface, shall be included with clearing and grubbing work. Trees not shown for removal are to be protected.

PART 2 - PRODUCTS None

PART 3 - EXECUTION

3.01 REQUIREMENTS:

The CONTRACTOR shall remove all trees, shrubs, brush, and similar vegetation in conflict with the construction indicated on the Plans. Trees may only be removed by contractors licensed to do so by the City of Sheridan. The City Clerk’s Office should be contacted for more information. All Work shall be performed in a safe and prudent manner. Removal and subsequent disposal of all material shall be the complete responsibility of the CONTRACTOR. Removal means all parts of the tree or brush, including the portion of the stump within 24 inches of the ground surface. Trees shall be removed without damage to nearby property and are to be legally disposed of. Trees requiring removal are indicated in the Plans. Except in areas to be excavated, stump holes and other holes from which obstructions are removed shall be backfilled with suitable material and compacted.

Materials and debris shall be disposed of at the City of Sheridan landfill or other approved locations. Landfill fees are to be paid by the CONTRACTOR. Trees, limbs and stumps disposed of at the landfill shall be in accordance with the following:

All trees and limbs 24” in diameter or less will be accepted at the landfill free of charge, provided they are cut into lengths no longer than twenty (20) feet and placed in the brush pile. Any trees or limbs exceeding 24” in diameter or longer than six feet, and all tree stumps, may be disposed of at the City landfill in the working waste cell at the then-current solid waste facility fee. Any roots delivered to the landfill shall be free of soil.

Copies of all agreements with property owners on whose property the materials and debris are placed shall be furnished to the ENGINEER. The CONTRACTOR shall make all necessary arrangements for obtaining suitable disposal locations, and the cost involved shall be included in the CONTRACTOR’S bid price.

If the CONTRACTOR opts to grind materials and debris on site, the chipping machine used must be adequately covered to prevent chips being projected in the area. Any damages caused by projectiles from a chipping operation shall be remedied at the CONTRACTOR’S expense.

Low-hanging, unsound or unsightly branches on trees or shrubs not designated to remain shall be removed as directed. Branches of trees extending over the easement shall be trimmed to

give a clear height of 20 feet above the easement. All trimming shall be done by a person who works for the CONTRACTOR, and who has passed the pruning, concepts and techniques test as licensed by the City of Sheridan.

Items damaged by the CONTRACTOR shall be replaced at the CONTRACTOR'S expense.

3.02 ENGINEER'S APPROVAL:

No trees shall be cut down without the on-site approval of the ENGINEER except those designated for removal as shown in the Plans.

PART 4 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.01 METHOD OF MEASUREMENT:

A. Standard Items:

1. 02110.01 CLEARING AND GRUBBING

This item shall be paid on a Lump Sum (LS) Basis for the area that is acceptably cleared and grubbed.

2. 02110. 1XXYY TREE REMOVAL – XX” - YY” DIAMETER

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of trees between XX” diameter and YY” diameter (as measured three feet above the ground surface) cut down and removed from the project site.

3. 02110. 2XXYY STUMP REMOVAL – XX” - YY” DIAMETER

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of preexisting tree stumps (stumps remaining from trees that were cleared by others before the project) between XX” diameter and YY” diameter (as measured at the top of the stump or three feet above the ground surface) removed from the project site.

4.02 BASIS OF PAYMENT:

A. Standard Items:

1. 02110.01 CLEARING AND GRUBBING

Payment shall include clearing, grubbing, removing and disposing of all vegetation and debris within the limits of the construction area(s) as shown on the Plans; and all labor, equipment, tools and incidentals necessary to complete this item.

2. 02110.1XXYY TREE REMOVAL – XX” - YY” DIAMETER

Payment will be made at the Contract Unit Bid price and will constitute full compensation for removal of trees that are from XX” in diameter through YY” in diameter as shown on the plans, including stump, disposal costs, equipment, tools, supplies, grading, backslope grading and incidentals necessary to complete the work. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

3. 02110.2XXYY STUMP REMOVAL – XX” - YY” DIAMETER

Payment will be made at the Contract Unit Bid price and will constitute full compensation for removal of preexisting tree stumps (stumps remaining from trees that were cleared by others before the project) that are from XX” in diameter through YY” in diameter as shown on the plans, including disposal costs, equipment, tools, supplies, grading, backslope grading and incidentals necessary to complete the work. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

END OF SECTION 02110

PART 1 - GENERAL

1.01 WORK INCLUDED:

The work covered by this Section of the Specifications consists of performing all operations in connection with all excavation, pipe bedding, backfilling, consolidation and compaction of backfill; dewatering and protection work; and final grading and dressing of the surface for installation of utility lines, utility service lines and appurtenances.

1.02 RELATED WORK:

- A. Section 02060 - Temporary Traffic Control
- B. Section 02110 - Clearing and Grubbing
- C. Section 02401 - Dewatering
- D. Section 02440 - Demolition of Existing Surfacing
- E. Section 02480 - Reclamation
- F. Section 02519 - Crushed Aggregate Base Course
- G. Section 02525 - Asphalt Pavement
- H. Section 02600 - Underground Utilities
- I. Section 02605 - Street Signs, Utility Poles and Mailboxes
- J. Section 02641 - Valves and Valve Boxes
- K. Section 02644 - Fire Hydrants
- L. Section 02645 - Water Service Lines and Appurtenances
- M. Section 02710 - Water Main
- N. Section 02712 - Sanitary Sewer
- O. Section 02714 - Storm Drain Pipe and Fittings
- P. Section 02722 - Manholes
- Q. Section 02800 - Culverts
- R. Section 13900 - Corrosion Protection of Plastic Pipe Systems

1.03 FIELD QUALITY CONTROL:

Field density tests of the compacted backfill shall be performed at all levels. The frequency of testing utility line(s), service line trenches, manholes, valve boxes and utility appurtenances shall be as follows:

- A. Trenches: 1 test at every 2 feet of vertical depth of trench per 200 lineal feet of trench.
- B. Manholes and valve boxes: 25% of the total manholes and valve boxes shown in the Plans and located within the roadway section shall be tested. Testing shall be every 2 feet of vertical depth as shown in the Plans.

The vertical depth is defined as the distance from the top of proposed final surface to the top of the utility pipe as shown in the Plans. Each test shall be taken in 2' vertical increments. The lowest elevation a test shall be performed is 12" above the pipe bedding. The highest elevation a test shall be performed shall be one foot below subgrade. These tests will be performed to ensure that the specified density is obtained. The CONTRACTOR will be responsible for all testing.

The CONTRACTOR shall provide safe access to all areas of backfill for the ENGINEER to perform density testing, if requested by the ENGINEER.

1.04 SUBMITTALS:

Certificates of Compliance: CONTRACTOR shall submit Certificates of Compliance for all imported materials showing they comply with these Specifications before any materials will be approved for use.

1.05 MATERIAL STORAGE:

Storage of all imported backfill materials is the responsibility of the CONTRACTOR, as is the protection of said materials from adverse conditions which would disqualify them from use under this Specification. All materials shall be approved by the ENGINEER prior to use.

1.06 PROTECTION OF EXISTING UTILITIES:

As specified in Sections 01010, 01560 and 02600.

1.07 CLASSIFICATION OF TRENCH EXCAVATED MATERIAL:

No classification of trench excavated materials will be made by OWNER or ENGINEER. Excavation and trenching work shall include the removal and subsequent handling of all earth, shale, loose or cemented gravel, loose rock, solid rock, and/or other material or materials excavated or otherwise removed in performance of the contract work, regardless of the type, character, composition, or condition thereof. It shall also include the removal and disposal of all vegetation, debris, junk, broken asphalt pavement, broken concrete, brick, stone, and other materials encountered within the trench excavation.

1.08 CONSTRUCTION

A. General: The CONTRACTOR is solely responsible for designing and constructing stable, temporary excavations and shall shore, slope or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. All excavations shall comply with applicable local, state, and federal safety regulations including the current OSHA Excavation and Trench Safety Standards. Construction site safety generally is the sole responsibility of the CONTRACTOR, who shall also be solely responsible for the means, methods, and sequencing of construction operations. Under no circumstances should the information provided below be interpreted to mean that ENGINEER or OWNER is assuming responsibility for construction site safety or the CONTRACTOR'S activities; such responsibility is not being implied and should not be inferred.

B. Excavations and Slopes: In no case shall slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations. Specifically, the current OSHA Health and Safety Standards for Excavations, 29 CFR Part 1926 shall be followed. It is the ENGINEER's understanding that these regulations are being strictly enforced and if they are not closely followed, the CONTRACTOR could be liable for substantial penalties.

The CONTRACTOR'S "competent person", as defined in 29 CFR Part 1926, shall evaluate the soil exposed in the excavations as part of the

CONTRACTOR'S safety procedures. If an excavation, including a trench, is extended to a depth of more than twenty (20) feet, it will be necessary to have the side slopes designed by a professional engineer registered in the State of Wyoming. The CONTRACTOR shall provide the name of their "competent person".

The CONTRACTOR'S "competent person" shall establish a minimum lateral distance (two feet or greater) from the crest of the slope for all vehicles and spoil piles. Likewise, the CONTRACTOR'S "competent person" shall establish protective measures for exposed slope faces.

- C. Temporary Shoring: Excavation of various depths will be needed to construct below-grade structures. As an alternative to temporary construction slopes, vertical excavations for these excavations can be temporarily shored. The CONTRACTOR shall be responsible for the design of the temporary shoring.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Water: Clean, free from harmful substances.
- B. Imported Bedding Material: For pressurized pipelines where minor pipe settlement will not affect performance of the conduit, Imported Bedding Material conforming to the requirements of Type A as listed below shall be placed from a point 6 inches below the bottom of the pipe to 6 inches above the top of the pipe, and a minimum of one foot on each side of the pipe.

For gravity flow pipelines where grade of the pipe is critical to performance and minor settlements may be detrimental, Imported Bedding Material conforming to the requirements of Type B as listed below shall be placed from a point 6 inches below the bottom of the pipe to the spring-line, and a distance of at least one foot on each side of the pipe. Type A bedding may be placed from 6 inches below the bottom of the pipe to the spring-line, if installed as required by Subsection 3.05B of this Section. From spring-line to 6 inches above the top of the pipe, Type A or Type B Imported Bedding Material may be used.

1. Imported Bedding Material (Type A) shall consist of gravel, sandy gravel, fine gravel, or screened pit run which is free of cementitious substances or thin, flat particles in an amount which would cause the material to cake, pack or otherwise form an unyielding support for the pipe. When metallic pipe, valves or fittings are used, the material shall also be free of sharp angular particles which will damage, tear or cut corrosion protection materials, shall meet the gradation of imported bedding material (Type A) shown below. The material shall have a PI of 6 or less, per ASTM D4318.

1½ -inch sieve.....	100% passing (rounded material)
1-inch sieve.....	100% passing
¾-inch sieve.....	90-100% passing (angular material)
½-inch sieve.....	60-100% passing
#4 sieve.....	35-70% passing
#200 sieve.....	0-12% passing

2. Imported Bedding Material (Type B) shall consist of clean sand with stones, washed or crushed stone or gravel conforming to the following gradation limits:

1½ -inch sieve.....	100% passing
¾-inch sieve.....	90-100% passing
½-inch sieve.....	60-100% passing
#4 sieve.....	5-50% passing
#200 sieve.....	0-5% passing

The aggregate shall be free from vegetable matter, lumps or balls of clay, frozen material, adherent films of clay or other matter which will prevent it from flowing. The material shall be non-plastic, as measured by ASTM D4318.

Where metallic pipe, valves or fittings are used, the material shall have an electrical resistivity greater than 5,000 ohm-cm in accordance with ASTM G57. This requirement includes metal valves and fittings on PVC pipe.

In unusual situations an alternative bedding material can be used if proposed by the CONTRACTOR and approved by the CITY ENGINEER. No scoria or shale shall be used as bedding material within the right of way or under any street section.

CONTRACTOR will be responsible for locating the source and obtaining the material as well as the excavation, haul, placement and compaction of the Imported Bedding Material (Type A or B).

C. Imported Pipe Foundation Material: When Imported Pipe Foundation material is authorized by the ENGINEER as specified herein, it shall meet the following gradation:

3-inch sieve.....	100% passing
1½-inch sieve.....	80-100% passing
¾-inch sieve.....	35-70% passing
#4 sieve.....	0-10% passing

Foundation material shall be used below the bedding zone. This material's purpose is to provide an acceptable foundation for the bedding and pipe, when this is found to be unacceptable per Subsection 3.05C of this Section. It is not intended to assist with the dewatering process. The CONTRACTOR may use imported material to assist with dewatering, but this is at no cost to the OWNER and must comply with both this Section and Section 02401. Any material imported by the CONTRACTOR for use in dewatering shall come from a CONTRACTOR secured source and will be subsidiary to other bid items.

The CONTRACTOR shall be responsible for locating the source, excavation, haul, placement, and compaction of the Imported Pipe Foundation Material.

D. Imported Trench Backfill Material: When Imported Trench Backfill Material is authorized by the ENGINEER, such material shall be granular with a maximum size of 3 inches. Material passing a #40 sieve shall not have a plasticity index in excess of 10. The material shall be free from ashes, cinders, organic material, debris, frozen material and other unsuitable material.

E. Trench Plugs: Trench Plug (cutoff collar) shall be material from excavation or imported material consisting of earth with particle sizes consisting of silts, clayey sands, or clays, and free from frozen material debris, vegetation, cinders, ashes and other organic materials. The nominal maximum particle size diameter for cutoff shall be ¾-inch and smaller with 100% passing a 1-inch sieve, a minimum of 20% passing a #200 sieve, and a minimum plasticity index of 20, as determined in accordance with ASTM D4318.

Trench Plugs shall be required whenever Imported Bedding Material Type B is utilized. They will not normally be required for Imported Bedding Material Type A.

The Trench Plug shall be 4 feet long and shall extend 18-inches into the trench walls and bottom, and shall extend 18-inches above the top of the pipe. Trench Plugs shall be installed approximately every 200 feet, at crossings of streams, ditches, (irrigation and drainage) or other sources of groundwater, or as requested by the ENGINEER.

F. Backfill Above Bedding: Excavated soil materials containing debris, waste, frozen materials, snow, vegetation and other deleterious matter, or containing excessive moisture as specified herein is unsuitable. If material is unsuitable and needs to be replaced, the imported material shall comply with Subsection 3.06 of this Section.

PART 3 - EXECUTION:

3.01 SITE PREPARATION AND DISPOSAL OF CLEARED MATERIALS:

All construction zones shall be cleared and grubbed of all stumps, logs, trees, roots, brush, weeds, tree trimmings, and other vegetation or debris per Section 02110, as may be required for the proper conduct and execution of the Work. All logs, trees, stumps, roots, brush, tree trimmings, and other materials resulting from clearing and grubbing operation shall become the property of the CONTRACTOR and shall be removed from the site of work.

3.02 BARRICADES, GUARDS AND SAFETY PROVISIONS:

To protect persons from injury and to avoid property damage, adequate barricades, construction signs, warning lights, and guards, as required, shall be placed and maintained during the progress of the construction work and until it is safe to resume use of the trench area. Rules and regulations of the local authorities respecting safety provisions shall be observed.

3.03 USE OF EQUIPMENT WITH TRACKS ON PAVEMENT:

Any equipment operating on tracks which is used on asphalt-paved or bituminous-surfaced areas shall be equipped with suitable pads to prevent damage to the surface. All such surfaces which are damaged during construction shall be restored to their original condition by the CONTRACTOR at his or her expense. Any mud or soil tracked onto existing roads shall be removed.

3.04 TRENCH EXCAVATION:

A. General: All excavation, trenching, shoring, and the like, under this contract shall be performed in a manner that meets with the Occupational Safety and Health Standards, 24 CFR Part 1926 - Excavations, as published by the Occupational Safety and Health Administration. The CONTRACTOR shall be responsible for enforcing safety and maintaining safe working conditions in the trenching operation.

The CONTRACTOR shall excavate as necessary at the locations shown in the Plans, staked in the field, or otherwise directed by the ENGINEER.

The CONTRACTOR shall take precautions to protect all adjoining private and public property and facilities, including underground and overhead utilities, curbs, sidewalks, driveways, structures, and fences. Any disturbed or damaged facilities will be suitably restored or replaced at no cost to the OWNER.

Trenches parallel to curb and gutter, sidewalk, walls, or other structures that can be disturbed by the trenching activity, shall normally be no closer than 5 feet to the structure. Special care must be made to protect these structures.

Excavation shall be by open cut. Tunneling under curb and gutter or sidewalk is not allowed, these must be open cut. The concrete shall be saw cut in a straight line to make a neat joint with no broken corners or ragged edges, and then replaced according to these specifications. Tunneling under short sections of other obstacles may be allowed if open cutting is not practical and if requested by the CONTRACTOR, and in the opinion of the ENGINEER, it appears the pipe can be properly installed and backfill can be properly placed in such sections. Flowable fill shall be used as backfill, and the backfill must fully support the above structure. After installing pipe and backfilling as specified, the concrete must be replaced, or other repairs made, to the ENGINEER's satisfaction.

When crossing gravel surfaced roads and streets, cultivated areas, or prospective cultivated areas, the CONTRACTOR shall strip the surfacing or topsoil to a depth indicated by the ENGINEER, usually about 6 inches. This surfacing or topsoil shall be stockpiled and placed back over the trench after backfilling to the extent that it is acceptable and usable for that purpose.

During excavation, materials suitable for backfilling shall be piled in an orderly manner a distance of at least two feet from the banks of the trench to avoid overloading and to prevent slides or cave-ins. Excavated material shall be stockpiled to permit access to existing buildings, fire alarm boxes, fire hydrants, valves, manholes and other appurtenances. Surface drainage of adjoining areas shall be unobstructed.

Grading shall be done as may be necessary to prevent surface water from flowing into excavations, and any water accumulating therein shall be promptly removed. Under no circumstances shall water be permitted to rise in trenches until after the pipe has been placed, bedded and backfilled. Any pipe having its alignment or grade changed by floating in a flooded trench shall be re-laid at no additional cost to the OWNER.

B. Trench Dimensions: Trench dimensions shall be as specified below unless otherwise noted:

Minimum Width of Trench: The minimum width of the trench shall be such as to provide adequate working room for workers to install and join the pipe and place and compact the bedding and backfill materials in the specified manner.

When installing pipe 36" or smaller in diameter; if the CONTRACTOR excavates a trench wider than five-feet, for the depth up to six inches above the top of pipe he shall, at his own expense, provide pipe bedding as defined in Part 2 of this Section or take such other measures as the ENGINEER may direct to protect the pipe against the crushing forces of trench backfill.

When installing pipe larger than 36" in diameter; should the CONTRACTOR excavate a trench wider than the pipe OD plus two feet in the depth interval up to six inches above the top of pipe, he shall at his own expense, provide pipe bedding as defined in Part 2 of this Section or take such other measures as the ENGINEER may direct to protect the pipe against the crushing forces of trench backfill.

This specification requirement will be strictly enforced. Thus, if the CONTRACTOR plans to use excavating and traveling shield equipment which requires a wider trench than the minimum width/depth relationships specified above, he shall bid the job to use not less than enough "Imported Bedding Material Type A or B" as required to install the pipe as shown in the Plans, absorbing the cost of providing and placing this material in either his trench excavation or pipe laying prices.

C. Blasting: Blasting will not be permitted.

D. Groundwater: If groundwater is encountered during excavation and installation of buried pipelines, CONTRACTOR is responsible for dewatering as per Section 02401.

3.05 PIPE BEDDING:

A. General: Pipe shall be bedded using "Imported Bedding Material Type A or B", as required to conform with each underground utility as identified in Subsection 2.01 of this Section or as indicated in the Plans.

B. Material Placement:

All Imported Bedding Material (Type A or B) shall be placed into the trench, to a minimum depth of 6 inches at any point after leveling, except bell holes shall

have a depth of at least 3 inches. Bell holes and the placement of bedding shall provide for the full support of the pipe. When deposited in the trench Imported Bedding Material (Type A or B) shall be spread, graded, and initially compacted no more than necessary to insure a slightly yielding, uniform and continuous support for installed pipe at all points between pipe joints.

All Imported Bedding Material (Type A or B) above the bottom of the pipe shall be placed to fill any voids adjacent to the pipe, leveled, and thoroughly compacted by tamping, vibration, rodding, or by a combination of these methods. Special effort is required to compact the material under the pipe "haunches", to provide adequate support to the pipe. Placement techniques are to avoid damage to the pipe, coating on pipe and fittings, joint bonds, and corrosion protection materials. Bedding adjacent to and over the pipe is to be placed in layers not to exceed 6 inches, with each layer thoroughly compacted. Bedding adjacent to the pipe is to be placed and compacted on both sides simultaneously. Water settling of bedding is not allowed. All backfill material, equipment used, and the results obtained in placing fill material shall be subjected at all times to the approval of the ENGINEER.

During the placement of bedding, de-watering per Section 02401 must be performed if water is present.

For pipes laid to grade, the CONTRACTOR shall provide compaction effort to the material beneath the pipe to assure the installed product meets the tolerances for alignment and grade. Grading of the compacted material beneath the pipe must be such that high points are not created that put stress on or bend the pipe.

For pipes laid to grade, the CONTRACTOR may use Type B bedding as noted in Subsection 2.01B of this Section. He may also use Type A bedding if installed as stated above, with the following additional requirements. Type A bedding placed below the pipe and up to the pipe haunches shall be compacted to at least 90% of maximum density as determined by ASTM D698, and the moisture content must be within 2% of optimum.

C. Pipe Foundation in Poor Soil:

Soft or unstable material is defined by "material which will not support a minimum of 300 pounds per square foot" will be removed. Material that is simply wet but firm will not be paid to be replaced, and if the trench foundation becomes unstable as a result of runoff into the trench or leaks resulting from the CONTRACTOR damaging new or existing water or sewer lines, it shall be replaced with suitable material, as determined by the ENGINEER, at no cost to the OWNER. Replacement shall be done in areas in which the subsurface will not uniformly support the pipe as defined above. If soft or unstable conditions exist, the material shall be excavated to an additional depth as required by the ENGINEER and backfilled with Imported Pipe Foundation Material compacted to the pipe foundation grade (original trench bottom). The CONTRACTOR may use Imported Pipe Foundation Material in areas not requested by the ENGINEER, at his cost.

Where unusually bad foundation conditions are encountered at the bottom of the trench, the ENGINEER may order special foundations, other than Imported Pipe

Foundation Material, to be placed. Extra compensation for unusually bad foundations will be paid for on a work order basis. Where this type of trench bottom stabilization is authorized, it shall be carried only up to a level 6 inches below the bottom outside of the pipe. Above this point "Imported Bedding Material Type A or B" shall be used.

3.06 BACKFILL:

A. Backfill Above Imported Bedding Material: After placing "Imported Bedding Material Type A or B", as specified above, the remainder of the backfill in the zone designated "Backfill Above Bedding" shown in the Plans shall be placed as herein specified, in lifts not to exceed 12 inches (uncompacted thickness). In this zone, backfill may be placed by machine or other method or combination of methods approved by the ENGINEER, which will not impose excessive, concentrated, or unbalanced loads, thus transmitting a shock or impact to the embedded pipe which might result in damage to, or displacement of the pipe. Frozen material, snow or mud shall not be used in backfill.

Backfill compaction up to the bottom of the road surface of surface restoration section or up to grade for unsurfaced sections shall be compacted to not less than the following percentages of maximum density, as determined by ASTM D698.

- Asphalt pavement - ninety-five percent (95%);
- Portland cement concrete surface - ninety-five percent (95%);
- Gravel surface - ninety-five percent (95%);
- Irrigation ditch crossings - ninety-five percent (95%);
- Unsurfaced areas - ninety percent (90%).

For backfill which shall be compacted or consolidated to a density equal to or greater than ninety percent (90%), the material shall be placed in continuous horizontal layers not to exceed the uncompacted depth of 12 inches. The CONTRACTOR shall add water or aerate material as required in placing compacted backfill to bring the material within 3% optimum moisture content, unless the backfill is below a road or street where Section 02450 requires a closer moisture tolerance. In locations where 95% compaction is specified and the excavated soil materials possess natural moisture in excess of 6% above optimum moisture as determined by ASTM D698, the material will be considered unsuitable for backfill. Either the CONTRACTOR or ENGINEER may perform the field tests to determine the in situ moisture content. When the ENGINEER determines the excavated material is unsuitable, it shall be processed by the CONTRACTOR to reduce the moisture content to an acceptable level or removed and disposed of at location of the borrow source, or at locations secured by the CONTRACTOR and approved by the ENGINEER. If the moisture content is between 3 and 6% over optimum, the CONTRACTOR shall blend or aerate the material to reduce it to less than 3% over.

CONTRACTOR will be responsible for excavation, haul, placement and compaction of the replacement material (Imported Trench Backfill Material) from a CONTRACTOR secured source. Payment for Imported Trench Backfill Material shall be in accordance with the following:

1. When excavated soil material is deemed suitable or suitable with conditioning as defined herein, the excavation, handling, placement and compaction required shall be considered subsidiary to the unit price for pipe installations.
2. When the excavated soils material is deemed unsuitable as defined herein (>6% over optimum moisture), the excavation, haul, disposal and subsequent loading, haul, handling, placement and compaction of the imported material shall be measured and paid in accordance with the bid item "Imported Trench Backfill Material."

Note: If the CONTRACTOR performs winter construction, frozen material or material containing frozen chunks, mud or snow, must be replaced at the CONTRACTOR's cost.

Detectable Warning Tape, in accordance with Subsection 2.14A of Section 13900, is to be buried in the backfill of Water Main trench to a depth of 18" to 24" below the finish surface grade shown in the Plans.

Detectable Warning Tape is to be buried in the backfill of Sewer Main trench to a depth of 18" to 24" below the finish surface grade shown in the Plans.

Where surface restoration is not specified, the CONTRACTOR shall grade all backfill surfaces and shall maintain them during the period of this contract in such a manner as to provide safe travel by the public, free of settlement, mud holes, ruts and high centers at no additional cost to the OWNER.

The CONTRACTOR may substitute flowable fill in areas under streets and roads at his cost if allowed by the ENGINEER, and shall utilize flowable fill if required by the Plans.

Backfill around hydrants, valve boxes, manholes, inlet boxes or similar appurtenances shall be hand compacted.

3.07 DRAINAGE CONSIDERATION:

Backfilling of trenches shall be done in such a manner that water will not accumulate in unfilled or partially filled trenches. Any backfill material that becomes saturated due to drainage entering the trench prior to final compaction shall be removed and replaced with suitable backfill material. No consideration will be given for replacement material if this should occur. All material deposited in roadway ditches or other water courses crossed by the trench shall be removed immediately after backfilling is completed and the section, grades and contours of such ditches or water courses shall be restored to their original conditions, in order that the surface drainage will be obstructed no longer than necessary.

Where trenches are constructed in or across roadway ditches or other water courses, the backfill shall be protected from surface erosion by adequate means. Run-on and run-off shall be controlled so as not to cause pollution.

3.08 DISPOSAL OF EXCESS EXCAVATED MATERIAL:

Except as otherwise permitted, all excess excavated materials shall be disposed of away from the site of the work. Broken concrete, asphalt and other coarse debris resulting from pavement or sidewalk removal; excavated rock in excess of the amount permitted to be and actually installed in trench backfill; junk and debris encountered in excavation work; and other similar waste materials shall be legally disposed of away from the site of the work at the CONTRACTOR's expense. This material may be taken to the Sheridan Landfill. Excess excavated material shall be disposed of by the CONTRACTOR at his own expense, except as discussed below. The OWNER reserves the right to claim any excess material. The CONTRACTOR shall load the OWNER's trucks. If required by the project Special Provisions or Project Manual, the CONTRACTOR shall haul excess material to a location designated by the OWNER.

Excess earth from excavations located in open fields and unimproved property shall be distributed directly back over the pipe trench and within the pipeline right-of-way to a maximum depth of 6 inches above the original ground surface elevation, at and across the trench, and sloping uniformly each way therefrom. Material thus placed shall be carefully finished with a drag, blade machine, or other suitable tools, to a smooth, uniform surface without obstructing drainage at any point. Wasting of excess excavated material in the above manner will not be permitted where the line of trench crosses public road rights-of-way or is within said rights-of-way, and more or less parallels the centerline thereof.

3.09 SURFACE RESTORATION

- A. Grassy Areas: Replace topsoil, prepare seedbed and re-seed or sod in accordance with Section 02480. Prior to seeding, surface is to be smoothed to eliminate wheel ruts, ridges, and low areas.
- B. Gravel Roadways or Parking Areas: Restore to pre-existing condition or better, but not less than 8 inches of crushed base. All materials, placement and compaction shall be in accordance with Section 02519.
- C. Asphalt Roadways or Parking Areas: Restore to pre-existing conditions or better, but not less than 4 inches of asphalt pavement atop 8 inches of crushed base in all travelled areas or as called out in the Plans. All materials, placement and compaction shall be in accordance with Section 02519, Section 02525, and Section 03010.
- D. Water Pollution Control: Water pollution from disturbed areas is to be controlled. Measures used are to comply with appropriate local, state and federal regulations.
- E. One-Year Warranty: The CONTRACTOR is responsible for surface restored areas for one year after final acceptance of work. This responsibility includes maintenance of settlement, additional material and blading if ruts are a problem in traffic areas, and reseeded of grass if growth is not complete. Settlement shall be repaired when a trench settles more than 2 inches for non-road areas, 1-inch for gravel roads and ¼-inch for asphalt or concrete roads when tested with a 10-foot long straight-edge laid perpendicular to the centerline of trench.

3.10 DRY UTILITIES TRENCHING:

Excavate, backfill and compact “dry utility trenches” in order for dry utility companies identified in the Contract Documents to install and/or relocate their equipment underground. The trench for the dry utilities shall be installed at the location and as shown in the Plans. The work shall include furnishing and installing PVC Schedule 80 conduit, sized as called out in the Plans, which shall then be used by the appropriate dry utility company for their wire or cable.

PART 4 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.01 METHOD OF MEASUREMENT:

A. Standard Items:

1. 02221.01 IMPORTED PIPE FOUNDATION MATERIAL

This item shall be measured by the number of cubic yards (CY) of imported pipe foundation material furnished, placed, and compacted, with the maximum trench width below the pipe measured for payment to be two feet plus the outside diameter of the pipe.

2. 02221.02 IMPORTED TRENCH BACKFILL MATERIAL

This item shall be measured by the number of cubic yards (CY) of imported trench backfill material furnished, placed, compacted in place.

3. 02221.40 DRY UTILITY TRENCHING - “X” CONDUIT

This item shall be measured by the lineal foot (LF) of dry utility trench excavated and conduit of the type and size specified installed.

4.02 BASIS OF PAYMENT:

A. Standard Items:

1. 02221.01 IMPORTED PIPE FOUNDATION MATERIAL

Payment shall include furnishing all labor, equipment, excavation, hauling and disposing of rejected material; and furnishing, hauling, placing, compacting and all other incidentals necessary for the imported pipe foundation material.

2. 02221.02 IMPORTED TRENCH BACKFILL MATERIAL

Payment shall include furnishing all labor, equipment, excavation, hauling and disposing of rejected material; and furnishing, hauling, placing, compacting and all other incidentals necessary for the imported trench backfill material.

3. 02221.40 DRY UTILITY TRENCHING - "X" CONDUIT

Payment shall constitute full compensation for furnishing all labor, equipment, conduit and associated fittings, excavation, hauling and disposing of waste material; backfill and compaction of the trench, and all other incidentals necessary for the completion of the dry utility trench in accordance with the Contract Documents.

END OF SECTION 02221

PART 1 – GENERAL

1.01 SUMMARY:

A. Flowable Fill shall consist of a mixture of cement, fine aggregate and water for backfill material prepared and placed in accordance with these Specifications at the locations and of the form and dimensions shown on the plans, or as called out in the Special Provisions. Class F - Fly ash, per Subsection 2.03 C in Section 03010 is optional and may be utilized as a partial replacement for cement if approved by the ENGINEER.

1.02 REFERENCES:

A. Testing Requirements:

1. ASTM C31 Making and Curing Test Specimens in the Field
2. ASTM C39 Compressive Strength of Cylindrical Concrete Specimens
3. ASTM C136 Sieve Analysis of Fine and Coarse Aggregate
4. AASHTO 26 Quality of Water to be used in Concrete

B. Material Requirements

1. ASTM C33 Concrete Aggregates
2. ASTM C94 Ready-Mixed Concrete
3. ASTM C150 Portland Cement
4. ASTM C618 Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete

1.03 SUBMITTALS:

A. Submittals shall be made for each proposed mix design showing the proportions of the materials to be used to produce flowable fill mix meeting the requirements of this specification. Each mix design shall include data consisting of type, brand and mill certificate of cementitious materials, aggregate gradations and test reports on all other materials as specified herein. The mix design for flowable fill must be submitted to the ENGINEER at least 10 days before placement of material. Construction may not begin until a satisfactory mix design is approved by the ENGINEER.

PART 2 – PRODUCTS

2.01 MATERIALS:

A. Only approved materials, conforming to the requirements of these Specifications, shall be used in the Work. They may be subject to inspection and tests at any

time during the progress of their preparation or use. The source of supply of each of the materials shall be approved by the ENGINEER before delivery or use is started. Representative preliminary samples of the materials shall be submitted by the CONTRACTOR, when required, for examination and test. Materials shall be stored and handled to ensure the preservation of their quality and fitness for use and shall be located to facilitate prompt inspection. All equipment for handling and transporting materials and flowable fill must be clean before any material or fill is placed therein.

B. The fine aggregate for flowable fill shall meet the requirements of ASTM C33.

1. The fine aggregate shall be well graded from fine to coarse and shall meet the requirements of Table 1, when tested in accordance with ASTM C136:

TABLE 1. GRADATION FOR FINE AGGREGATE

Sieve Designation (square openings)	Percentage by Weight Passing Sieves
3/8 inch (9.5 mm)	100
No. 4 (4.75 mm)	95-100
No. 16 (1.18 mm)	45-80
No. 30 (0.60 mm)	25-55
No. 50 (0.30 mm)	10-30
No. 100 (0.15 mm)	2-10

2. Blending will be permitted, if necessary, in order to meet the gradation requirements for fine aggregate. Fine aggregate deficient in the percentage of material passing the No. 50 mesh sieve may be accepted, provided that such deficiency does not exceed 5% and is remedied by the addition of pozzolanic or cementitious materials other than Portland cement, in sufficient quantity to produce the required workability as approved by the ENGINEER.

C. The fly ash for flowable fill shall meet the requirements of ASTM C311 and ASTM C618. Prior approval by the ENGINEER will be required for source acceptance based on the following sampling and testing procedures used by the fly ash supplier:

1. Daily individual samples for five days
2. Weekly composite samples for four weeks
3. Monthly composite samples for six months

All testing shall be performed by an independent testing laboratory.

D. Cement shall conform to the requirements of ASTM C150 Type II Modified.

1. The CONTRACTOR shall furnish vendors' certified test reports for each carload, or equivalent, of cement shipped to the project. The report shall be delivered to the ENGINEER before permission to use the cement is

granted. All such test reports shall be subject to verification by testing sample materials received for use on the project.

- E. The water used in concrete shall be potable. If the water is of questionable quality, it shall be tested in accordance with AASHTO 26.

PART 3 – EXECUTION

3.01 GENERAL:

- A. The CONTRACTOR shall furnish all labor, materials, and services necessary for, and incidental to, the completion of all work as shown in the Plans and specified herein. All machinery and equipment owned or controlled by the CONTRACTOR, which he proposes to use on the work, shall be of sufficient size to meet the requirements of the work, and shall be such as to produce satisfactory work. All work shall be subject to the inspection and approval of the ENGINEER.
- B. The flowable fill shall consist of a flowable, controlled low-strength cement-aggregate slurry, with a minimum slump of 6 inches capable of attaining a minimum compressive strength of 100 psi. The mix shall contain not less than 1.0 sack (94 lbs. per sack) of cement per cubic yard and approximately 50 gallons of water and 2 ounces of air entraining admixture per cubic yard. Actual proportions to be identified in a mix design submitted to the ENGINEER.

Fly ash may be used as a partial replacement for the cement, provided the required strength can still be met and proportions are identified in the approved mix design.

- C. Flowable fill will be accepted on the basis of the compressive strength specified in paragraph B of this Subsection. Compressive strength specimens shall be made in accordance with ASTM C31 and tested in accordance with ASTM C39 except that the material should be placed in the cylinder in one lift and not rodded. One set of cylinders shall be taken for each 50 cubic yards (or fraction thereof) of flowable fill placed.

The CONTRACTOR shall employ the services of a qualified testing laboratory acceptable to the ENGINEER for all testing required herein. The testing laboratory shall obtain compressive strength specimens and complete all tests at the CONTRACTOR's expense. The CONTRACTOR must notify the ENGINEER at least four hours in advance of placement of flowable fill.

- D. When package cement is used, the quantity for each batch shall be equal to one or more whole sacks of cement. The aggregates shall be measured separately by weight. If aggregates are delivered to the mixer in batch trucks, the exact amount for each mixer charge shall be contained in each batch compartment. Weighing boxes or hoppers shall be approved by the ENGINEER and shall provide means of regulating the flow of aggregates into the batch box so that the required and exact weight of aggregates can be readily obtained.

3.02 MIXING:

- A. Flowable fill may be mixed at the construction site, at a central point, or wholly or in part in truck mixers. The concrete shall be mixed and delivered in accordance with the requirements of ASTM C94.
- B. The flowable fill shall be mixed only in quantities required for immediate use. Flowable fill shall not be mixed while the air temperature is below 40° F (4°C) without permission of the ENGINEER. If permission is granted for mixing under such conditions, aggregates or water, or both, shall be heated and the CDF shall be placed at a temperature not less than 50° (10°C) nor more than 100° F (38°C). The CONTRACTOR shall be held responsible for any defective work, resulting from freezing or injury in any manner during placing and curing, and shall replace such work at his/her expense.

Retempering of concrete by adding water or any other material shall not be permitted.

3.03 PLACEMENT:

- A. All flowable fill shall be placed during daylight, unless otherwise approved. Flowable fill shall not be placed until the pipeline to be backfilled has been properly bedded and set in the correct alignment. Flowable fill shall be placed as soon as practical after mixing and in no case after more than one (1) hour after water has been added to the mix. Troughs, pipes, and chutes shall be used as an aid in placing flowable fill when necessary.
- B. Flowable fill shall be placed to assure complete filling of void and support of pipe haunches. Filling operations shall proceed simultaneously on both sides of the pipeline so that both fills are kept at approximately the same elevation at all times.
- C. If the pipe or culvert begins to float, filling operations shall immediately cease. An external load shall be applied to hold the culvert in proper location and alignment prior to continuing placement of flowable fill. If necessary, the filling may be suspended until the buoyancy effect of the flowable fill has ceased. The flowable fill shall be placed to the elevation shown on the plans. No vibration or mechanical compaction of the material shall occur. The placement of the flowable fill shall occur in a continuous operation unless pipeline movement is observed.
- D. When flowable fill is placed at temperatures below 40°F, the CONTRACTOR shall provide satisfactory methods and means to protect the mix from injury by freezing. The aggregates, or water, or both, shall be heated in order to place the flowable fill at a temperature of at least 40°F. In no case shall flowable fill be placed on frozen ground.
- E. Construction equipment and traffic shall not be permitted on the flowable fill until at least 48 hours after placement.

PART 4 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.01 METHOD OF MEASUREMENT:

A. Standard Items:

1. 02228.01 FLOWABLE FILL

This item shall be measured by the number of cubic yards (CY) of flowable fill furnished and placed.

4.02 BASIS OF PAYMENT:

A. Standard Items:

1. 02281.01 FLOWABLE FILL

Payment shall include furnishing all labor, equipment, fitting protection, hauling and disposing of rejected material (if any); and furnishing, hauling, placing and all other incidentals necessary for the flowable fill.

END OF SECTION 02228

PART 1 - GENERAL

1.01 SUMMARY:

This item shall consist of furnishing and applying water required in the compaction of backfill, embankments, subgrades, base courses and surface course, or for the control of dust for the safety and convenience of the public, for the reduction of the dust nuisance with adjacent property, or for other purpose as required by the Contract Documents, or as directed by the ENGINEER, in accordance with the requirements of these Specifications.

PART 2 - MATERIALS

2.01 WATER SOURCE:

The CONTRACTOR is responsible for obtaining water required for compaction of backfill, embankments, subgrade and gravel courses. If the water is obtained from the City of Sheridan, it must be obtained at one of the water sales loadout sites in the area.

PART 3 - EXECUTION

3.01 WATER ADDED:

Deficiencies in moisture content of backfill or embankment materials, crushed base, or surfacing courses shall be corrected by the addition of water by approved water distribution equipment. Water for dust control, finishing operations, and seeding shall be applied by approved distributor equipment.

- A. Grading Operations: Prewetting does not guarantee that additional water will not be required. Water added to embankment material during grading operations shall be distributed in a manner that will avoid ponding or overwetting materials for the full width of each layer of material placed.
- B. Crushed Base: Water added to crushed base shall be applied to the material immediately prior to mixing and placing the material.
- C. Finishing Operation: Water added during finishing operations shall be uniformly applied in a fine spray across the full width of the course by means of controllable pressures and spray bars or nozzles.
- D. Seeding: Water added to seeded areas shall be applied in a spray that will not wash or erode the seeded area.
- E. Dust Control: Water ordered for dust control measures for the protection and safety of traffic, for abatement of air pollution, or for other purposes, shall be applied in a manner that will best accomplish the elimination of dust.

F. Mixing: Mixing is required when water is added into soil to bring the moisture content closer to optimum.

PART 4 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT – All watering is considered incidental to the project and shall not be paid for.

END OF SECTION 02290

PART 1 - GENERAL

1.01 WORK INCLUDED:

The work covered by this Section of the Specifications includes the furnishing of all plant, labor, equipment and incidentals necessary for the dewatering of the project site, including trenches for water, sanitary sewer, and storm drain lines during construction.

1.02 RELATED WORK:

- A. Section 02221 - Trenching, Backfilling, and Compacting
- B. Section 02641 - Valves and Valve Boxes
- C. Section 02644 - Fire Hydrants
- D. Section 02645 - Water Service Lines and Appurtenances
- E. Section 02710 - Water Main
- F. Section 02712 - Sanitary Sewer
- G. Section 02714 - Storm Drain Pipe and Fittings
- H. Section 02722 - Manholes
- I. Section 02723 - Culverts
- J. Section 13900 - Corrosion Protection of Plastic Pipe Systems

PART 2 – MATERIALS None

PART 3 - EXECUTION

3.01 CONTRACTOR'S RESPONSIBILITY:

The CONTRACTOR shall furnish all labor, equipment, and incidentals necessary to dewater the project site during construction. All excavation shall be kept free of water during all construction and the placement of materials. No groundwater or stormwater shall be allowed to enter or flow through the water or sanitary sewer lines installed in the project. Groundwater may be discharged into the existing storm drain if approved by the appropriate regulating agency and the OWNER. The CONTRACTOR shall by pumping, dewatering wells, berming, cofferdamming, sheetpiling, or by other methods or combinations thereof, keep the construction area free from water.

If the CONTRACTOR over excavates and places a clean rock in the bottom of the trench for dewatering, a barrier must be placed between this rock and the pipe bedding to prevent the migration of fine soil particles out of the bedding. This barrier shall be a geotextile fabric or polyethylene or polyurethane membrane of sufficient strength to resist damage when placed in this location and be of a material that does not deteriorate over time. The material and method of installation shall be approved by the ENGINEER.

3.02 FIELD QUALITY CONTROL:

It shall be the CONTRACTOR's responsibility to comply with all requirements and regulations of all federal, state, or local agencies that govern the handling of groundwater or stormwater, or other aspects of the work at the construction site or affected areas.

Upon completion of the project tasks requiring the dewatering measures specified herein, the CONTRACTOR shall remove all such structures and restore all areas so disturbed to their original conditions and grade and in accordance with these Specifications. No berms, excavations for dewatering, or similar features shall be allowed to remain at the completion of the restoration. All restoration shall be approved by the ENGINEER.

3.03 PROTECTION:

At all times the CONTRACTOR shall provide sufficient protection to ensure the safety to personnel, equipment and materials, and the public for activities relating to dewatering. The protection of all equipment, materials, structures, or incidentals for this project are the responsibility of the CONTRACTOR. Any such equipment, materials, structures, or incidentals so placed or installed by the CONTRACTOR that are lost, damaged, or destroyed during construction shall be replaced by the CONTRACTOR at no additional cost to the OWNER.

3.04 DISPOSAL:

The CONTRACTOR shall not allow water resulting from dewatering activities to be discharged or disposed of in such a manner as to flood existing landscaped areas, graveled areas or structures, cause erosion problems, or violate Wyoming Water Quality Regulations.

3.05 EXISTING STRUCTURES:

The CONTRACTOR's dewatering program shall be conducted in such a manner as to avoid damage to existing structures. The CONTRACTOR shall be responsible for repairing all structures damaged as a result of the dewatering. No extra payment shall be made to the CONTRACTOR for repairing any structures damaged by dewatering.

PART 4 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT – No additional payment shall be made for any dewatering or similar construction controls required for the project. All payment for this work shall be considered a part of the unit price for any item for which it is incidental.

END OF SECTION 02401

PART 1 - GENERAL

1.01 SUMMARY:

- A. This Section consists of removal of all surfacing material encountered and scheduled for demolition.
- B. All costs associated with the demolition and removal of existing surfacing shall be included in the unit prices provided in the Bid Schedule.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 02060 - Temporary Traffic Control
- B. Section 02110 - Clearing and Grubbing
- C. Section 02221 - Trenching, Backfilling and Compacting
- D. Section 02450 - Grading

1.03 PROTECTION:

- A. Perform demolition in such manner as to eliminate hazards to persons and property; to minimize interference with use of adjacent areas, utilities and structures or interruption of use of such utilities; and to provide passage to and such adjacent areas of structures. Adequate notification of surrounding residences shall be made by the CONTRACTOR prior to commencement of activities.
- B. Provide safeguards, including warning signs, barricades, temporary fences, warning lights, and other similar items that are required for protection of all personnel during demolition and removal operations in compliance with the Traffic Control Plan.
- C. Fences, barricades, lights, and other similar items around exposed excavations shall be maintained until such excavations have been completely filled.
- D. Prevent spread of flying particles and dust. Sprinkle rubbish and debris with water to keep dust to a minimum.
- E. Exercise care in such removal to assure that remaining nearby facilities and/or structures are not disturbed. Restore to original condition any such existing facilities or structures damaged by construction activities.

PART 2 – PRODUCTS None

PART 3 - EXECUTION

3.01 PAVEMENT REMOVAL:

- A. Where trench, street or structure excavation requires the removal of curb and gutter, concrete sidewalks, asphalt or concrete pavement, the pavement or concrete shall be cut in a straight line parallel to the edge of the excavation by

use of a spadebitted air hammer, concrete saw or similar approved equipment to obtain a straight, square clean break. Pavement cuts shall be at least two (2) feet wider than the actual required removal limits. Final cuts shall not be made until the surface is ready for the new pavement or concrete.

- B. All existing asphalt and non-reinforced concrete surfacing that is removed during execution of the work (but not milled onsite and used as Temporary Crushed Asphalt) shall be hauled to and stockpiled at the City Landfill at locations authorized by the City. The ENGINEER shall approve of the loads sent to the landfill. This material is to remain the property of the City. Stockpiles shall be a minimum of 6' in height, and materials shall be placed to minimize the overall footprint of the stockpile.

All reinforced concrete will become the property of the Contractor and shall be properly disposed of off the project area.

- C. Remove and dispose of existing private concrete driveways and/or sidewalks which interfere with construction or do not match new grades, or as directed by the ENGINEER.

PART 4 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.01 METHOD OF MEASUREMENT:

A. Standard Items:

1. 02440.01 DEMOLITION OF EXISTING SURFACING

This item shall be paid by one of the following methods:

- a. On a Lump Sum (LS) Basis for the area where existing surfacing is acceptably removed.
- b. On an area basis by the Square yard (SY) of existing surfacing removed within the limits specified in the Plans.

2. 02440.10 CONCRETE REMOVAL

The quantity of concrete removal shall be measured by the square yard (SY) in its original position. Pay quantities shall be computed to the neat lines staked or as marked by the ENGINEER.

3. 02440.15 ASPHALT REMOVAL

The quantity of asphalt removal shall be measured by the square yard (SY) in its original position. Pay quantities shall be computed to the neat lines staked or as marked by the ENGINEER.

4. 02440.20 SAWCUTTING

The quantity of sawcutting shall be measured on a linear foot (LF) basis.

Measurement of the sawcutting shall be made along the sawcut line.

4.02 BASIS OF PAYMENT:

A. Standard Items:

1. 02440.01 DEMOLITION OF EXISTING SURFACING

Payment shall include furnishing all labor, materials, equipment, and incidentals necessary to complete this item, including saw cutting, removal, hauling, stockpiling and disposing of rejected material (if any); including pavement, sidewalk, curb and gutter, valley gutter, curb turn fillets, driveway or alley approaches and any related items imbedded in these materials.

2. 02440.10 CONCRETE REMOVAL

Payment shall be made at the contract unit price for concrete removal. Price shall include the full depth removal of existing concrete for pavement, sidewalk, curb & gutter, valley gutters and equipment pads.

This price shall be full compensation for furnishing all materials, labor, equipment, tools and incidentals necessary to complete this item, including hauling, stockpiling and disposal.

3. 02440.15 ASPHALT REMOVAL

Payment shall be made at the contract unit price for asphalt removal. Price shall include the full depth removal of existing asphalt pavement and pedestrian walkways.

This price shall be full compensation for furnishing all materials, labor, equipment, tools and incidentals necessary to complete this item, including hauling, stockpiling and disposal.

4. 02440.20 SAWCUTTING

Payment shall be made at the contract unit price for sawcutting to a neat line. Price shall include full depth sawcutting of the surface.

This price shall be full compensation for furnishing all materials, labor, equipment, tools and incidentals necessary to complete this item.

END OF SECTION 02440

PART 1 - GENERAL

1.01 DESCRIPTION:

The work covered by this Section of the Specifications covers the construction of embankments and the scarification, shaping, and compacting of the new or existing roadway surface and drainage improvements as shown in the Plans as directed by the ENGINEER. It also covers grading required to maintain temporary surfaces during construction.

All costs associated with grading shall be included in the unit prices provided in the Bid Schedule.

1.02 RELATED WORK:

- A. Section 02060 - Temporary Traffic Control
- B. Section 02110 - Clearing and Grubbing
- C. Section 02440 - Demolition of Existing Surfacing
- D. Section 02519 - Crushed Aggregate Base Course

1.03 QUALITY CONTROL/ASSURANCE:

A. Testing and Inspection Service:

CONTRACTOR will engage soil testing and inspection service acceptable to the ENGINEER for quality control testing during operations per Section 01400. CONTRACTOR's testing laboratory shall provide ENGINEER with copies of all test reports within 24 hours of tests having been completed. In-place quality control density testing shall be completed in accordance with ASTM D2922 and ASTM D3017 or ASTM D1556. Also refer to Part 3 of this Section.

Allow testing service to inspect and approve subgrades and fill layers before further construction work is performed.

OWNER may provide quality assurance testing as they determine necessary. CONTRACTOR shall provide safe access to construction areas at all times for OWNER testing. All failed tests shall be paid for by the CONTRACTOR

If, based on the test results by either the OWNER or CONTRACTOR and inspection of the work, the ENGINEER determines subgrade or fill is below the specified density or moisture content, the CONTRACTOR shall provide additional compaction or watering and blending of material, at no additional cost.

In addition to compaction testing, the CONTRACTOR shall use its loaded trucks and other heavy equipment to proof-roll subgrade in accordance with Subsection 3.04C of this Section. Any soft spots shall be dug out and replaced.

1.05 JOB CONDITIONS:

A. Site Information:

Data on indicated subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil borings. It is expressly

understood that the OWNER will not be responsible for interpretations or conclusions drawn therefrom by the CONTRACTOR. Data is made available for the convenience of the CONTRACTOR. Additionally test borings and other exploratory operations may be made by the CONTRACTOR at no cost to the OWNER.

B. Existing Utilities:

Locate existing underground utilities in areas or work. If utilities are to remain in place, provide adequate means of protection during earthwork operations.

Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult the utility owner immediately for directions. Cooperate with OWNER and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.

Do not interrupt existing utilities serving facilities occupied and used by OWNER or others, except when permitted in writing by ENGINEER and then only within allowable periods for down time, or after acceptable temporary utility service have been provided.

CONTRACTOR shall demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies or OWNER for shut-off of service if lines are active.

1.06 USE OF EXPLOSIVES:

The use of explosives is not permitted.

1.07 PROTECTION OF PERSONS AND PROPERTY:

A. Barricade open excavations occurring as part of this Work and post with warning signs and lights. Operate warning lights as recommended by authorities having jurisdiction.

B. Protect structure, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

PART 2 – PRODUCTS None

PART 3 – EXECUTION

3.01 CONSTRUCTION:

A. All excavation and embankment work shall be constructed to the neat lines shown in the Plans. No materials shall be wasted without the approval of the ENGINEER. All grading and related slopes operations shall be conducted so that the terrain outside of the limits of slopes will not be disturbed. Prior to the

commencement of grading operations, all necessary clearing and grubbing in the area shall have been performed in accordance with Section 02110.

- B. When embankments are to be placed on a hillside, or where new fill is to be placed against existing embankment, the slope of the original hillside, or old fill respectively, shall be benched or stepped by cutting into it horizontally, for a minimum distance of 12 inches to provide for secure bonding of the embankment while it is being brought up in layers. Each bench shall be cut as close to the one below as the slope of the ground will permit. Material thus cut out of the benches shall be incorporated into the new fill at the CONTRACTOR's expense.
- C. If it should become necessary, because of weather or other conditions, to suspend grading operations, the entire area worked upon shall be bladed until smooth, free of depressions and ruts, and crowned so that no water can collect or be impounded.
- D. Embankment placed adjacent to structures shall be brought up in equal layers on all sides to prevent distortion of any of these parts. If it is necessary to deposit embankment on only one side of abutments, wing walls, piers, or culvert headwalls compaction shall be accomplished without causing overturning of or excessive pressure against the structure. Areas inaccessible to tamping rollers or power rollers shall be compacted by hand or mechanical tampers or other means until the density conforms to adjacent embankment, compacted in accordance with these specifications.
- E. Embankment material shall be placed in uniform approximate horizontal layers not exceeding 8 inches in loose thickness, for the material compacted by heavy compaction equipment, and not more than 4 inches in loose thickness for material compacted by hand-operated tampers, for the entire width of the embankment and around all appurtenances. Each layer of embankment shall be completed, leveled and compacted before the succeeding layer is placed.
- F. Embankment which has been subjected to freezing shall be refinished to grade, cross-section and compaction requirements after the frost is out of the ground and the embankment is in suitable condition of work.
- G. Subgrade Preparation shall consist of the top 12 inches of subgrade being scarified, moisture conditioned and recompacted. The scarified subgrade shall be compacted per Subsection 3.02A of this Section. Scarification shall include thorough mixing, blending, aerating, discing, and moisture conditioning of the entire roadway surface. Work shall also include the filling in or cleaning of ditches and re-establishment of drainage at designated locations as shown in the Plans or directed by ENGINEER. Subgrade preparation will not be completed in areas that require excavation below subgrade, unless directed by the ENGINEER.
- H. The subgrade shall be graded to construct the design earthgrade width, and shaped and compacted to the density and template shape as specified.
- I. Excavation Below Subgrade shall consist of the excavation and disposal of unstable or unsuitable materials in the subgrade as directed by the ENGINEER. These areas shall be excavated to the extent determined by the ENGINEER,

engineering fabric installed to those extents, and backfilled with crushed aggregate base course material.

3.02 MOISTURE AND DENSITY CONTROL

A. The CONTRACTOR shall provide watering and rolling as required to obtain the density of 90% of maximum dry density for all the embankment placed outside paved areas and 95% under areas to be paved and no separate pay compensation shall be allowed for rolling and watering other than the earthwork bid item or items listed in the Plans. The amount of water required for rolling shall be within plus 2 or minus 3 percentage points of optimum moisture content as determined by ASTM D698, Standard Proctor Density. Maximum densities shall be determined by ASTM D698, Standard Proctor Density.

Remove and replace or scarify and air dry, soil material that is too wet to permit compaction to specified density. Soil material that has been removed because it is too wet to permit compaction may be stockpiled at an approved location or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing until moisture content is reduced to a satisfactory level.

Where moisture must be added, uniformly apply water to surface or layer of soil material to prevent free water appearing on surface during or subsequent to compaction operations. Then thoroughly mix the material.

If acceptable material becomes unacceptable due to precipitation, snowmelt, drying, or otherwise, the CONTRACTOR shall rework the area until it is acceptable.

There shall be no additional cost to moisture condition, either by drying or wetting.

Should conditions become present following a passing compaction test that cause a change in the conditions of the compacted subgrade (such as precipitation from a storm event) prior to the placement of a subsequent lift or section, then the area(s) shall be re-tested, at the ENGINEER'S discretion, to confirm adequate compaction. These additional tests shall be performed at no additional cost.

B. Within the areas indicated in the Plans or as directed by the ENGINEER, earth shall be removed to the subgrade layer. The 12-inch layer, below subgrade, shall be thoroughly scarified. The moisture content increased or reduced as necessary, and then compacted to not less than 95% of the maximum density.

3.03 EQUIPMENT:

The CONTRACTOR may use any type of earthmoving, compaction and watering equipment he or she may desire or has at their disposal, provided the equipment is in a satisfactory condition and is of such capacity that the construction schedule can be maintained as planned by the CONTRACTOR and as approved by the ENGINEER in accordance with the total calendar days or working days in the Contract Documents. The CONTRACTOR shall furnish, operate, and maintain such equipment as is necessary to control uniform and specified density layers,

section and smoothness of grade. Equipment used for scarification must be able to thoroughly mix, aerate, and blend the material.

3.04 FIELD QUALITY CONTROL:

Quality Control Testing During Construction – Codes and Standards: Perform excavation work in compliance with applicable requirements of authorities having jurisdiction.

A. Quality Assurance: ENGINEER will perform compaction density tests on a random basis in the embankment and subgrade areas.

B. Quality Control: Compaction tests shall be made by a qualified testing laboratory employed by the CONTRACTOR and approved by the ENGINEER. Compaction tests shall be made on the project at approximately one density test per 500 SY per layer of compacted material. The ENGINEER shall determine the exact location of such compaction tests.

Each of the tests referred to above shall meet the compaction density requirements specified. Where tests indicate a section of backfill or subgrade does not meet the required density as specified, the CONTRACTOR shall excavate that section of backfill or subgrade and replace it according to the procedures specified at no additional cost to the OWNER. Upon completion of re-backfilling, compaction tests shall be taken again as described above.

The procedure shall be followed until that section of backfill or subgrade meets the required densities specified. The cost of all compaction tests shall be included in the unit prices for Unclassified Excavation Above Subgrade. The cost of re-testing of any areas due to compaction density failure shall be paid by the CONTRACTOR with no additional cost to the OWNER.

C. Compacted satisfactory subgrade shall further be determined by proof-rolling with equipment approved by the ENGINEER prior to use. Proof-rolling equipment shall be a loaded 10-wheel, tandem-axel dump truck or similar piece of equipment having pneumatic tires and weighing not less than 15 tons. Each succeeding pass of the proof-roller over the roadbed shall be offset by not greater than one tire width. Limit vehicle speed to 3 mph.

Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by ENGINEER, and replace with compacted backfill as directed.

3.05 MAINTENANCE:

A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances.

B. Reconditioning of Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.

3.06 DISPOSAL OF EXCESS AND WASTE MATERIALS:

Waste materials shall be disposed of by the CONTRACTOR at his expense. Rubble and broken concrete or asphalt may be taken to the Sheridan Landfill. Excess excavated material shall be disposed of by the CONTRACTOR, except as discussed below. The OWNER reserves the right to claim any excess material. The CONTRACTOR shall load the OWNER's trucks. If required by the project Special Provisions or Requirements, the CONTRACTOR shall haul excess material to a location designated by the OWNER.

3.07 HAUL:

No payment will be made separately or directly for haul on any part of the work. All hauling will be considered a necessary and incidental part of the work, and its cost shall be considered by the CONTRACTOR and included in the contract unit price for the pay items of work involved.

3.08 FINE GRADING:

- A. After the earthwork has been substantially completed and after all underground utilities, manholes, catch basins, valve boxes, etc. have been installed or adjusted to grade, the subgrade shall be brought to the lines, grades, and cross-sections shown in the Plans, and compacted to the required density.
- B. All soft and unstable material and other portions of the subgrade which, in the opinion of the ENGINEER, cannot be compacted satisfactorily shall be removed to lines and grades as directed by the ENGINEER and replaced with compacted crushed aggregate base course material.
- C. All rocks appearing in the earth excavation shall be removed or broken off to a depth of not less than 9 inches below subgrade. All rock sections shall be brought to grade by depositing a satisfactory cushion material to a depth authorized by the ENGINEER.
- D. If the surface of an old stone or gravel roadbed conforms approximately to the surface of the finished subgrade, such sections shall be scarified superficially for the full width of the subgrade to a depth sufficient to eliminate all depressions and to permit uniform reshaping and compaction.
- E. At all times, ditches and drains along the subgrade shall be so maintained as to drain effectively. When ruts of 2 inches or more in depth are formed, the subgrade shall be brought to grade and if necessary, be reshaped and re-rolled. In no case shall any surface course or pavement be placed on a frozen or muddy subgrade. The top 9 inches of the subgrade shall have a minimum compacted density as specified for embankment.
- F. In addition, the finish grade shall not deviate more than 0.05 feet at any point from both the staked and true elevations. Until the subgrade has been checked and approved, no surface course or pavement shall be laid thereon.

Also, grading shall be sufficient to allow the top of the asphalt or concrete surfacing to be placed to the thickness, elevation, crown and grades specified, whichever is more restrictive. Any deviation in excess of the amount shall be

corrected by loosening, adding, or removing materials, reshaping and recompacting by sprinkling or drying and rolling.

PART 4 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.01 METHOD OF MEASUREMENT:

A. Standard Items:

1. 02450.01 UNCLASSIFIED EXCAVATION ABOVE SUBGRADE

This item shall be measured by the number of square yards (SY) OR lump sum (LS) of excavation above subgrade as shown in the Plans or directed by ENGINEER.

2. 02450.02 EXCAVATION BELOW SUBGRADE

This item shall be measured by the number of cubic yards (CY) of excavation below subgrade as shown in the Plans or directed by ENGINEER.

3. 02450.03 IMPORTED FILL

This item shall be measured by the number of cubic yards (CY) of imported fill as shown in the Plans or directed by ENGINEER.

4. 02450.04 SUBGRADE PREPARATION

This item shall be measured by the number of square yards (SY) OR lump sum (LS) of subgrade preparation as shown in the Plans or as directed by ENGINEER.

4.02 BASIS OF PAYMENT:

A. Standard Items

1. 02450.01 UNCLASSIFIED EXCAVATION ABOVE SUBGRADE

Payment shall constitute full compensation for all labor, equipment, tools and incidentals necessary to accomplish all clearing, grubbing, street excavations, including excavation and/or grading for sidewalk, curb and/or combined curb and gutter, curb turn fillets, valley gutters, and ally aprons as shown in the Plans; to construct, shape and slope embankments, cuts, subgrades, shoulders, gutters, ditches, street and alley intersections, approaches and private driveway entrances in the locations, to the elevations and according to details shown in the Plans; to backfill ditches, depressions and behind sidewalk, curb and/or combined curb and gutter; to remove and to make satisfactory disposal of all unsuitable and surplus materials occurring within the limits of the work.

2. 02450.02 EXCAVATION BELOW SUBGRADE

Payment shall constitute full compensation for all labor, equipment, tools and incidentals necessary to complete the excavation and disposal of unstable material in embankment foundations and soft or unstable material in the subgrade and the cost of furnishing, delivering to the site, backfilling and compacting the excavated areas created by the removal of unstable material with engineering fabric and crushed aggregate base course.

3. 02450.03 IMPORTED FILL

Payment shall constitute full compensation for all labor, equipment, tools and incidentals necessary to complete the embankment of material to subgrade and the cost of furnishing, delivering to the site, backfilling and compacting the excavated areas created by the removal of unstable material with engineering fabric and crushed aggregate base course.

4. 02450.04 SUBGRADE PREPARATION

Payment shall constitute full compensation for all labor, equipment, tools, materials and incidentals necessary to scarify, moisture condition and recompact the roadway subgrade to the Plan elevation, and for the filling in or cleaning of ditches and the re-establishment of drainage at designated locations.

END OF SECTION 02450

PART 1 - GENERAL

1.01 WORK INCLUDED:

The work covered by this Section of the Specifications consists of excavating and depositing topsoil in accordance with the Specifications and in reasonably close conformity with the lines, grades, thicknesses, and typical cross-section shown in the Plans. Removing and stockpiling topsoil prior to grading operations shall be classified as "Topsoil Stripping."

1.02 RELATED WORK:

- A. Section 02221 - Trenching, Backfilling and Compacting.
- B. Section 02450 - Grading
- C. Section 02480 - Reclamation

PART 2 - PRODUCTS

2.01 GRASS MATERIALS:

- A. Topsoil shall consist of any soil suitable for the growth of grass or other cover crops. It shall be a fertile, friable material; loam or sandy clay loam. It shall not be saline or sodic and shall not contain noxious weeds or toxic substances. To a depth of 4 inches the soil shall be free of roots, branches, hard dirt, clay, pieces of concrete, sticks, stones or any other materials that would inhibit the germination of seeds or the growth of the cover crop. Classification of soils suitable for topsoil will be at the discretion of the ENGINEER.

PART 3 - EXECUTION

3.01 STRIPPING AND STORING TOPSOIL:

- A. Prior to stripping topsoil from the designated areas, brush, grass, agricultural crops, or other suitable material shall be conserved as mulch and incorporated into the topsoil. The material shall be chopped through a brush chopper, shredded by means of a commercial- sized rotary blade mower, or reduced by other approved methods.
- B. Unless it can be placed directly on the prepared slopes, topsoil shall be stockpiled for later incorporation into the work. Stockpiles shall be placed at the location and to the dimensions designated by the ENGINEER.
- C. All topsoil shall be stripped from within the disturbance limits and any staging areas or material storage sites prior to commencement of construction. Topsoil shall be stripped to the actual depths encountered. Topsoil depths may be estimated as identified in the Geotechnical report.

3.02 PREPARATION OF AREAS:

- A. The embankment or cut slope areas to be covered with topsoil shall be

completed to the designated lines and grades. Areas that have become crusted or hardpacked shall be scarified to a depth of approximately three inches (3"), prior to placement of the topsoil.

3.03 PLACING TOPSOIL:

- A. Topsoil shall be placed in a uniform manner to a minimum depth of 4 inches or as indicated in the Plans.
- B. After the topsoil has been spread, stones larger than 1 inch in any dimension, sticks, stumps or other foreign debris that would seriously affect the effectiveness or appearance of the topsoil, shall be raked up and removed from the area.
- C. If any damage by erosion or other causes has occurred after the completion of grading, the Contractor shall repair such damage. This may include filling gullies, smoothing irregularities, and repairing other incidental damage.
- D. Excess topsoil, beyond that needed for replacement, shall remain the property of the landowner and be stockpiled in the location on site as shown in the Plans or as designated by the ENGINEER.

PART 4 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.01 METHOD OF MEASUREMENT:

A. Standard Items:

1. 02460.01 TOPSOIL STRIPPING AND STOCKPILING

This item shall be measured by the number of square yards (SY) of topsoil stripped and stockpiled in a location as directed by the ENGINEER.

2. 02460.02 TOPSOIL PLACING

This item shall be measured by the number of square yards (SY) of topsoil placed.

4.02 BASIS OF PAYMENT:

A. Standard Items:

1. 02460.01 TOPSOIL STRIPPING AND STOCKPILING

Payment shall constitute full compensation for all labor, equipment, tools and incidentals necessary to accomplish all removal, loading, hauling and stockpiling of the topsoil

2. 02460.02 PLACING TOPSOIL

Payment shall constitute full compensation for all labor, equipment, tools and incidentals necessary to complete the preparation of the area for topsoil, loading, hauling, placing and grading of the topsoil.

END OF SECTION 02460

PART 1 - GENERAL

1.01 WORK INCLUDED:

The work covered by this Section of the Specifications includes topsoil placement and seedbed preparation with seeding or sodding as required. The areas to be reclaimed will be the water, sanitary sewer, or storm drain line routes, back of curb and gutter, behind sidewalk, and other areas disturbed during construction that do not receive other surfacing.

1.02 RELATED WORK:

- A. Section 02221 - Trenching, Backfilling and Compacting.
- B. Section 02450 - Grading
- C. Section 02460 - Topsoil

1.03 QUALITY ASSURANCE:

A. Source Quality Control:

1. General: Provide landscape materials with certificates of inspection required by governing authorities. Comply with regulations applicable to landscape materials.
2. Do not make substitutions: Package standard products with manufacturer's certified analysis. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Agriculture Chemists, wherever applicable.

1.04 SUBMITTALS:

- A. Certification: The CONTRACTOR shall furnish the ENGINEER duplicate signed copies of a statement by the vendor certifying that each lot of seed has been tested by a recognized laboratory for seed testing within twelve months of date of seeding. This statement shall include:
 1. The species, genus, and variety of the seed.
 2. The commonly accepted name of the seed.
 3. The percentage of pure seed, crop seed, inert material, weed seeds by weight, germination, and hard seed.
 4. The month and year of the germination test.
 5. Origin of the seed.
 6. Lot or mixture number or other lot identification.
 7. The full name and address of the supplier.
 8. Name and number of each kind of restricted noxious weed seeds per pound pursuant to the Wyoming Seed Law. Seed shall not contain any of the

prohibited noxious weed seeds as designated in the Wyoming Seed Law. Noxious weed seed listed as prohibited in another state shall be considered prohibited in Wyoming.

9. Net weight of seed in each container.
10. The words "poisonous treated" shall appear in BOLD print on the label of seeds treated with chemicals which are toxic to either humans, livestock, or wildlife.

Prior to seeding, the CONTRACTOR shall furnish to the ENGINEER, duplicate copies of a certification signed by the vendor, certifying that each lot of seed has been tested by a State Testing Laboratory, Commercial Seed Testing Laboratory, or a registered member of the Society of Commercial Seed Technologists.

The CONTRACTOR shall also furnish to the ENGINEER, duplicate copies of the seed analysis reports as prepared by the respective seed testing authority. If requested by the ENGINEER, the CONTRACTOR shall have the seed on the site and available for testing 15 days before the start of seeding.

A Tetrazolim (Tz) Viability Test will be accepted in lieu of the germination portion of the Service Sample Seed Analysis Report as prepared by the seed testing laboratory. The Wyoming Department of Agriculture reserves the right to random sample all seed entering the State or delivered on-site to the project. The total percentage of "crop seed" shall not exceed 3 percent of weight. The species and varieties of seed, or blends of seeds, shall conform to the Pure Live Seed (PLS) at the rates as called for in the Plans. Seed which has less than 85% pure seed shall not be used.

- B. Maintenance Instructions: Submit typewritten instructions recommending procedures to be established by OWNER for maintenance of landscape work for one full year. Submit prior to expiration of required maintenance period(s).

1.05 DELIVERY, STORAGE AND HANDLING:

Deliver package materials in containers showing weight, analysis and name of manufacturer. Protect all materials from deterioration during delivery, and while stored at site.

1.06 JOB CONDITIONS:

- A. Proceed with and complete landscape work as rapidly as portions of site become available, working within seasonal limitations.
- B. Utilities: Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate, as required. Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.
- C. Excavation: When conditions detrimental to plants grown are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify ENGINEER before planting.

D. Planting Time: Plant or install materials during normal planting seasons for each type of reclamation work required. Correlate planting with specified maintenance periods to provide maintenance required. Seeding is not recommended between May 15th and October 10th, however, since the CONTRACTOR is responsible for obtaining an acceptable growth of grass, the CONTRACTOR may select the seeding time.

PART 2 - PRODUCTS

2.01 GRASS MATERIALS:

A. Grass Seed: Provide fresh, clean, new-crop seed complying with tolerance for purity and germination established by Official Seed Analysts of North America. Provide seed of grass species, proportions and minimum percentages of purity, germination, and maximum percentage of weed seed, as shown on the table below. Seed must be purchased through a dealer licensed with the Wyoming Department of Agriculture.

Mixtures are to be used throughout the project as directed by the ENGINEER. The ENGINEER reserves the right to direct the CONTRACTOR not to reseed an area. If the OWNER of a lawn area desires a special lawn grass mixture, the seed mixture will be provided at no cost to the CONTRACTOR. The CONTRACTOR will be required to sow the mixture and this seeding will be considered incidental to the reclamation efforts.

ROAD RIGHT-OF-WAY, OPEN AREAS and Embankments (not lawns or boulevards)			
COMMON NAME	SCIENTIFIC NAME	VARIETY	LBS/(PLS)/ ACRE DRILLED (1)
Western Wheatgrass	<i>Agropyron smithii</i>	Rosanna	3
Slender Wheatgrass	<i>Agropyron trachycaulum</i>	Pryor	3
Thickspike Wheatgrass	<i>Elymus Lanceolatus</i>	Critana	3
Green Needlegrass	<i>Nesella Viridula</i>	Monocot	3
Spredor Alfalfa	<i>Medicago Sativa</i>	Spredor 4	2
TOTAL			14
(1) Application rate shall be doubled for all areas to be seeded by broadcasting.			

Purity: 85% Minimum
 Germination: 80% Minimum
 Weed Seed: 1% Maximum

B. Lawns and Boulevards:

New crop mixture. A minimum of 95% Perennial Ryegrass, or approved equal. Other acceptable varieties include Merion, Baron and Fylking. Apply seed at the rate of 2 pounds PLS per 1,000 SF. Application of seed rates shall be doubled for all areas to be seeded by broadcasting.

Mixture shall contain no "Prohibited" noxious weed seed and shall comply with Wyoming Seed Law (W. S. 11-12-101 through W. S. 11-12-123) and the Federal Seed Act.

Provide a mixture of 95% Kentucky bluegrass if requested by the landowner.

C. Sod: Sod shall have a good cover of living or growing grass. This shall be interpreted to include grass that is seasonally dormant during the cold or dry seasons and capable of renewing growth after the dormant period. All sod shall be obtained from areas where the soil is reasonably fertile and contains a high percentage of loamy topsoil. Sod shall be cut or stripped from living, thickly matted turf relatively free of weeds or other undesirable foreign plants, large stones, roots, or other materials which might be detrimental to the development of the sod or to future maintenance. At least ninety percent (90%) of the plants in the cut sod shall be composed of the Kentucky Bluegrass, and any vegetation more than six inches in height shall be mowed to a height of three inches or less before sod is lifted. Sod, including the soil containing the roots and the plant growth showing above, shall be cut uniformly to a thickness not less than two inches. Suppliers of sod must conform to the provisions set forth in Wyoming Statutes 11-9-101 through 11-9-108.

2.02 FERTILIZER:

Fertilizer in compliance with Wyoming Statutes 11-14-101 through 11-17-116 shall be standard commercial fertilizer supplied separately or in mixtures containing the percentages of total nitrogen, available phosphoric acid, and water-soluble potash as specified below. Fertilizers shall be furnished in standard containers with name, weight, and guaranteed analysis of contents clearly marked thereon. No cyanamide compounds or hydrated lime shall be permitted in mixed fertilizers.

A. Fertilizer Forms: Fertilizer may be supplied in one of the following forms:

1. A dry, free-flowing fertilizer suitable for application by a common fertilizer spreader;
2. A finely-ground fertilizer soluble in water, suitable for application by power sprayers; or
3. A granular or pellet form suitable for application by blower equipment.

Fertilizer composition for seeded areas shall be either ammonium sulfate, with an analysis of 21-11-11 applied at a rate of forty pounds of available nitrogen per acre or ammonium nitrate, with an analysis of 34-11-11 applied at a rate of forty pounds of available nitrogen per acre. Where fertilizer has been applied, signs stating this shall be placed at intervals not to exceed 200 feet.

2.03 TOPSOIL:

Topsoil shall be of at least equal quality to the topsoil which exists in areas adjacent to the area to be repaired. It shall be a fertile, friable material; loam or sandy clay loam, suitable for growing grass. It shall not be saline or sodic and shall not contain noxious weeds or toxic substances. To a depth of 4 inches the soil shall be free of roots, branches, pieces of concrete or other materials that will interfere with subsequent sowing of seed and establishing turf, and any sticks or stones greater

than 1 inch in diameter. Stones and other debris shall be removed from the surface prior to seeding. The surface shall be approved by the ENGINEER before seeding.

2.04 MULCH:

Vegetative mulch material shall be clean wheat straw, rye straw, barley straw, or oat straw, in that order of preference.

Chopped or ground material and material that is musty, moldy, rotted, or contains seed-bearing stalks of noxious weeds or grasses is not acceptable. The mulch shall be free of stones, dirt, roots, stumps, or other foreign material.

Mulch shall be applied at a rate of two tons per acre. Mulch shall be certified weed free pursuant to W.S. 11-5-102(a)(viii)(x)(xi); W.S. 11-5-302(a)(viii); or Regulations, or Federal Law (P.L. 93-629). The crop shall be inspected and certified by proper, authorized officials in the State of origin.

2.05 EROSION CONTROL BLANKET:

The erosion control blanket, as a minimum, shall be made of 100% biodegradable straw encased in netting on both sides that is sewn together with cotton thread. The blanket shall come in minimum widths of 6-feet and weigh at least 0.5 lbs. per square yard. The blanket shall have a life of at least 12 months. It shall be North American Green S150 or approved equal.

2.06 IRRIGATION CONDUIT:

Conduit shall be rigid polyvinyl chloride (PVC) conduit complying with UL 651, Schedule 40, unless otherwise indicated.

PART 3 - EXECUTION

3.01 SEEDING:

A. Seedbed Preparation: An area to be seeded shall be considered a satisfactory seedbed without additional treatment if it has recently been thoroughly loosened and worked to a depth of not less than five inches as a result of grading operations, immediately prior to replacing the topsoil. This soil shall be loosened, friable, and reasonably free from clods, rocks, roots, concrete pieces or other undesirable matter as determined by the ENGINEER. Wheel ruts, ridges and low areas are to be eliminated. Weeds, stumps, and tree suckers shall be eliminated.

When the area to be seeded is sparsely sodded, weedy, barren and unworked, or packed and hard, any grass and weeds shall first be cut or otherwise satisfactorily disposed of, and the soil then scarified or otherwise loosened to a depth not less than five inches. Clods shall be broken, soil shall be worked into a satisfactory seedbed by discing, or by use of cultipackers, rollers, drags, harrows, or other appropriate means. Compost or mulch applied to the soil shall be thoroughly mixed in.

After grading of area has been completed topsoil shall be placed. Before applying fertilizer or seed, areas to be seeded shall be raked or otherwise cleared of stones larger than two inches in any diameter, sticks, stumps, and other debris which might

interfere with sowing of seed, growth of grasses, or subsequent maintenance of grass-covered areas. If any damage by erosion or other causes has occurred after the completion of grading and before beginning the application of fertilizer and seed, the CONTRACTOR shall repair such damage. This may include filling gullies, smoothing irregularities, and repairing other incidental damage.

Do not seed when ground is muddy, or during windy conditions.

B. Dry Application Method:

1. Fertilizing. Following advance preparations and cleanup, fertilizer shall be uniformly spread at the rate which will provide not less than the minimum quantity stated in Part 2 of this Section.
2. Seeding. Grass seed shall be sown at the rate specified in Part 2 of this Section immediately after fertilizing. Seed shall be drilled at a depth of 0.5 inches and along the contours. If seed is broadcasted, the fertilizer and seed shall be raked to cover the seeds approximately 0.5 inches.

C. Wet Application Method:

1. General. The CONTRACTOR may elect to apply seed and fertilizer by spraying them on the previously prepared seedbed in the form of an aqueous mixture and by using the methods and equipment described herein. The rates of application shall be as specified in Part 2 of this Section.
2. Spraying Equipment. The spraying equipment shall have a container or water tank equipped with a liquid level gauge calibrated to read in increments not larger than fifty gallons over the entire range of the tank capacity, mounted so as to be visible to the nozzle operator. The container or tank shall also be equipped with a mechanical power-drive agitator capable of keeping all the solids in the mixture in complete suspension at all times until used.

The unit shall also be equipped with a pressure pump capable of delivering one hundred gallons per minute at a pressure of one hundred pounds per square inch. The pump shall be mounted in a line which will re-circulate the mixture through the tank whenever it is not being sprayed from the nozzle. All pump passages and pipelines shall be capable of providing clearance for 5/8-inch solids. The power unit for the pump and agitator shall have controls mounted so as to be accessible to the nozzle operator.

There shall be an indicating pressure gauge connected and mounted immediately at the back of the nozzle.

The nozzle pipe shall be mounted on an elevated supporting stand in such a manner that it can be rotated through 360 degrees horizontally and inclined vertically from at least 20 degrees below to at least 60 degrees above the horizontal. There shall be a quick-acting, three-way control valve connecting the recirculating line to the nozzle pipe and mounted so that the nozzle operator can control and regulate the amount of flow of mixture

delivered to the nozzle. At least three different types of nozzles shall be supplied so that mixtures may be properly sprayed over distances varying from twenty feet to one hundred feet. One shall be a close-range ribbon nozzle, one a medium-range ribbon nozzle, and one a long-range jet nozzle. For case of removal and cleaning, all nozzles shall be connected to the nozzle pipe by means of quick-release couplings.

In order to reach areas inaccessible to the regular equipment, an extension hose at least fifty feet in length shall be provided to which the nozzles may be connected.

3. Mixtures. All water used shall be obtained from fresh water sources and shall be free from injurious chemicals and other toxic substances harmful to plant life. Brackish water shall not be used at any time. Seed and fertilizer shall be mixed together in the relative proportions specified, but not more than a total of two hundred twenty pounds of these combined solids shall be added to and mixed with each one hundred gallons of water.

All mixtures shall be constantly agitated from the time they are mixed until they are finally applied to the seedbed. All such mixtures shall be used within two hours from the time they were mixed or they shall be wasted and disposed of at locations acceptable to the ENGINEER.

4. Spraying. Mixtures of seed and fertilizer shall only be sprayed upon previously prepared seedbeds. The mixtures shall be applied by means of a high-pressure spray which shall always be directed upward into the air so that the mixtures will fall to the ground like rain in a uniform spray. Nozzles or sprays shall never be directed toward the ground in such a manner as might produce erosion or runoff.

Particular care shall be exercised to insure that the application is made uniformly and at the prescribed rate and to guard against misses and overlapped areas. Proper predetermined quantities of the mixture in accordance with specifications shall be used to cover specified sections of known areas. Checks on the rate and uniformity of application may be made by observing the degree of wetting of the ground or by distributing test sheets of paper or pans over the area at intervals and observing the quantity of material deposited thereon.

Seed and mulch are NOT to be mixed and applied in a single application. Seed and fertilizer can be applied using a wet method, however mulch shall be applied in a separate application. In any case, seed must be applied to a prepared seedbed and lightly worked into the soil prior to mulching to assure proper seed germination and growth.

D. Mulching:

On areas that have been drilled or broadcast seeded, mulching shall be done as follows:

Before spreading mulch, all large clods, stumps, stones, brush, roots, and other foreign material shall be removed from the areas to be mulched. Mulch shall be

applied immediately after seeding. The spreading of the mulch may be by hand methods, blower, or other mechanical methods, provided a uniform covering is obtained.

Mulch material shall be furnished, hauled, and evenly applied on the area shown in the Plans or designated by the ENGINEER. Straw or hay shall be spread over the surface to a uniform thickness at the rate of two tons per acre to provide a loose depth of not less than 1½-inches or more than three inches. Other acceptable organic material shall be spread at the rate directed by the ENGINEER. Mulch may be blown on the slopes and the use of cutters in the equipment for this purpose will be permitted to the extent that at least ninety-five percent (95%) of the mulch in place on the slope shall be six inches or more in length. When mulches applied by the blowing method are cut, the loose depth in place shall be not less than one inch or more than two inches.

The mulch shall be held in place by light discing, a very thin covering of topsoil, small brush, pins, stakes, wire mesh, or other adhesive material approved by the ENGINEER.

The CONTRACTOR shall care for the mulched areas until final acceptance of the project. Such care shall consist of providing protection against traffic or other use by placing warning signs, as approved by the ENGINEER, and erecting any barricades that may be shown in the Plans before or immediately after mulching has been completed on the designated areas. The CONTRACTOR shall also be responsible for cleaning catch basins, or any other structure that becomes clogged with mulch.

The CONTRACTOR shall be required to repair or replace any mulching that is defective or becomes damaged until the project is finally accepted. When, in the judgment of the ENGINEER, such defects or damages are the result of poor workmanship or failure to meet the requirements of the specifications, the cost of the necessary repairs or replacement shall be borne by the CONTRACTOR. However, once the CONTRACTOR has completed the mulching of any area in accordance with the provisions of the specifications and to the satisfaction of the ENGINEER, no additional work at his expense will be required, but subsequent repairs and replacements deemed necessary by the ENGINEER shall be made by the CONTRACTOR and will be paid for as additional or extra work.

E. Maintenance of Seeded Areas:

The CONTRACTOR shall protect seeded areas against traffic or other use by warning signs or barricades, as approved by the ENGINEER. Surfaces gullied or otherwise damaged following seeding shall be repaired by regrading and reseeding as directed. The CONTRACTOR shall mow, water, and otherwise maintain seeded areas in a satisfactory condition until final inspection and acceptance of the work.

Temporary fencing shall be installed around seeded areas where horses and livestock are present that could damage the seeded area. These fences are to remain in-place for up to two years if requested by the ENGINEER, and the CONTRACTOR is not responsible for their removal.

When either the dry or wet application method outlined above is used it will be required that the CONTRACTOR establish a good stand of grass of uniform color

and density to the satisfaction of the ENGINEER. If at the time when the contract has been otherwise completed it is not possible to make an adequate determination of the color, density, and uniformity of such stand of grass, payment for the unaccepted portions of the areas seeded out of season may be withheld until such time as these requirements have been met.

The project one-year warranty also applies to the seeding. CONTRACTOR will be required to repair, replace and replant all areas where seeds do not germinate, do not grow, grow and die, or erosion occurs, at no cost to the OWNER.

3.02 EROSION CONTROL BLANKET

The area to be covered with erosion control blanket shall be prepared as described above for seeding. Seeding shall be accomplished prior to placement of the mat. The erosion control blanket shall be placed according to manufacturer's requirements. Mat edges shall be overlapped 3 to 4 inches. Stapling shall be manufacturer's requirements minimum and as necessary to ensure continued placement throughout the project warranty period. Mat installation shall be done in a manner so as not to disturb the previously placed seedbed. Mulching is not required where erosion mat is used.

3.03 SODDING

A. General: Areas to be solid, strip, or spot sodded shall be as shown in the Plans or designated by the ENGINEER. Suitable equipment necessary for proper preparation of the ground surface and for the handling and placing of all required materials shall be on hand, in good condition, and shall be approved by the ENGINEER before the various operations are started. The CONTRACTOR shall demonstrate to the ENGINEER before starting the various operations that the application of required materials will be made at the specified rates.

B. Preparing the Ground Surface: After grading of areas has been completed and before applying fertilizer, areas to be sodded shall be raked or otherwise cleared of stones larger than two inches in any diameter, sticks, stumps, and other debris which might interfere with sodding, growth of grasses, or subsequent maintenance of grass covered areas. If any damage by erosion or other causes occurs after grading of areas and before beginning the application of fertilizer, the CONTRACTOR shall repair such damage. This may include filling gullies, smoothing irregularities, and repairing other incidental damage.

Select areas, as shown in the Plans, within the project that currently contain rock or other landscaping materials will be replaced with sod. CONTRACTOR shall remove these landscaping materials as part of Clearing and Grubbing and shall prepare the soil for sod in accordance with these specifications. The property owner shall be asked if they want to retain the landscaping material that is removed, and if so, the CONTRACTOR shall place the material at the location selected by the property owner. If the property owner does not want the landscaping material, CONTRACTOR shall remove and dispose of this material.

Removal and disposal of landscaping material, and soil preparation for sod, shall not be paid for separately, but shall be included in the unit price for sod.

C. Applying Fertilizer: Following ground surface preparation, fertilizer shall be uniformly spread at a rate which will provide not less than the minimum quantity of each fertilizer ingredient, as stated in Part 2 of this Section. These materials shall be incorporated into the soil to a depth of not less than two inches by discing, raking, or other methods acceptable to the ENGINEER. Any stones larger than two inches in any diameter, large clods, roots, and other litter brought to the surface by this operation shall be removed.

D. Obtaining and Delivering Sod: After inspection and approval of the source of sod by the ENGINEER, the sod shall be cut with approved sod cutters to such a thickness that after it has been transported and placed on the prepared bed, but before it has been compacted, it shall have a uniform thickness of not less than specified in Part 2 of this Section. Sod sections or strips shall be cut in uniform widths, not less than ten inches, and in lengths of not less than eighteen inches, but of such length as may be readily lifted without breaking, tearing, or loss of soil. Where strips are required, the sod must be rolled without damage with the grass folded inside.

The sod shall be transplanted within twenty-four hours from the time it is stripped, unless circumstances beyond the CONTRACTOR'S control make storing necessary. In such cases, sod shall be stacked, kept moist, and protected from exposure to the air and sun and shall be cut and moved only when the soil moisture conditions are such that favorable results can be expected. Where the soil is too dry, permission to cut sod may be granted only after it has been watered sufficiently to moisten the soil to the depth the sod is to be cut.

E. Laying Sod: Sodding shall be performed only during the seasons when satisfactory results can be expected. Frozen sod shall not be used and sod shall not be placed upon frozen soil. Sod may be transplanted during periods of drought with the approval of the ENGINEER, provided the sod bed is watered to moisten the soil to a depth of at least four inches immediately prior to laying the sod.

The sod shall be moist and shall be placed on a moist earth bed. Pitchforks shall not be used to handle sod, and dumping from vehicles shall not be permitted. The sod shall be carefully placed by hand, edge to edge and with staggered joints, in rows at right angle to the slopes, commencing at the base of the area to be sodded and working upward. The sod shall immediately be pressed firmly into contact with the sod bed by tamping or rolling with approved equipment to provide a true and even surface, and insure knitting without displacement of the sod or deformation of the surfaces of sodded areas. Wherever the sod may be displaced during sodding operations, the workmen when replacing it shall work from ladders or treaded planks to prevent further displacement. Screened soil of good quality shall be used to fill all cracks between sod pieces. The quantity of the fill soil shall not cause smothering of the grass. Where the grades are such that the flow of water will be from paved surfaces across sodded areas, the surface of the soil in the sod after compaction shall be set approximately one inch below the pavement edge. Where the flow will be over the sodded areas and onto the paved surfaces around manholes and inlets, the surface of the soil in the sod after compaction shall be placed flush with pavement edges.

On slopes steeper than 1 vertical to 2 1/2 horizontal and in V-shaped or flat bottom ditches or gutters, the sod shall be pegged with wooden pegs not less than twelve

inches in length and have a cross-sectional area of not less than 3/4 square inch. The pegs shall be driven flush with the surface of the sod.

F. Watering: Adequate water and watering equipment must be on hand before sodding begins, and sod shall be kept moist until it has become established and its continued growth assured. In all cases, watering shall be done in a manner which will avoid erosion from the application of excessive quantities and will avoid damage to the finished surface.

G. Maintenance:

1. General: The CONTRACTOR shall provide general care for the sodded areas as soon as the sod has been laid and shall continue until sixty days after substantial completion.
2. Protection. All sodded areas shall be protected against traffic or other use by warning signs or barricades approved by the ENGINEER.
3. Mowing. The CONTRACTOR shall mow the sodded areas with approved mowing equipment, depending upon climatic and growth conditions and the need for mowing specific areas. In the event that weeds or other undesirable vegetation are permitted to grow to such an extent that, either cut or uncut, they threaten to smother the sodded species, they shall be mowed and the clippings raked and removed from the area.

The CONTRACTOR will also be responsible for the irrigation of existing grassed areas that have historically been irrigated with underground sprinkler systems but are temporarily out of service due to project construction. Irrigation shall continue until the sprinkler systems are again operational.

Included with this work shall be the irrigation of any trees and/or shrubs planted by CONTRACTOR for the period immediately upon planting and extending for one year after final completion.

H. Repairing: When the surface has become gullied or otherwise damaged during the period covered by this contract, the affected areas shall be repaired to re-establish the grade and the condition of the soil, as directed by the ENGINEER, and shall then be resodded as specified in this Section.

3.04 IRRIGATION CONDUIT:

Where required in retrofitting sprinkler systems, or to provide for future installation of irrigation systems, CONTRACTOR shall furnish and install conduit beneath any proposed new sidewalks or driveways (and the crushed aggregate base course beneath concrete flatwork) at the direction of the ENGINEER, prior to their installation.

3.05 INSPECTION AND ACCEPTANCE:

When reclamation is completed, including maintenance, ENGINEER will, upon request, make an inspection to determine acceptability.

Reclamation may be inspected for acceptance in parts agreeable to ENGINEER, provided work offered for inspection is complete, including maintenance.

Where inspected reclamation does not comply with requirements, replace rejected work and continue specified maintenance until reinspected by ENGINEER and found to be acceptable. Remove rejected plants and materials promptly from project site. See also Subsection 3.01E of this Section.

PART 4 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.01 METHOD OF MEASUREMENT:

A. Standard Items:

1. 02480.01 SOD

This item shall be measured by the number of square feet (SF) of area sodded.

2. 02480.02 SEEDING

This item shall be measured by the number of square feet (SF) or acre (ACRE) or square yards (SY) of area seeded.

3. 02480.03 EROSION CONTROL BLANKET

This item shall be measured by the number of square yards (SY) of erosion control blanket placed as called out in the Plans or as directed by the ENGINEER or Lump Sum (LS).

4. 02480.0X X" IRRIGATION CONDUIT

This item shall be measured by the number of linear feet (LF) of irrigation conduit installed. Measurement of conduit shall be made along the centerline of conduit.

4.02 BASIS OF PAYMENT:

A. Standard Items:

1. 02480.01 SOD

Payment shall constitute full compensation for all labor, equipment, tools and incidentals necessary to place the sod. This shall include but is not limited to preparation of the area for topsoil, loading, hauling, placing and grading of the topsoil, preparation of the sod bed, and furnishing of all sod and fertilizer.

2. 02480.02 SEEDING

Payment shall constitute full compensation for all labor, equipment, tools

and incidentals necessary to complete the seeding. This shall include but is not limited to preparation of the area for topsoil, loading, hauling, placing and grading of the topsoil, preparing the seed bed, and furnishing of all seed, fertilizer and mulching.

3. 02480.03 EROSION CONTROL BLANKET

Payment shall constitute full compensation for all labor, equipment, tools and incidentals necessary to install the erosion control blanket. This shall include but is not limited to purchasing, hauling, prepping, placing, securing and maintenance of the erosion control blanket.

4. 02480.0X X" IRRIGATION CONDUIT

Payment shall be made at the contract unit bid price and shall constitute full compensation for all trench excavation, backfill and compaction. This shall include, but is not limited to all labor, equipment, tools and incidentals necessary to complete the irrigation conduit installation.

END OF SECTION 02480

PART 1 – GENERAL

1.01 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.
- B. Finish Grade: Elevation of finished surface of planting soil.
- C. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- D. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.
- E. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.
- F. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

1.02 SUBMITTALS

- A. Submittal showing experience of landscaping Subcontractor shall be provided.
- B. Product Data: For each type of product indicated.
- C. Samples of medium bark, mulch.
- D. Planting Schedule: Indicating anticipated planting dates for exterior plants.
- E. Irrigation system submittal including bill of materials.
- F. Maintenance Instructions: Procedures required by OWNER for maintenance of sod, trees and shrubs during a calendar year.

1.03 QUALITY ASSURANCE

- A. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project.
- B. Topsoil Analysis: Furnish topsoil analysis by a qualified soil-testing laboratory.

C. Report suitability of topsoil for plant growth. State-recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory topsoil genus, species, and variety of exterior plants indicated, complying with applicable requirements in ANSI Z60.1, "American Standard for Nursery Stock". If existing topsoil is to be used, ensure it is treated to meet the above specifications.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their, natural shape. Provide protective covering of exterior plants during delivery. Do not drop exterior plants during delivery and handling.

B. Handle planting stock by root ball or container.

C. Deliver exterior plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set exterior plants and trees in shade, protect from weather and mechanical damage, and keep roots moist.

1.05 WARRANTY

A. Special Warranty: Installer agrees to repair or replace plantings that fail in materials, workmanship, or growth within specified warranty period.

1. Failures include, but are not limited to, the following:
 - a. Structural failures including plantings falling or blowing over.
2. Warranty Periods from Date of Final Completion:
 - a. Trees and Shrubs: One year.
 - b. Ground Cover and Plants: One year.

1.06 MAINTENANCE SERVICE

A. Initial Maintenance Service: Provide full maintenance by skilled employees of landscape installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until planting are acceptably healthy and well established, but for not less than maintenance period below.

1. Maintenance Period for Trees and Shrubs: One year from date of Final Completion.
2. Maintenance Period for sod and grasses: One year from date of Final Completion.

PART 2 – PRODUCTS

2.01 TREE AND SHRUB MATERIAL

- A. General: Furnish nursery-grown trees and shrubs complying with ANSI Z60.1, with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
- B. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which shall begin at root flare according to ANSI Z60.1.
- C. Provide balled and burlapped or container-grown trees.
- D. Shrub sizes shall have a planted height of not less than 4’.

2.02 GROUND COVER PLANTS

- A. Ground Cover: Provide ground cover of species indicated, established and well rooted in pots or similar containers, and complying with ANSI Z60.1.

2.03 PLANTS

- A. Perennials: Provide healthy, field-grown plants from a commercial nursery, of species and variety shown or listed, complying with requirements in ANSI Z60.1.

2.04 TOPSOIL

- A. Topsoil: ASTM D 5268, pH range of 5.5 to 7.5, a minimum of 4 percent organic material content; free of stones 1 inch or larger in any dimension and other extraneous materials harmful to plant growth.
 - 1. Topsoil Source: Import topsoil or manufactured topsoil from off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from bogs or marshes. Obtain topsoil from local sources that best match existing soil conditions.
 - 2. Topsoil Source: Amend existing in-place surface soil to produce topsoil that meets the criteria listed above. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
 - a. Surface soil may be supplemented with imported or manufactured topsoil from off-site sources.

2.05 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch sieve; soluble salt content of 5 decisiemens/m.
- B. Peat: Sphagnum peat moss, partially decomposed, finely divided or granular texture, with a pH range of 3.4 to 4.8.
- C. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

2.06 FERTILIZER

- A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 10 percent phosphoric acid.
- B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - 1 Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
- C. Follow the most current edition of “Best Management Practices: Tree and Shrub Fertilization” (companion to ANSI A300 Part 2.) for fertilization standards for trees and shrubs.

2.07 MULCHES

- A. Organic Mulch: Wood and bark chips.

2.08 WEED-CONTROL BARRIERS

- A. Composite Fabric: Woven, needle-punched polypropylene substrate bonded to a nonwoven polypropylene fabric, 4.8 oz./sq. yd.

2.09 PLANTING SOIL MIX

- A. Planting Soil Mix: Mix topsoil with recommended amendments from soil analysis from qualified lab. Whenever possible utilize natural fill from planting site. If mixing topsoil, treat for deficiency only.

2.10 TREE GRATES

- A. Where required, tree grates shall be Neenah R-8706-1A Metropolitan Collection, or approved equal.

PART 3 – EXECUTION

3.01 PLANTING BED ESTABLISHMENT

- A. Loosen subgrade of planting beds to a minimum depth of 8 inches. Remove stones larger than 1-1/2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off OWNER's property.

Thoroughly blend planting soil mix off-site before spreading; or spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil mix. Only apply soil amendments and fertilizer if soil analysis shows a need. Amend for deficiencies only.

Spread planting soil mix to a depth of 4 inches but not less than required to meet finish grades after natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.

- B. Finish Grading: Grade planting beds to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.02 TREES AND SHRUBS

- A. Excavation of Pits and Trenches: Excavate circular pits with sides sloped inward. Trim base leaving center area raised slightly to support root ball and assist in drainage. Do not further disturb base. Scarify sides of plant pit smeared or smoothed during excavation.

Excavate approximately three times as wide as ball diameter.

Balled and Burlapped: Remove 2/3 of the burlap and all wire baskets from the root balls. Do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.

Place planting soil mix around root ball in layers, tamping to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of planting soil mix.

- B. Organic Mulching: Apply 2-inch average thickness of organic mulch extending 12 inches beyond edge of planting pit or trench. Do not place mulch within 4 inches of trunks or stems.

- C. Tree Grates and Guards: Where trees are planted in sidewalk or other paved areas, planting procedure shall follow that outlined above in 3.02A. At grade of pavement, Neenah R-8706-1A Metropolitan Collection tree grate, or approved equal, and a tree guard shall be installed in accordance with Contract Documents.

3.03 TREE AND SHRUB PRUNING

- A. Remove only dead, dying, or broken branches. Do not prune for shape.
- B. Prune, thin, and shape trees and shrubs according to standard horticultural practice. Prune trees to retain required height and spread. Do not cut tree leaders; remove only injured or dead branches from flowering trees. Prune shrubs to retain natural character. Follow “Best Management Practices: Tree Pruning”, a companion publication to ANSI A300 Part 1. Only ISA certified arborist may prune city trees.

3.04 GROUND COVER AND PLANT PLANTING

- A. Set out and space ground cover and plants as indicated on plant legend.
- B. Dig holes large enough to allow spreading of roots and backfill with planting soil.
- C. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
- D. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
- E. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.05 PLANTING BED MULCHING

- A. Install weed-control barriers before mulching according to manufacturer's written instructions. Completely cover area to be mulched, overlapping edges a minimum of 6 inches. Tape or pin seams as recommended by manufacturer.
- B. Mulch backfilled surfaces of planting beds and other areas indicated. Provide mulch ring around trees in lawn areas.
 - 1. Organic Mulch: Apply 3-inch average thickness of mulch, and finish level with adjacent finish grades. Do not place mulch against plant stems.

3.06 PLANT MAINTENANCE

- A. Tree and Shrub Maintenance: Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, restoring planting saucers, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.
- B. Ground Cover Maintenance: Maintain and establish plantings by watering, weeding, fertilizing, mulching, and other operations as required to establish healthy, viable plantings.
- C. Protect exterior trees and shrubs from damage due to lawn maintenance equipment, landscape operations, operations by other CONTRACTORS and trades, and others. Maintain protection during installation and maintenance periods. Treat,

repair, or replace damaged plantings.

PART 4 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.01 METHOD OF MEASUREMENT:

A. Standard Items:

1. 02490.0X TREE INSTALLATION – TREE TYPE Y

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of trees planted (EA).

2. 02490.10 TREE GRATE

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of tree grates installed (EA).

4.02 BASIS OF PAYMENT:

A. Standard Items:

1. 02490.0X TREE INSTALLATION – TREE TYPE Y

Payment will be made at the Contract Unit Bid price and will constitute full compensation for tree installation, including topsoil, mulch, staking, equipment, tools, supplies, grading, and incidentals necessary to complete the work. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

2. 02490.10 TREE GRATE

Payment will be made at the Contract Unit Bid price and will constitute full compensation for the tree grate and all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

END OF SECTION 02490

SECTION 02510 – GRAVEL ALLEY RESTORATION AND MAINTENANCE

PART 1 - GENERAL1.01 WORK INCLUDED:

The work covered in this section includes furnishing and installing recycled asphalt material meeting Grading W specifications, or approved equal, to all alleys identified in the Plans.

1.02 RELATED WORK:

- A. Section 01300 – Submittals
- B. Section 02110 – Clearing and Grubbing
- C. Section 02290 – Watering
- D. Section 02519 – Crushed Aggregate Base Course
- E. Section 02450 – Grading

1.03 RESPONSIBILITY FOR MATERIALS:

The CONTRACTOR shall be responsible for all such material furnished by him.

The CONTRACTOR shall be responsible for the safe storage of material furnished by him or to him and accepted by him and intended for the work.

1.04 SUBMITTALS:

Submittals shall be in accordance with Section 01300 and these specifications.

PART 2 - PRODUCTS2.01 SURFACING:

- A. Recycled Asphalt Or Asphalt/Concrete Mixture Meeting Grading W: Gravel surfacing within the alleys identified in the Plans shall conform to Section 02519. Surfacing shall be recycled asphalt or asphalt/concrete mixture meeting Grading W, or approved equal.

PART 3 - EXECUTION3.01 TIMING OF WORK

- A. All work associated with gravel alley restoration shall be completed prior to any other work items related to the alleys, including use in temporary access and traffic control plans.

3.02 CLEARING & GRUBBING

- A. All grass, weeds, shrubs, trees and tree limbs less than 6" in diameter shall be removed from the alley travel way surface, as directed by the ENGINEER.

3.03 EXCAVATION

- A. The existing gravel alley surfacing shall be excavated to a minimum depth of 6". The material shall not be used for replacement of alley surfacing, but if suitable as determined by the ENGINEER, may be used as fill for other portions of the project.

3.04 SURFACE PREPARATION AND PLACEMENT OF MATERIAL:

- A. The excavated ground shall be scarified to a minimum depth of 6", moisture conditioned and compacted to provide a solid surface for installation of the recycled asphalt or asphalt concrete mixture. No surface material shall be placed upon a frozen, muddy, yielding, or rutted sub-grade or gravel surface. Material shall be deposited in a uniform manner approved by the ENGINEER to ensure the required plan thickness of the course following spreading and compaction.
- B. The material shall be placed such that the compacted finished cross-section of the surface shall have an inverted-crown shape. The cross slopes shall be directed down towards the centerline only to the extent necessary to direct flow to the centerline and away from the sides of the alley.

3.05 COMPACTION:

- A. If the required compacted depth of any aggregate surfacing course exceeds 6 inches, it shall be constructed in two or more layers of approximate equal thickness; not to exceed 6 inches.

The material shall be deposited and spread in a uniform layer, with no segregation of size. If segregation occurs, it will be rejected and removed/replaced by the CONTRACTOR at no additional cost.

- B. Watering and Rolling: Watering and rolling necessary to obtain the required compaction will not be paid for separately but will be considered incidental and included in the payment for the various classes of aggregate.

Compaction shall achieve a minimum density of 95% of maximum density per ASTM D698. The moisture content will be within 3% of optimum, and the surface shall be stable with no soft spots.

The surface of each layer shall be maintained during the compaction operations in such a manner that a uniform texture and surface is produced and the aggregates firmly keyed. Water shall be uniformly applied over the materials during compaction in the amount necessary for proper consolidation.

Testing may be accomplished using a nuclear gage in accordance with ASTM D2922. The gage shall be calibrated in accordance with the annex of ASTM D2922.

Use of ASTM D2922 results in a wet unit weight, and when using this method, ASTM D3017 shall be used to determine the moisture content of the material. The gage shall be calibrated in accordance with the annex of ASTM D2922.

C. In no case shall the addition of thin layers of material be added to the top layer of crushed base to meet grade. If the top layer is $\frac{3}{4}$ -inch or more above or below grade from the profile elevation, the top layer shall be scarified to a depth of at least 3-inches, new material added or removed, and the layer shall be blended and re-compacted to bring it to grade.

3.06 RESTRICTIONS:

In addition to the restrictions imposed by Federal, State, County, and City law on hauling vehicles, including weight restrictions, the CONTRACTOR shall restrict the speed of the hauling units and the weight of loads as he deems necessary to prevent damage to the subgrade, base, surface courses, or public thoroughfares used.

3.07 SURFACE SMOOTHNESS:

The surface of the aggregate when finished, shall not vary more than 2 inches when the maximum gradation is 1-1/2 inches or less but greater than $\frac{3}{4}$ -inch; and by more than 1-inch when the maximum gradation is $\frac{3}{4}$ -inch or under. These smoothness tolerances are when testing with a 10-foot straightedge placed on the surface, parallel to the centerline, the maximum deviation of the surface from the plane of the straightedge shall not exceed the above figures.

The surface elevation shall also be within 0.1' of its existing position in all locations or as directed in the field by the ENGINEER.

3.08 PROTECTION:

Hauling equipment may be routed over completed portions of the base course, provided no damage results and provided that such equipment is routed over the full width of the base course to avoid rutting or uneven compaction. Any rutting, soft spots, or damage to subgrade or aggregate courses shall be repaired by the CONTRACTOR at his expense, to the satisfaction of the ENGINEER.

3.09 MAINTENANCE:

The CONTRACTOR shall perform all maintenance work necessary to keep the base course in a condition satisfactory throughout the duration of the project. The surface shall be kept clean and free from foreign material. The base course shall be properly drained at all times. If cleaning is necessary, or if the graded surface becomes disturbed, any work or restoration necessary shall be performed at the expense of the CONTRACTOR.

3.10 THICKNESS CONTROL

The completed thickness of the base course shall be within 0.05-foot of the design thickness. Four determinations of thickness shall be made for each lot of material placed. The lot size shall be consistent with that specified in paragraph 3.11B. Each lot shall be divided into four equal sub lots. One test shall be made for each sub lot. Sampling locations will be determined by the ENGINEER on a random basis in accordance with procedures contained in ASTM D3665. Where the thickness is deficient by more than 0.05-foot, the CONTRACTOR shall correct such areas at no additional cost by excavating to the required depth and replacing with new material. Additional test holes may be required to identify the limits of deficient areas.

3.11 MATERIALS TESTING

A. Quality Assurance: ENGINEER may perform the following tests:

1. Compaction tests on a random basis on the completed crushed base.
2. Surface tolerance tests.
3. Determination of thickness (with CONTRACTOR responsible for excavating the holes).

B. Quality Control: Compaction tests shall be made by a qualified testing laboratory employed by the CONTRACTOR and approved by the ENGINEER.

Recycled asphalt or asphalt/concrete mixture shall be accepted for density on a lot basis consisting of 250 square yards.

Each lot will be divided into two equal sub lots. One density test will be made for each sub lot. Sampling locations will be determined by the ENGINEER on a random basis in accordance with ASTM D3665.

CONTRACTOR shall also provide all labor and equipment to excavate holes for determination of thickness, including backfilling and compaction after measurements have been taken by the ENGINEER, at no additional cost.

In addition to the initial aggregate submittal, CONTRACTOR shall also submit progress gradations as material is delivered to the project. One gradation shall be taken per 250 square yards of material placed (per lift).

PART 4: METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.01 METHOD OF MEASUREMENT

A. Standard Items:

1. 02510.10000 -GRAVEL ALLEY RESTORATION AND MAINTENANCE

This item shall be measured in the field with the quantity for payment determined by the actual number of square yards (SY) (corresponding to neat lines as defined by the ENGINEER) of existing alley excavated to a minimum depth of 6", backfilled with crushed aggregate base course, recycled asphalt or concrete pavement/asphalt mix as approved by the ENGINEER, shaped, proof-rolled and compacted, and maintained throughout construction.

4.02 BASIS OF PAYMENT

A. Standard Items

1. 02510.10000 - GRAVEL ALLEY RESTORATION AND MAINTENANCE

Payment for this item shall constitute full compensation for excavating and hauling existing surfacing off-site, scarifying sub base, importing crushed aggregate base course, recycled asphalt or concrete pavement/asphalt mix, moisture conditioning, water, haul, compaction, proof rolling, and quality control testing. Price shall also include all costs to cover materials, labor, equipment, tools, quality control testing, and incidentals to complete the work in accordance with the Contract Documents.

END OF SECTION 02510

PART 1 - GENERAL

1.01 WORK INCLUDED:

The work covered by this Section of the Specifications consists of furnishing all materials, labor, equipment and incidentals for the construction of crushed aggregate base course or surfacing course for streets, alleys and parking areas or other paved areas, to the lines, grades and dimensions as shown in the Plans and in accordance with the Specifications.

1.02 RELATED WORK:

- A. Section 02060 - Temporary Traffic Control
- B. Section 02290 - Watering
- C. Section 02450 - Grading
- D. Section 02525 - Asphalt Pavement
- E. Section 03010 - Concrete Work
- F. Section 03020 - Concrete Curb and Gutter
- G. Section 03030 - Concrete Sidewalks, Approaches, Fillets, and Valley Gutters
- H. Section 03040 - Portland Cement Concrete Pavement

1.03 DEFINITIONS:

Crushed Aggregate Base Course is defined as an untreated crushed aggregate material placed on a prepared subgrade. Crushed Aggregate Base Course shall include untreated aggregate for base courses, cushion or level courses, and top surfacing courses.

1.04 QUALITY CONTROL/ASSURANCE:

Contractor will engage soil testing/inspection service acceptable to the ENGINEER for quality control testing during construction per Section 01400. Contractor's testing laboratory shall provide ENGINEER with copies of all test reports within 24 hours of tests. In-place quality control density testing shall be completed in accordance with ASTM D2922 and ASTM D3017 or ASTM D1556. Also see Part 3 of this Section.

Allow testing service to inspect and ENGINEER to approve subgrade and fill layers before further construction work is performed.

OWNER may provide quality assurance testing as they determine necessary. CONTRACTOR shall provide safe access to construction areas at all times for OWNER testing. All failed tests shall be paid for by the CONTRACTOR

If, based on the test results by either the OWNER or CONTRACTOR and inspection of the work, the ENGINEER determines subgrade or fill is below the specified density or moisture content, the CONTRACTOR shall provide additional compaction or watering and blending of material, at no additional cost.

In addition to compaction testing, the CONTRACTOR shall use its loaded trucks and other heavy equipment to proof-roll the base course in accordance with Subsection 3.09C of this Section. Any soft spots shall be dug out and replaced.

1.05 SUBMITTALS:

- A. Test Reports: CONTRACTOR will test materials and submit one copy of the results to the ENGINEER within 24 hours for the following (unless the project Special Provisions say quality control testing is provided by the OWNER):
1. Field test reports, including for density and moisture content.
 2. One optimum moisture/density curve for each source of material, performed in accordance with ASTM D698.
 3. One sieve analysis and Atterberg Limits and aggregate properties analysis per source tested in accordance with ASTM C136, ASTM C117 and ASTM D4318.
- B. Certificates of Compliance: CONTRACTOR shall submit Certificates of Compliance for all aggregates showing that the materials will comply with these Specifications before any materials will be approved for use.

1.06 PRODUCT HANDLING:

- A. Sufficient trucks will be utilized to assure a continuous operation with consideration given to distance of haul and traffic conditions.
- B. Delivery shall be made with the least possible impedence to normal flow of traffic and, when necessary, the CONTRACTOR will supply flagmen and/or traffic control devices consistent with state law and the Manual on Uniform Traffic Control Devices (MUTCD), latest edition.

PART 2 - PRODUCTS

2.01 AGGREGATES:

Aggregates shall be crushed and free of organic or vegetative matter, clay balls, frozen lumps, or other extraneous matter and shall conform to the specifications and grading for the various classes required.

Aggregate material shall be furnished by the CONTRACTOR and the gradation of the crushed material shall meet the requirements of the gradations given in the following table, when tested in accordance with ASTM C117 and C136.

AGGREGATE GRADATION CHART

SIEVE DESIGNATION (SQUARE OPENINGS)	PERCENTAGE BY WEIGHT PASSING SIEVES
1½"	100
1"	90 – 100
¾"	-----
½"	60 – 85
No. 4	45 – 65
No. 8	33 – 53
No. 40	----- *
No. 200	3 – 12

Coarse aggregate shall consist of hard, durable particles or fragments of stone or gravel. Materials that break up when alternately frozen and thawed or wetted and dried shall not be used. At least 50% of the material by mass retained on the No. 4 (4.75 mm) sieve shall have at least one fractured face. Unless otherwise specified, the coarse aggregate shall have a percentage of wear of not more than 50 as per ASTM C131.

Fine aggregate shall consist of crushed stone, crushed gravel, or natural sand.

*The fraction passing the #200 sieve shall not be greater than two-thirds of the fraction passing the #40 sieve. The liquid limit shall not be greater than 25 and a plasticity index not greater than 6 except that, when the plasticity index is non-plastic (NP), the liquid limit shall not be more than 30 when tested in accordance of ASTM D4318.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION:

- A. No surface material shall be placed upon a frozen, muddy, yielding, or rutted sub-grade or gravel surface. Material shall be deposited in a uniform manner approved by the ENGINEER to ensure the required plan thickness of the course following spreading and compaction.

3.02 COMPACTION:

- A. If the required compacted depth of any aggregate surfacing course exceeds 6 inches, it shall be constructed in two or more layers of approximate equal thickness; not to exceed 6 inches. The material shall be deposited and spread in a uniform layer, with no segregation of size.
- B. Watering and Rolling: Watering and rolling necessary to obtain the required compaction will not be paid for separately but will be considered incidental and included in the payment for the various classes of aggregate.

Compaction shall achieve a minimum density of 95% of maximum density per ASTM D698. The moisture content will be within 3% of optimum, and the surface shall be stable with no soft spots, prior to placing asphalt or concrete.

The surface of each layer shall be maintained during the compaction operations in such a manner that a uniform texture and surface is produced and the aggregates firmly keyed. Water shall be uniformly applied over the materials during compaction in the amount necessary for proper consolidation.

Testing may be accomplished using a nuclear gage in accordance with ASTM D6938. The gage shall be calibrated in accordance with the annex of ASTM D6938.

- C. In no case shall the addition of thin layers of material be added to the top layer of crushed base to meet grade. If the top layer is ½-inch or more above or below grade from the profile elevation, the top layer shall be scarified to a depth of at

least 3-inches, new material added or removed, and the layer shall be blended and re-compacted to bring it to grade.

3.03 RESTRICTIONS:

In addition to the restrictions imposed by Federal, State, County, and City law on hauling vehicles, including weight restrictions, the CONTRACTOR shall restrict the speed of the hauling units and the weight of loads as he deems necessary to prevent damage to the subgrade, base, surface courses, or public thoroughfares used. Except truck traffic shall be used to locate soft spots in the subgrade and base course.

3.04 SURFACE SMOOTHNESS:

The surface of the aggregate when finished, shall not vary more than $\frac{3}{4}$ -inch when the maximum gradation is 1-1/2 inches or less but greater than $\frac{3}{4}$ -inch; and by more than $\frac{1}{2}$ -inch when the maximum gradation is $\frac{3}{4}$ -inch or under. These smoothness tolerances are when testing with a 10-foot straightedge placed on the surface, parallel to the centerline, the maximum deviation of the surface from the plane of the straightedge shall not exceed the above figures.

The surface elevation shall also be within 0.05' of its design position in all locations. It shall also allow the asphalt and concrete to be placed to the elevations, grade, thickness and crown required by the Specifications.

3.05 PROTECTION:

Hauling equipment may be routed over completed portions of the base course, provided no damage results and provided that such equipment is routed over the full width of the base course to avoid rutting or uneven compaction. Any rutting, soft spots, or damage to subgrade or aggregate courses shall be repaired by the CONTRACTOR at his expense, to the satisfaction of the ENGINEER.

3.06 MAINTENANCE:

- A. If asphalt pavement is to be placed over the base course as a part of the contract, the CONTRACTOR shall perform all maintenance work necessary to keep the base course in a condition satisfactory for priming and/or paving. The surface shall be kept clean and free from foreign material. The base course shall be properly drained at all times. If cleaning is necessary, or if the graded surface becomes disturbed, any work or restoration necessary shall be performed at the expense of the CONTRACTOR.
- B. Before preparations begin for the application of a surface treatment or for a surface course, the base course shall be allowed to partially dry until the average moisture content of the full depth of base is less than 80 percent of the optimum moisture of the base mixture. The drying shall not continue to the extent that the surface of the base becomes dusty with consequent loss of binder. If during the curing period the surface of the base dries too fast, it shall be kept moist by sprinkling. The base course must be stable as final surfacing is placed.

3.07 ENGINEERING FABRIC

Engineering fabric shall be installed where shown in the Plans or requested by the ENGINEER. It shall be installed per the manufacturer's recommendations, with a minimum of 2 feet overlap per roll. The fabric shall be laid without wrinkles or folds and this condition shall be maintained during the placement of the base course. Engineering fabric shall be in accordance with Section 02895.

3.08 THICKNESS CONTROL

The completed thickness of the base course shall be within 0.05-foot of the design thickness. Four determinations of thickness shall be made for each lot of material placed. The lot size shall be consistent with that specified in Subsection 3.09B in this Section. Each lot shall be divided into four equal sublots. One test shall be made for each sublot. Sampling locations will be determined by the ENGINEER on a random basis in accordance with procedures contained in ASTM D3665. Where the thickness is deficient by more than 0.05-foot, the CONTRACTOR shall correct such areas at no additional cost by excavating to the required depth and replacing with new material. Additional test holes may be required to identify the limits of deficient areas.

3.09 MATERIALS TESTING

A. Quality Assurance: ENGINEER may perform the following tests:

1. Compaction tests on a random basis on the completed crushed base.
2. Surface tolerance tests.
3. Determination of thickness (with CONTRACTOR responsible for excavating the holes).

B. Quality Control: Compaction tests shall be made by a qualified testing laboratory employed by the CONTRACTOR and approved by the ENGINEER.

Crushed base shall be accepted for density on a lot basis consisting of 500 square yards.

Sampling locations will be determined by the ENGINEER on a random basis in accordance with ASTM D3665.

CONTRACTOR shall also provide all labor and equipment to excavate holes for determination of thickness, including backfilling and compaction after measurements have been taken by the ENGINEER.

In addition to the initial aggregate submittal, Contractor shall also submit progress gradations as material is delivered to the project. One gradation shall be taken per 250 cubic yards of material placed.

Compaction tests taken for crushed base under curb and gutter shall be taken at a minimum of one density test per 300 linear feet.

Compaction tests taken for crushed base under sidewalk shall be taken at a minimum of one density test per 1,200 square feet.

Should conditions become present following a passing compaction test that cause a change in the conditions of the compacted crushed aggregate base course (such as precipitation from a storm event) prior to the placement of a subsequent lift or section, then the area(s) shall be re-tested, at the ENGINEER'S discretion, to confirm adequate compaction. These additional tests shall be performed at no additional cost.

C. Compacted satisfactory base course shall further be determined by proof-rolling with equipment approved by the ENGINEER prior to use. Proof-rolling equipment shall be a loaded 10-wheel, tandem-axel dump truck or similar piece of equipment having pneumatic tires and weighing not less than 15 tons. Each succeeding pass of the proof-roller over the roadbed shall be offset by not greater than one tire width. Limit vehicle speed to 3 mph.

Excavate soft spots and areas of excessive pumping or rutting, as determined by ENGINEER, and replace with compacted material as directed.

3.10 PROTECTION FOR AGGREGATE

A. The equipment and methods utilized in the production, storage, transportation and final placement of aggregate materials shall be such as to provide in-place materials meeting all requirements as specified.

3.11 STOCKPILED AGGREGATE

A. This work shall consist of storing aggregate material which will be used in construction projects in accordance with these Specifications as locations shown in the Plans, noted in the Contract Documents, or as otherwise designated by ENGINEER.

B. The aggregates shall meet applicable parts of this Section for the type of material required.

C. Sites for aggregate stockpiles shall be grubbed and cleaned prior to storing aggregates, and the site shall be firm, smooth, and well drained. A bed of aggregate suitable to avoid the inclusion of soil or foreign material shall be maintained.

D. The stockpiles shall be built in layers not exceeding four feet in height, with layers built to prevent segregation. The material shall be deposited in such manner as to prevent coning, except in the case of fine aggregate composed of material approximately 90% finer than a #4 sieve.

E. Dumping, casting, or pushing over sides of stockpiles is prohibited except in the case of fine aggregate materials.

F. Stockpiles of different types or sizes of aggregates shall be spaced far enough apart or separated by suitable walls or partitions to prevent the mixing of the aggregates.

G. Any stockpiling of materials derived by wet pit or dredging operations, other than those stockpiles previously mentioned, are subject to prior approval of ENGINEER and must be specified and submitted in the CONTRACTOR's plan of operations.

H. When it is necessary to operate trucks or other equipment on the stockpile in the process of building that stockpile, it should be done in a manner approved by ENGINEER. Any method of stockpiling aggregate that allows the stockpile to become contaminated with foreign matter or causes excessive degradation of the aggregate will not be permitted. Excessive degradation will be determined by sieve tests of samples taken from any portion of the project (stockpiles or point of acceptance) over which equipment has operated. Failure of such samples to meet all grading requirements for the aggregate shall be considered cause for discontinuance of such stockpiling or placement procedures.

I. The aggregate shall be transferred from the stockpiles in such a way as to obtain a material having a uniform grading.

PART 4 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.01 METHOD OF MEASUREMENT:

A. Standard Items:

1. 02519.05 CRUSHED AGGREGATE BASE COURSE

This item shall be measured by the number of compacted cubic yards (CY) of crushed aggregate base course placed, based upon the neat lines defined in the Plans.

2. 02519.10 CRUSHED AGGREGATE BASE COURSE - X"

This item shall be measured by the number of square yards (SY) of ___ inch (___") thick crushed aggregate base course placed, based upon the neat lines defined in the Plans.

4.02 BASIS OF PAYMENT:

A. Standard Items:

3. 02519.05 CRUSHED AGGREGATE BASE COURSE

Payment shall constitute full compensation for all investigations, quality control testing to determine suitability for use, haul, placing, permits, water, compaction and all pit reclamation required. Price will also include all costs to cover labor, equipment, tools and incidentals to complete the work in accordance with the contract documents.

4. 02519.10 CRUSHED AGGREGATE BASE COURSE – X"

Payment shall constitute full compensation for all investigations, quality

control testing to determine suitability for use, haul, placing, permits, water, compaction and all pit reclamation required. Price will also include all costs to cover labor, equipment, tools and incidentals to complete the work in accordance with the contract documents.

END OF SECTION 02519

PART 1 - GENERAL

1.01 DESCRIPTION:

The work covered by this Section of the Specifications covers preparation and overlaying of areas or portions of areas with asphalt pavement as shown in the Plans or as directed by the ENGINEER. Refer to the Special Provisions for specific requirements of the Project.

1.02 RELATED WORK:

- A. Section 02060 - Temporary Traffic Control
- B. Section 02519 - Crushed Aggregate Base Course
- C. Section 02450 - Grading

1.03 SUBMITTALS:

- A. Certificates: Submit certificates of compliance with Specifications for all asphalt material and aggregates signed by material producer and CONTRACTOR.

1.04 PRODUCT HANDLING:

- A. Delivery and Asphaltic Mixture: The mixture shall be delivered to the area to be paved in such a manner that the temperature at the time of discharging into the paver will not be less than that hereinafter specified.

Each truck shall be capable of being equipped with a cover of canvas or other suitable material of such size as to prevent unnecessary heat loss and to protect the mixture from the weather. Any loads wet excessively by rain will be rejected. Trucks shall have tight, clean, smooth metal beds, coated with an approved material to prevent adhesion of the mix to the truck bed.

Deliveries shall be made so that spreading and rolling of all the mixture prepared for a day's run can be completed during daylight, unless adequate and Engineer approved artificial light is provided.

Delivery shall be made with the least possible impedance to normal flow of traffic and, when necessary, the CONTRACTOR will supply flagmen and/or traffic control devices consistent with State law and the Manual on Uniform Traffic Control Devices (MUTCD), latest edition.

1.05 SCHEDULING OF WORK:

The CONTRACTOR shall work with the ENGINEER to schedule the work covered in this Section to minimize inconvenience to the OWNER's operation on the site. The CONTRACTOR's schedule shall be approved by the ENGINEER.

PART 2 - PRODUCTS

2.01 BITUMINOUS MATERIALS

A. Work Included:

The work covered by this Section of the Specifications consists of the application of bituminous materials needed for the tacking of asphalt pavement and mixing of the asphalt cement as specified herein and indicated in the Plans.

B. Submittals:

1. **Certificates of Compliance:** Samples of the bituminous materials that the CONTRACTOR proposes to use, together with a statement as to their source and character, shall be submitted and approval obtained before use of such materials begins.

The CONTRACTOR shall furnish vendor's certified test reports for each tanker, or equivalent, of bitumen when delivered to the project. The report shall be delivered to the ENGINEER before permission is granted for use of the material. The furnishing of the vendor's certified test report for the bituminous material shall not be interpreted as a basis for final acceptance. All such test reports shall be subject to verification by testing sample materials as received on the project. Samples of bituminous materials shall be obtained by the CONTRACTOR in the presence of the ENGINEER from each tanker when delivered to the project.

2. **Freight and Weight Bills:** Certified copies of all freight bills and weight bills shall be furnished to the ENGINEER during the progress of the work for each tanker and trailer when delivered to the project if requested. The CONTRACTOR shall provide the ENGINEER full opportunity to verify delivered quantities prior to distribution and prior to any tanker or trailer leaving the project.

C. Product Handling:

1. The bituminous materials shall be delivered to the area to be surfaced in such manner that the temperature at the time of application will not be less than that hereinafter specified.
2. Sufficient trucks will be utilized to assure a continuous operation with consideration given to distance of haul and traffic conditions.
3. Delivery shall be made with the least possible impedance to normal flow of traffic and, when necessary, the CONTRACTOR will supply flagmen and/or traffic control devices consistent with State law and the MUTCD.

D. Materials and Quantities:

1. Bituminous Materials: The bituminous materials used for the project shall comply with the following table, and as called out in the Special Provisions.

The approximate amounts of materials per square yard and the application temperatures for the bituminous surface treatment shall be as shown in the following table, or as modified in the Special Provisions.

MATERIALS	SPECIFICATION	AMOUNTS	APPLICATION TEMPERATURES	USE
Cutback Asphalt, MC-70	AASHTO M81, M82, M141	0.25 – 0.5 Gal/S.Y.	80° – 150° F.	Prime Coat
Emulsified Asphalt SS-1, CSS-1, SS-1h, or CSS-1h	(Anionic) AASHTO M140 Modification (Cationic) AASHTO M208 Modification	0.05 – 0.10 Gals./S.Y.	75° – 130° F	Tack Coat
PG 64 – 22	---	To be determined by Contractor's job-mix formula	To be determined by Contractor's job-mix formula	Hot Plant Mix Bituminous Pavement

F. Weather Limitations:

Aggregate shall be clean and dry for AC, MC & SS-1 applications. The surface on which pavement is to be placed shall be free of surface moisture or any condition that prevents proper handling, compaction, or finishing during the CONTRACTOR'S operating periods.

The bottom lift of any bituminous material shall not be placed when the atmospheric temperature is less than 40° F and rising. The top lift of any bituminous material shall not be placed when the atmospheric temperature is less than 50°F and rising. The Engineer may require the CONTRACTOR to delay the application of bituminous material until the atmospheric and pavement surface conditions are satisfactory. No bituminous material shall be placed which cannot be cared for during daylight hours.

G. Equipment and Organization:

Each unit required in the execution of these Specifications shall be under the continuous supervision of a competent superintendent thoroughly experienced in this type of work. Experienced operators will be required on all equipment used in hauling and applying bituminous material and aggregates.

All equipment necessary to perform this work properly shall be on the project, in proper working condition, and proved capable of by placing of test strips, whenever requested by the ENGINEER.

H. Application of Bituminous Material:

Bituminous material shall be applied upon the properly prepared surface at the rate and temperature specified using the pressure distributor to obtain uniform distribution at all points. To insure proper drainage, the strips shall begin along the centerline of the pavement on a crowned section or on the high side of the pavement with a one-way slope. During all applications, the surfaces of manhole castings, valve boxes, and adjacent structures shall be protected in such manner as to prevent their being spattered or marred. Bituminous materials shall not be discharged into borrow pits, curb and gutter, or valley gutters. Any bituminous material discharged onto these areas shall be removed by the CONTRACTOR at his or her expense.

2.02 OTHER MATERIALS:

A. Hot Plant Mix Bituminous Pavement:

1. Aggregate: The aggregate shall be supplied by the CONTRACTOR.

The aggregate shall consist of crushed stone, crushed gravel, or sharp-edged natural sand with or without other inert finely divided particles, free from clay balls, organic matter, and other deleterious substances. Reclaimed Asphalt Pavement (RAP) will be permitted for use providing that all mixture properties are maintained. The aggregates shall not contain more than 8 percent, by weight, of flat or elongated pieces. The crushed aggregate shall have a percentage of wear of not more than 40, and a sulfate soundness loss of not more than 12 percent, and shall be non-plastic.

All reference to coarse aggregate is that portion retained on the No. 4 sieve. The crushing of the aggregate shall result in a product in which the coarse aggregate (retained on the No. 4 sieve) shall have 100 percent by weight of particles with one or more fractured faces.

The fine aggregate, including any blended filler, shall have a liquid limit and a plasticity index of not more than 25 and 6 respectively when tested in accordance with ASTM D-4318.

2. Filler: If filler, in addition to that naturally present in the aggregate, is necessary, it shall consist of stone dust, loess, Portland cement, or other approved mineral matter. Filler shall not exceed 15% of the total aggregate. The filler shall meet the requirements of AASHTO M17.
3. Bituminous material: The type, grade, controlling specification, and mixing temperature for the bituminous material is identified in Subsection 2.01 of this Section
4. Composition of mixtures: The bituminous plant mix shall be composed of a mixture of aggregate, filler if required, and bituminous material. The several aggregate fractions shall be sized, uniformly graded, and combined in such proportions that the resulting mixture meets the grading requirements of the job-mix formula. The mix shall be designed by the

Marshall Method in accordance with the most current edition of the Asphalt Institute MS-2 Manual and shall meet the following requirements:

AASHTO T245	
Number of blows each side of specimen	50
Stability (min)	1,500 (min.)
Flow (hundredths of an inch)	8 - 14
Asphalt Content	4 - 7
Percent voids	3 to 5
Percent void in mineral aggregate (VMA)	See Note Below

Note: For ¾-inch nominal particle size: Minimum VMA is 13%
 For ½-inch nominal particle size: Minimum VMA is 14%

If the tensile strength ratio of the specimens of composite mixture, as determined by AASHTO T283 is less than 75, the aggregates shall be rejected or the asphalt shall be treated with an approved antistripping agent. The amount of antistripping agent added to the asphalt shall be sufficient to produce a tensile strength ratio of not less than 75. If an antistripping agent is required, it will be provided by the CONTRACTOR at no additional cost.

5. Job mix formula: At least thirty (30) days prior to the time the CONTRACTOR expects to begin paving operations, he shall submit for the ENGINEER'S approval, a job-mix formula for each mixture to be supplied for the project. **The job mix formula shall be within the master range specified.** The allowable tolerances will be applied to the job mix formula. The job-mix formula for each mixture shall be in effect until modified by the ENGINEER. The job-mix formula for each mixture shall establish a single percentage aggregate passing each require sieve size and a single mixing temperature. The percentage of bituminous material to be added will also be designated by the job-mix design.

The gradations in Table 1, shown on the following page, represent the limits that shall determine suitability of aggregate for use from the sources of supply. The job-mix gradation shall be within the limits designated in the Table, shall be well graded from coarse to fine, and shall not vary from the low limit on one sieve to the high limit on the adjacent sieves, or vice versa.

The bituminous content of the mixture shall be calculated on the percentage basis by weight of the total mix. The gradation of the aggregate for the Hot Plant Mix Bituminous Pavement shall be as specified in Table 1, for the maximum size as called out in the Special Provisions.

TABLE 1
HOT PLANT MIX BITUMINOUS PAVEMENT

Sieve Sizes (Square Openings)	½ - Inch Maximum Total Percent Passing (By Weight)	¾ - Inch Maximum Total Percent Passing (By Weight)
1¼"	-----	-----
1"	-----	100
¾"	100	90-100
½"	90-100	60-85
⅜"	55-90	45-85
No. 4	35-70	30-65
No. 8	20-55	20-50
No. 30	5-35	5-30
No. 200	2-7	2-7

After the job mix formula is established all mixtures furnished for the project shall conform thereto with the following tolerances:

Passing No. 4 and larger sieves	± 5%
Passing No. 8	± 5%
Passing No. 200	± 2%
Asphalt Content	± 0.5%
Mixing Temperatures	± 20°F
Stability	>1500
Flow hundredths of an inch	8 - 16
Air Voids	2.5 - 5
VMA (1/2")	12 - 16
VMA (3/4")	11 - 15

Should changes in sources of materials be made, a new job-mix formula shall be established before the new material is used. When unsatisfactory results or other conditions make it necessary, the ENGINEER may require that a new job-mix formula be submitted at the CONTRACTOR'S expense.

The combined mineral aggregate for the asphalt pavement shall be of such size that the percentage composition by weight, as determined by laboratory sieves, will conform to the appropriate gradation in Table 1, when tested in accordance with ASTM C117 and ASTM C136 or ASTM D5444. The percent of weight for the bituminous material shall be within the limits specified.

2.03 BITUMINOUS MIXING PLANT:

- A. Mixing plants shall be of sufficient capacity and coordinated to adequately handle the proposed bituminous construction but not less than capable of producing 100 tons per hour.
1. Plant scales: Scales shall be accurate to 0.5 percent of the maximum load. Poises shall be designed to be locked in any position to prevent unauthorized change of position. In lieu of plant and truck scales, the CONTRACTOR may provide an approved automatic printer system to print the weights of the material delivered, provided the system is used in conjunction with an approved automatic batching and mixing control system. Such weights shall be evidenced by a weigh ticket for each load. Scales shall be independently inspected and certified for accuracy and sealed as often as the ENGINEER may deem necessary.
 2. Equipment for preparation of bituminous material: Tanks for the storage of bituminous material shall be equipped to heat and hold the material at the required temperatures. Heating shall be accomplished by approved means so that flames will not contact the tank. The circulating system for the bituminous material shall be designed to assure proper and continuous circulation during the operating period. Provisions shall be made for measuring quantities and for sampling the material in the storage tanks.
 3. Feeder for drier: The plant shall be provided with accurate mechanical means for uniformly feeding the aggregate into the drier to obtain uniform production and temperature.
 4. Drier: The plant shall include a drier(s) that continuously agitates the aggregates during the heating and drying process. The moisture content of the bituminous mixture at the discharge from the mixer shall not exceed 0.5%.
 5. Screens: Plant screens, capable of screening all aggregates to the specified sizes and proportions, and having normal capacities in excess of the full capacity of the mixer, shall be provided.
 6. Bins: The plant shall include storage bins of sufficient capacity to supply a mixer operating at full capacity. Bins shall be arranged to assure separate and adequate storage of appropriate fractions of the mineral aggregates. When used, separate dry storage shall be provided for filler or hydrated lime, and the plant shall be equipped to feed such material into the mixer. Each bin shall be provided with divider boards of such size and at such location to prevent overflow of material into other compartments or bins. Each compartment shall be provided with its individual outlet gate to prevent leakage. The gates shall cut off quickly and completely. Bins shall be constructed so that samples may be obtained readily. Bins shall be equipped with adequate tell-tale devices which indicate the position of the aggregates in the bins at the lower quarter points.
 7. Thermometric equipment: An armored thermometer of adequate range shall be placed in the bituminous feed line at a suitable location near the

charging valve of the mixer unit. The plant shall also be equipped with an approved thermometric instrument placed at the discharge chute of the drier to indicate that temperature of the heated aggregates. The ENGINEER may require replacement of any thermometer by an approved temperature-recording apparatus for better regulation of the temperature of aggregates.

8. Dust collector: The plant shall be equipped with a dust collector to waste or return uniformly to the hot elevator all or any part of the material collected.
9. Safety requirements: Adequate and safe stairways to the mixer platform and sampling points shall be provided, and guarded ladders to other plant units shall be placed at all points where accessibility to plant operations is required. Accessibility to the top of truck bodies shall be provided by a suitable device to enable the ENGINEER to obtain samples and mixture temperature data. Means shall be provided to raise and lower scale calibration equipment, sampling equipment, and other similar equipment between the ground and the mixer platform. All gears, pulleys, chains, sprockets and other dangerous moving parts shall be thoroughly guarded. Ample and unobstructed passage shall be maintained at all times in and around the truck loading area. This area shall be kept free of drippings from the mixing platform. The CONTRACTOR shall comply with OSHA and other applicable Local, State, and Federal regulations and requirements.
10. If the CONTRACTOR elects to use Warm Mix Asphalt (WMA) systems, appropriate equipment shall be on the plant for either the foaming process to produce WMA or the additives necessary to do same.

B. Inspection of Plant: The OWNER or his authorized representative shall have access, at all times, to all parts of the paving plant for checking adequacy of equipment; inspecting operation of the plant; verifying weights, proportions and character of materials; and checking the temperatures maintained in the preparation of the mixtures.

2.04 EQUIPMENT:

A. The equipment used by the CONTRACTOR shall include a self-powered pressure bituminous material distributor, a paver and rolling equipment necessary to place and compact asphalt mixtures.

B. Distributor: Provide an asphalt distributor that is equipped, maintained, and operated to apply bituminous material uniformly at variable widths. Equip with a tachometer, pressure gauges, accurate volume measuring devices or a calibrated tank, a thermometer for measuring temperatures of tank contents, a power unit for the pump, full circulation spray bars capable of being adjusted laterally and vertically, and a positive cut-off for the spray bars. The distributor shall be designed, equipped, and operated so that bituminous material at even heat can be applied uniformly on variable widths of surface at readily controlled rates from 0.05 to 2.0 gallons per square yard. The material shall be applied within a pressure range from 25 to 75 pounds per square inch and with an allowable variation from any specified rate not to exceed 5 percent.

C. Asphalt Pavers: Asphalt pavers shall be self-contained, power-propelled units with an activated screed or strike-off assembly, heated as necessary. It shall be capable of spreading and finishing courses of asphalt plant mix material which will meet the specified thickness, smoothness and grade. For typical street widths, the paver shall have a screed of sufficient width capable of spreading the plant mix material to a width equal to 0.5' wider than the distance from the centerline to edge of roadway or lip of gutter.

The paver shall have a receiving hopper of sufficient capacity to permit a uniform spreading operation. The hopper shall be equipped with a distribution system to place the mixture uniformly in front of the screed. The screed or strike-off assembly shall effectively produce a finished surface of the required evenness and texture without tearing, shoving, or gouging the mixture.

1. Automatic grade and crown control: Machines shall be equipped with an electronically controlled, motor-operated screed that is capable of automatically controlling longitudinal grade and transverse slope of the leveling course during placing. The longitudinal control shall operate on both string line grade control and on the surface of previously placed paving lanes. The controls shall be so arranged that independent longitudinal grade controls can be operated simultaneously on both sides of the machine or single on either side. The electronic controls shall be arranged so that the machine can be operated with fully automatic, semi-automatic, partial-automatic and all manual control.

The automatic equipment shall be capable of controlling the grade to not less than plus or minus 1/8 inch and the transverse slope to not less than plus or minus 0.1 percent from the controlling grade.

When required by the ENGINEER, the machine shall be equipped with a leveling ski not less than 30 feet in length to be operated in connection with the automatic grade control.

2. Slope indicator: The machine shall be equipped with a slope indicator which will continuously indicate the average transverse slope of the screed.

D. Rollers: Rollers shall be in good condition, capable of reversing without backlash, and operating at low speeds to avoid displacement of the bituminous mixture. The number, type, and weight of rollers shall be sufficient to compact the mixture to the required density while the mixture is still in a workable condition. Excessive crushing of the aggregate will not be permitted. Rollers shall be equipped with scrapers and water spray bars to keep plant mix material from sticking to rollers. Only water or an ENGINEER approved agent will be used on any drum to prevent adhesion. Petroleum based products shall not be permitted for use. The rubber-tired rollers shall be self-propelled and consist of two axles, on which are mounted multiple pneumatic tired wheels, in such a manner that the rear group of wheels will not flow in tracks of the forward group, and will be spaced to give uniform coverage with each pass. The axle shall be mounted in a rigid frame, provided with a loading platform or body suitable for ballasting. The tires shall be smooth and shall be capable of being inflated to pressures between 40 and 90 pounds per square inch. Tire pressures should not vary by more than 5 psi

between individual tires. The roller shall be equipped with skirts to maintain the tire temperature.

Steel wheel rollers shall have a minimum weight of 8 tons and a unit compression of not less than 250 psi of the driving roll. The rate of travel shall not exceed 4 miles per hour.

Vibratory rollers shall be equipped with a variable amplitude and frequency system. The roller shall have vibratory drum with a minimum width of 60 inches. The vibrations of the drum shall be a minimum of 2000 vibrations per minute. The maximum rate of travel shall be 3 miles per hour.

PART 3 - EXECUTION

3.01 SUBGRADE AND LEVELING:

A. General: Prior to performing any work specified in this Section, the CONTRACTOR shall verify the nature and extent of areas designated in the Plans to be surfaced or overlaid. The CONTRACTOR shall use a stringline or other approved method to provide suitable controls for the paver. The CONTRACTOR shall coordinate the Work under this Section with the OWNER's operations on the site. Prior to paving, the top of the crushed base shall be proof-rolled. Proof-rolling equipment shall be a loaded 10-wheel, tandem-axel dump truck or similar piece of equipment having pneumatic tires and weighing not less than 15 tons. Each succeeding pass of the proof-roller over the crushed base shall be offset by not greater than one tire width. Limit vehicle speed to 3 mph.

Excavate soft spots and areas of excessive pumping or rutting, as determined by ENGINEER, and replace with compacted crushed aggregate base course as directed.

B. Prime Coat: Areas to be paved which are a 6% grade or greater, shall be primed prior to placing the first lift of asphalt pavement. Areas to receive prime coat are the more steeply sloped areas as identified by the ENGINEER during construction or any street with a grade of 6% or more.

1. Weather limitations: The prime coat shall be applied only when the existing surface is dry, when the atmospheric temperature is 40°F and rising. and when the weather is not foggy or rainy.
2. Application: Immediately before applying the prime coat, the full width of surface to be treated shall be swept with a power broom and otherwise cleaned as necessary to remove all loose dirt and other objectionable material.

The application of bituminous material shall meet the requirements in the table located in Subsection 2.1 of this Section.

Following the application, the surface shall be allowed to cure. This period may be modified by the ENGINEER depending upon job conditions. The CONTRACTOR shall not allow traffic on the bituminous material until it has

been absorbed by the surface and will not pick up. The surface shall be maintained by the CONTRACTOR until the first paving lift has been placed. Suitable precautions shall be taken by the CONTRACTOR to protect the surface against damage during this interval, including any sand necessary to blot up excess bituminous material.

All fixtures in the areas to be overlaid shall be protected during paving operations.

C. Tack Coat: The tack coat shall be applied between all lifts of asphalt and to all abutting pavement edges.

1. Weather limitations: The tack coat shall be applied only when the existing surface is dry, when the atmospheric temperature is above 40°F and rising, and when the weather is not foggy or rainy.
2. Application: Immediately before applying the tack coat, the full width of surface to be treated shall be swept with a power broom and otherwise cleaned as necessary to remove all loose dirt and other objectionable material.

The application of bituminous material shall be made by means of a pressure distributor at the pressure and in the amount of 0.03-0.05 gallons per square yard of diluted material as directed by the ENGINEER. Maintain pressure so that the application rate varies no more than two-hundredth of a gallon per square yard (0.02 gallons/SY).

Following the application, the surface shall be allowed to cure without being disturbed for such period of time as may be necessary to develop a tacky consistency. This period shall be determined by the ENGINEER. The area to which the tack coat is applied shall be no larger than can be paved during that day's work. The surface shall then be maintained by the CONTRACTOR until the next course has been placed. Suitable precautions shall be taken by the CONTRACTOR to protect the surface against damage during this interval, including any sand necessary to blot up excess bituminous material.

All fixtures in the areas to be overlaid shall be protected during paving operations.

D. Hot Plant Mix Bituminous Pavement: The asphalt pavement shall be placed to the grades as shown in the Plans.

1. Weather limitations: Place the asphalt pavement only when the prime coat or tack coat has cured, when the weather is not rainy and when:
 - a. The atmospheric temperature is above 40°F and rising for the bottom lift of pavement.
 - b. The atmospheric temperature is above 50°F and rising for the top lift of pavement

No pavement shall be placed on frozen subbase.

2. Application:

- a. Before laying the asphalt pavement, the underlying course shall be cleaned of all loose dirt, clay, or other objectionable material and the prime coat, or the tack coat is applied.
- b. The mechanical spreader shall be adjusted and regulated so that the surface of the course will be smooth and of such depth that, when compacted, it will conform to the cross section, grade, and contour shown in the Plans.
- c. Asphalt mixture that has a temperature of less than 250°F. shall not be dumped into the mechanical spreader.
- d. Unless otherwise directed, the placing shall begin along the low edge of areas to be paved.
- e. The mixture shall be placed to minimize longitudinal joints.
- f. Placing of the mixture shall be as nearly continuous as possible.
- h. Contact surfaces or previously constructed curbs, and similar structures shall be painted with a thin coat of hot bituminous liquid prior to placing the bituminous mixture.
- i. Each day's production shall be squared off for the entire width of the area paved in order to eliminate as many cool or cold longitudinal joints as possible, unless otherwise allowed by ENGINEER.
- j. The compacted thickness of any one lift shall not exceed 3", unless specifically approved by the ENGINEER.

3. Compaction: After spreading, the mixture shall be thoroughly and uniformly compacted with power rollers. Rolling of the mixture shall begin as soon as the material will bear the roller without undue displacement. Rolling shall commence on low side and continue to the higher side of mat being placed.

Cold longitudinal joints shall be kept to a minimum. These shall be tacked prior to installing adjacent materials.

Initial rolling shall be done longitudinally. The roller shall overlap on successive trips. Alternate trips by the roller shall be of slightly different lengths.

Rolling shall continue until all roller marks are eliminated, the surface is of uniform texture and true to grade and cross section and appropriate density is achieved. Density shall be obtained prior to initial heat loss, and completed before the temperature of mat drops below 180°F. The

CONTRACTOR shall work with the testing service to establish a rolling pattern that optimizes achieving proper density for the asphalt placement.

To prevent adhesion of the mixture to the roller, the wheels shall be kept properly moistened, but excessive water will not be permitted.

In areas not accessible to the roller, the mixture shall be thoroughly compacted with mechanical plate compactors.

Any mixture that becomes loose and broken, mixed with dirt, or in any way defective shall be removed and replaced with fresh asphalt mixture and immediately compacted to conform to the surrounding area. This work will be done at the CONTRACTOR'S expense.

4. Test Section. Prior to the full production, the Contractor shall prepare a quantity of bituminous mixture according to the job mix formula. The quantity shall be sufficient to construct a test section a minimum of 200 feet long and two paver widths wide. Place the test section in two sections with a longitudinal joint.

If the test section does not meet all specified testing requirements, the necessary adjustments to the mix design, plant operation laydown operation, and/or rolling operation shall be made. This test section shall be removed and will not be paid for. Additional test sections shall be placed until all testing requirements are met. Should any test section fail, the CONTRACTOR shall remove the test section at his or her expense. Test sections that do not meet the specifications will not be paid for.

Full production shall not begin without the ENGINEER'S approval.

5. Joints:
 - a. General: The mixture at the joints shall comply with the surface requirements and present the same uniformity of texture, density, smoothness, etc., as other sections of the course. In the formation of all joints, provision shall be made for proper bond with the adjacent course for the specified depth of the course. Joints shall be formed by cutting back on the previous day's run to expose the full depth of the course; the exposed edge shall be given a light coat of asphalt. The fresh mixture shall be raked against the joint and thoroughly tamped and rolled.
 - b. Transverse: The placing of the course shall be as continuous as possible. The roller shall pass over the unprotected end of the freshly laid mixture only when discontinuing the laying of the course. Transverse joints shall be formed to ensure smoothness and optimum performance. Tack coat shall be applied prior to placing new mat adjacent to the transverse joint.
 - c. Longitudinal: The placing of the course shall be as specified and in such a manner that the joint is exposed for the shortest period

possible. Tack coat shall be applied prior to placing new mat adjacent to the longitudinal joint.

6. Lift Thickness: The compacted lift thickness shall be between 1½ and 2½-inches. The total compacted lift thickness shall be within 1/4-inch of thickness, as shown in the Plans. A 3-inch lift (compacted thickness) may be allowed by the ENGINEER, if the CONTRACTOR can demonstrate he can construct it in compliance with these Specifications.
7. Smoothness test: The finished surface shall not vary more than 3/8 inch when tested with a 10-foot straightedge applied both parallel with and at right angles to the centerline of the paved area. Irregularities that exceed the specified tolerance or that retains water when a water truck sprays water over the surface shall be corrected by removing the defective work from the face of the curb to the centerline of the street and replacing with new material as directed by the ENGINEER and without additional cost to the OWNER.
8. Crown: The crown shall be within 0.05 feet of the design crown, for a half roadway width of 15 to 20 feet. The crown shall be a minimum of 2% unless approved by the ENGINEER.
9. Against Concrete: Where asphalt is to be placed against concrete pavement, a joint sealer of polymer modified asphalt shall be applied to the concrete prior to placing the asphalt mixture. Asphalt shall extend above the lip of the curb but in no case extend above the lip of the curb by more than 1/2-inch. The crushed base shall allow placement of full depth of asphalt.

3.02 FIELD QUALITY CONTROL:

Quality Control Testing and sampling shall be performed by the CONTRACTOR, and all charges shall be paid for by the CONTRACTOR. Quality Assurance testing will be conducted by the OWNER on a random basis.

The CONTRACTOR shall perform, in addition to other specified testing; the following tests and **submit test reports to OWNER and ENGINEER on a daily basis during paving operations and prior to the start of the next day's production.**

Sampling and testing for quality control during placement of asphalt will include the following, at a minimum but may include additional testing as determined by ENGINEER.

- A. Sampling: Sampling of the blended asphalt shall be performed in accordance with the ASTM D979 test method for sampling bituminous mixtures.
- B. Testing: Samples shall be taken for Aggregate Gradation, Asphalt Content, Marshall mixture properties and Mixture Density twice per day, or once per day for a half-day's production. The Marshall Test shall include the evaluation of stability, flow, percent air voids and voids in mineral aggregate (VMA). The Marshall Test shall be performed in accordance with ASTM D6926 and ASTM D6927. The mixture tests shall be performed on either plant samples or field samples. The gradation tests shall be performed in accordance with the test

methods described in the ASTM D5444 or the ASTM C117 and C136 test methods. Plant samples for gradation tests may be taken every two (2) hours during production if directed by the ENGINEER. Asphalt content shall be determined by either of the test methods ASTM D2172, ASTM D4125 or ASTM D6307. Core Samples will be taken in accordance with ASTM D 5361. Testing of the cores will be done in accordance with ASTM D 2726 or D 1188, depending on the water absorption of the mixture. Maximum Density of the mixture will be determined in accordance with ASTM D 2041. The Maximum Density value will be used to calculate the percent (%) density.

Split sampling for all asphalt tests will be required. The QC testing agency will be responsible for collecting all samples and delivering samples to the QA testing agency. Both the QC and QA testing agency shall be on site during sample collection. CONTRACTOR is responsible for coordinating with ENGINEER and all testing agencies. Test results from the QC testing agency will be used to determine measurement and payment for asphalt pavement.

Testing frequency and type may be modified by the ENGINEER.

C. Failing Tests: When any test result is not in compliance with these Specifications or if any Gradation or Asphalt Content Tests fail, then the Material Testing Lab or their field technician shall immediately notify the ENGINEER. The ENGINEER shall notify the CONTRACTOR of the noncompliance at which time the plant shall take the necessary steps to correct the asphalt mix. The CONTRACTOR shall make such modifications as required to ensure the in-place asphalt meets specification requirements. The modifications shall be approved by the ENGINEER, prior to implementation.

1. One (1) additional sample for Marshall Tests, Gradation and Asphalt Content Tests shall be taken at the next asphalt placement to determine if the asphalt mix is in compliance with Project Specifications. If any one or more of the additional Marshall, Gradation or Asphalt Content Tests fail, the CONTRACTOR shall terminate production until the mix is corrected.
2. If the asphalt fails to meet its Marshall Test, Gradation or Asphalt Content requirements, or if there are indications of deficient placement procedures, the ENGINEER, before final acceptance of the project, may request additional tests on the asphalt pavement. In the event that the additional tests indicate that the asphalt is unsatisfactory, the CONTRACTOR shall make such modifications as required to make the asphalt sound.

D. The acceptable temperature range for Asphalt Concrete at the construction site shall be based on the Mix Design Criteria for that project. Asphalt arriving at the site unable to meet these temperature limitations will be rejected and the CONTRACTOR will be responsible for all replacement costs.

E. Pavement density will be determined by comparing the density of cores taken from the compacted pavement to the Maximum Theoretical Density determined by ASTM D 2041.

F. Prior to testing, the bulk specific gravity of the test specimen shall be measured in accordance with ASTM D2726 or D1188, whichever is applicable, for use in computing air voids and pavement density.

G. **Core Density:** Cores for determining the density of the compacted pavement shall be taken on a lot basis. The lot size shall consist of one day's production not to exceed 1,000 tons, or a half day's production where a day's production is between 1,000 and 2,000 tons. The lot shall then be divided into four equal sublots. One core shall be taken from each subplot on a random basis in accordance with procedures contained in ASTM D3665. The density of each core shall be determined in accordance with ASTM D2726 or D1188, whichever is applicable.

Core samples for determination of the density of completed pavements shall be obtained by the CONTRACTOR at no extra cost. The number and locations of the samples will be as directed by the ENGINEER. Samples shall be neatly cut with a saw, core drill, or other approved equipment. Cores that are clearly defective shall be re-sampled. The CONTRACTOR shall furnish all tools, labor, and materials for cutting samples and replacing pavement.

If any core density test result indicates a compaction value less than 90% of the Maximum Theoretical Density, two (2) additional samples will be obtained from the lot using a random sample procedure. The average density of the total samples taken for that event that a sample is obviously damaged, and alternate sample shall be taken within 24" of the location of the damaged sample. The CONTRACTOR shall be responsible for all costs associated with the alternate sample.

H. **Thickness:** The in-place pavement will be accepted for thickness by measuring the cores taken for density. The Thickness will be determined in accordance with ASTM D3549. The thickness shall be the average of the cores for that lot. If any core thickness test result indicates a thickness less than ¼ inch of the design thickness, two (2) additional samples will be obtained from the lot using a random sample procedure. The average thickness of the total samples taken for that event that a sample is obviously damaged, and alternate sample shall be taken within 10' of the location of the damaged sample. The CONTRACTOR shall be responsible for all costs associated with the alternate sample.

All core samples shall be measured and recorded to the near 1/8 inch.

I. **All test holes** (even holes made by the ENGINEER) shall be filled flush with approved hot plant mix bituminous pavement, or alternate material approved by the ENGINEER, and thoroughly compacted with methods approved by the ENGINEER within 48 hours. The surface of the fill shall not allow water to stand or enter the underlying layers.

3.03 PROTECTION OF PAVEMENT:

After final rolling, no vehicular traffic of any kind shall be permitted on the pavement until it has cooled to 140 degrees Fahrenheit.

3.04 BITUMINOUS PAVEMENT DEFICIENCY:

A. Sliding scale pay factor for compaction acceptance:

1. The sliding scale pay factors shown in the following Table, shall be applied to the Bituminous pavement quantities used in each lot:

**ACCEPTANCE SCHEDULE
DENSITY OF COMPACTED BITUMINOUS PAVEMENT**

Average Density, Percent of Maximum Theoretical Density Payment*	Percent of
92.0 or Greater	100
91.0 to 91.9	90
90.0 to 90.9	80
<u>Less than 90.0</u>	<u>Reject**</u>

* - Pertains only to the bituminous pavement production

** - The ENGINEER may elect to leave the reject material in place in which case the pay factor will be 40%. Payment will not be made for material ordered removed from the project.

2. Bituminous pavement which replaces rejected and removed material, in any previously designated lot area, will be tested for density, if directed by the ENGINEER.

The CONTRACTOR shall pay for any additional costs incurred from testing rejected materials; for all replacement materials; any additional engineering costs associated with the acceptance of reject material, or the removal and replacement if the material (including, but not limited to the time of the RPR and ENGINEER); additional surveying required; testing of replacement materials; and any other incidentals associated with the rejection of the Bituminous pavement.

3. The surfaces from which core samples have been taken shall be restored by the CONTRACTOR with approved hot plant mix bituminous pavement, or alternate material approved by the ENGINEER, and thoroughly compacted with methods approved by the ENGINEER within 48 hours. The surface of the fill shall not allow water to stand or enter the underlying layers.
4. The work of obtaining core samples for the determination of density and restoring the surface will not be measured for payment, but shall be considered subsidiary to the items for which direct payment is provided

B. Pay factor for thickness deficiency:

1. Thickness equals or exceeds specified thickness: When the average thickness of a lot, determined as specified, equals or exceeds the specified plan thickness, no adjustments in payment will be made.

2. Bituminous Pavement thickness deficient ten percent (10%) or less: When the average thickness of a lot determined as specified above is less than the specified Plan thickness by more than 1/8-inch or five percent (5%) whichever is greater, an adjusted unit price will be used in computing payment for the pavement involved. The adjusted unit price as given in the following schedule:

Average Thickness Deficiency (In Percent of Plan Thickness)	Percent of Contract Unit Price for Asphalt in the Unit
0.0 to 1/4"	100
1/4" to 1/2"	90
1/2" >	Remove and Replace

All core samples shall be measured and recorded to the nearest 1/8 inch.

3. The CONTRACTOR shall pay for all additional costs incurred determining and/or correcting asphalt pavement deficiencies. This includes but is not limited to: all costs of coring; and additional engineering costs associated with the determination and correction of the deficiency (including, but not limited to the time of the RPR and ENGINEER); additional surveying required; testing of additional lifts of bituminous pavement; and any other incidentals associated with the deficiency of the bituminous pavement.

All lifts shall comply with lift thicknesses, as specified herein. The minimum lift of bituminous pavement shall be one inch and the material shall meet gradation specifications for surface course. In order to assure a smooth ride, the CONTRACTOR shall taper the edge of the lift, as required. The minimum area to receive an additional lift or lifts shall be 50 feet in length by the width of the pavement.

PART 4 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.01 METHOD OF MEASUREMENT:

A. Standard Items:

1. 02525.01 PRIME COAT

This item shall be measured by the number of square yards (SY) of prime coat applied based upon the neat lines defined in the Plans.

2. 02525.10 HOT PLANT MIX BITUMINOUS PAVEMENT- X"

This item shall be measured by the number of square yards (SY) of ___ inch (___") thick hot plant mix is placed, based upon the neat lines defined in the Plans or Specifications.

3. 02525.20 RESTORATION OF ASPHALT SURFACE - X"

This item shall be measured by the number of square yards (SY) of ___ inch (___") thick asphalt restoration that is placed based upon the neat lines defined in the Plans or Specifications.

4. 02525.30 TEMPORARY ASPHALT PAVEMENT- X"

This item shall be measured by the number of square yards (SY) of ___ inch (___") thick temporary asphalt pavement is placed, based upon the neat lines defined in the Plans or Specifications.

4.02 BASIS OF PAYMENT:

A. Standard Items:

1. 02525.01 PRIME COAT

Payment shall constitute full compensation for all haul and placing. Price will also include all costs to cover labor, equipment, tools and incidentals to complete the work in accordance with the Contract Documents.

2. 02525.10 HOT PLANT MIX BITUMINOUS PAVEMENT- X"

Payment shall constitute full compensation for all investigations, quality control testing to determine suitability for use, construction staking, haul, placing, permits, water, tack coat, compaction and all pit reclamation required. Price will also include all costs to cover labor, equipment, tools and incidentals to complete the work in accordance with the Contract Documents.

3. 02525.20 – RESTORATION OF ASPHALT SURFACE - X"

Payment shall constitute full compensation for all investigations, quality control testing to determine suitability for use, construction staking, subgrade preparation, crushed base, haul, placing, permits, water, tack coat, compaction and all pit reclamation required. Price will also include all costs to cover labor, equipment, tools and incidentals to complete the work in accordance with the Contract Documents.

4. 02525.30 TEMPORARY ASPHALT PAVEMENT- X"

Payment shall constitute full compensation for all investigations, quality control testing to determine suitability for use, construction staking, haul, placing, permits, water, tack coat, compaction and all pit reclamation required. Price will also include all costs to cover labor, equipment, tools and incidentals to complete the work in accordance with the Contract Documents.

END OF SECTION 02525

PART 1 - GENERAL

1.01 WORK INCLUDED:

The work covered by this Section of the Specifications covers preparation and overlaying of areas or portions of areas with chip seal as shown in the Plans or as directed by the ENGINEER. Refer to the Special Provisions for specific requirements of the Project.

1.02 RELATED WORK:

A. Section 02060 - Temporary Traffic Control

1.03 SUBMITTALS:

A. Certificates: Submit certificates of compliance with Specifications for all asphalt material and aggregates signed by material producer and CONTRACTOR.

1.04 PRODUCT HANDLING:

A. Delivery: Delivery shall be made with the least possible impedance to normal flow of traffic and, when necessary, the CONTRACTOR will supply flagmen and/or traffic control devices consistent with State law and the Manual on Uniform Traffic Control Devices (MUTCD), latest edition.

1.05 SCHEDULING OF WORK:

The CONTRACTOR shall work with the ENGINEER to schedule the work covered in this Section to minimize inconvenience to the OWNER's operation on the site. The CONTRACTOR's schedule shall be approved by the ENGINEER.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Chip Seal Aggregate Types: For chip seal, provide and use aggregate types in accordance with the following:

1. Types B, C, and K: Nonplastic crushed stone or gravel, of which, before crushing, at least 95 percent is retained on a 11-inch [12.5 mm] sieve.
2. Types B and C: Process produced aggregate over a slotted screen that has openings % in [6.25 mm] wide by at least % in [18.75 mm]. Do not use material that passes through the screen.
3. Type D: Crushed stone or gravel, or clean pea gravel.
4. Types B, C, D and K: LA abrasion loss maximum of 35 percent.
5. Type E: Crushed sand-gravel.

6. Type S: Screened or pit-run sand.
7. Types E and S: Plasticity index no greater than 3.

B. Chip Seal Aggregate Gradation: Provide and use aggregate well-graded from coarse to fine and in accordance with the following table:

Gradation Requirements: Chip Seal

Sieve	% Passing					
	Type					
	B	C	D	E	K	S
1 in [25.0 mm]	-	-	-	-	-	-
¾ in [10.0 mm]	100	-	100	100	-	-
½ in [12.5 mm]	95 to 100	100	95 to 100	95 to 100	100	100
⅜ in [9.5 mm]	40 to 70	90 to 100	-	-	95 to 100	95 to 100
No. 4 [4.75 mm]	0 to 15	0 to 10	0 to 15	35 to 70	0 to 35	85 to 100
No. 8 [2.36 mm]	0 to 7	0 to 5	-	-	0 to 20	-
No. 200 [75 µm]	0 to 2	0 to 2	0 to 10	0 to 10	0 to 3	0 to 5

C. Emulsified Asphalt:

1. Provide and use a blend of asphalt binder, water, emulsifiers, and polymer, if specified. When specified, polymerize using at least 3 percent polymer by weight [mass] of the asphalt binder.
2. Ensure that emulsions show no separation, such as a white/milky appearance after mixing/stirring/agitating in tank, and are smooth and homogeneous throughout. Provide pumpable emulsion suitable for application through a distributor without plugging or reducing flow through filters, piping, or nozzles.
3. For the type of emulsified asphalt specified, provide in accordance with the following:
 - a. Anionic: AASHTO M 140 and ASTM D 977.
 - b. Cationic: AASHTO M 208 and ASTM D 2397.
 - c. Recycling Agents: AASHTO R 14 and ASTM D 4552 and ASTM D 5505.

d. Other: see table below.

Applicable Requirements: Emulsified Asphalt									
Property	AASHTO or ASTM TEST METHOD		EMULSION TYPE						
			HFRS-2P	HFMS-2P	HFMS-2PS	HFMS-2SS, HFMS-1000	CMS-2P, CRS-2P	CQS-1HP, CSS-1HP	RA1+
Demulsibility, 35 mL, 0.02 N, CaCl ₂ , %	T59	min.	40	20	-	-	40	-	-
		max.	-	80	-	-	-	-	-
			(1)			(2)			
Flash Point, COC, OF [OC]	T48	min.	-	-	-	-	-	-	424
									[218]
Residue, %	(3)	min.	65	65	65	65	65	65	60
		max.	-	-	-	-	-	-	65
									(4)
Oil Distillate by volume, %	T59	max.	-	-	7.0	7.0	-	-	-
Sieve, %	T59	max.	0.1	0.1	0.1	0.1	0.1	0.1	0.1
									(5)
Storage stability, 24 hours, %	T59	max.	1.0	1.0	1.0	1.0	1.0	1.0	-
								(6)	
Miscibility, coagulation	(7)	min.	-	-	-	-	-	-	None
Particle Charge	T59	-	-	-	-	-	-	-	Pass
Viscosity, Saybolt Furol, 122 °F	T72	min.	50	100	50	50	100	20	15
		max.	450	400	400	400	400	100	40
[50 °C], sec							77 °F	77 °F	
							[25 °C]	[25 °C]	
TESTS ON DISTILLATION or EVAPORATION RESIDUE									
Solubility in trichloroethylene, %	T44	min.	97.5	97.5	97.5	97.5	97.5	97.5	-
Kinematic Viscosity, cSt	T201	min.	-	-	-	-	-	-	100
		max.	-	-	-	-	-	-	200
[mm ² /sec]									
Penetration, sec, 0.004 in [0.1 mm]	T49	min.	70	90	275	300	90	40	-
		max.	150	200	-	-	200	90	-
Float test, 140°F [60 °C], sec	T50	min.	1200	1200	1200	1200	-	-	-
Ductility, in [mm]	T51	min.	30	16 [400]	16	-	16 [400]	16	-
				[750]	39 °F [4 °C]	[400]		39 °F [4 °C]	[400]
Softening Point, °F [°C]	T53	min.	-	-	-	-	-	135	-
								[57]	
Elastic Recovery, 77 °F [25 °C], %	(8)	min.	55	50	50	-	50	-	-
					39 °F [4 °C]		39 °F [4 °C]		

- (1) For mixing type emulsions use 0.11 pt [50 mL], 0.10 N, CaCl₂ for the solution.
- (2) For cationic emulsions use 0.74 pt [35 mL], 0.8%, C₂₀H₃₇NaO₇S (sodium dioctyl sulfosuccinate) for the solution. Demulsibility is not applicable to CMS-2P.
- (3) Modify and perform the AASHTO T 59 distillation procedure in accordance with the manufacturer's recommendations.
- (4) The AASHTO T 59 modified evaporation test for percent residue consists of heating a 1.61 oz [50 g] sample to 300 °F [148 °C] until foaming stops; cool immediately and calculate results.
- (5) Test procedure is AASHTO T 59; use distilled water in place of 2 percent sodium oleate solution.
- (6) Storage Stability is not applicable to CQS-1HP.
- (7) Test procedure is AASHTO T 59; use 0.02N CaCl₂ solution in place of distilled water.
- (8) Test procedure is AASHTO T 301; sever the specimen immediately after elongation.

D. Cover Paper:

1. Plastic, building felt or other material approved by the Engineer shall be used for covering manhole covers, water valve boxes, catch basins, other such utility structures within the area, and striping to be preserved (within 10 ft of the area to be chip sealed).
2. Building paper in strips 3 ft wide shall be used to form a uniform edge at the beginning of each spread of emulsified asphalt.

2.02 COMPATIBILITY OF COMPONENTS:

Ensure that the emulsion and aggregate are compatible for chip seals. If necessary, change the emulsion type or the aggregate source to ensure compatibility. If a polymer-modified emulsion is specified, do not change to a non-polymer- modified emulsion.

2.03 EQUIPMENT:

Ensure that the equipment meets the following:

- A. Power-operated rotary brooms and a pick-up broom for curb and gutter sections.
- B. Tank trucks, asphalt distributor truck, and on-site storage tanks.
- C. A light pneumatic roller, a vibratory roller, or both.
- D. One self-propelled aggregate spreader supported by at least four wheels fitted with pneumatic tires on two axles and equipped with positive controls so that the specified quantity of material is deposited uniformly over the width of the surface. Other types of aggregate spreaders that produce equivalent results may be used.

PART 3 – EXECUTION

3.01 WEATHER AND SEASONAL LIMITATIONS:

- A. Place chip seal coats from June 15 to August 31, unless otherwise approved in writing by the engineer: Place seal only on a dry surface. Place in accordance with the following criteria:

1. Air and pavement temperatures at least 65 °F [18 °C] or higher;
2. No fog;
3. Precipitation not expected within 4 hours; and
4. Applied seal material not at risk of freezing within 24 hours.

3.02 SURFACE PREPARATION:

- A. Clean surface of extraneous material, including vegetation, dirt, mud, and loose materials before applying the emulsified asphalt.
- B. Cover all manhole covers, water valve boxes, catch basins and other such utility structures within the area being treated with material specified in above Section 2.01 D, "Cover Paper." Also cover areas of existing road striping to be preserved within 10 feet of the area to be chip-sealed. Remove the covers each day.
- C. Remove any epoxy, thermoplastic, preformed tape or high built waterborne pavement markings not designated to be preserved. Other markings shall be removed as ordered by the Engineer.

3.03 APPLICATION:

- A. Emulsified Asphalt shall be applied as follows:;
 1. Use a strip of building paper 3 ft [1 m] wide, as specified above in Section 2.01 D, "Cover Paper," to form a uniform edge at the beginning of each spread. Make junctions of spreads to ensure a smooth riding surface. Do not spread the emulsified asphalt beyond the width of the chip seal aggregate application or allow cooling or setting before application of the aggregate. Avoid delays that could impair retention of the aggregate
 2. Follow supplier's recommendations when applying emulsified asphalt and, when specified, overshoot
 3. If the texture of the surface allows the emulsified asphalt to penetrate too rapidly, spray the roadway again at a rate specified by the Engineer:
- B. Chip Seal Aggregate: Immediately after the application of emulsified asphalt, spread and seat the cover coat aggregate. Spread the material without operating the equipment's tires on the exposed, newly applied emulsified asphalt. Immediately after spreading, cover deficient areas with additional material.
- C. Ensure that longitudinal joints coincide with the specified locations of lane lines, edge lines, or the center of traveled ways.
- D. Use of a vibratory roller will only be allowed by the Engineer, if the chip seal is placed during the same construction season as the plant mix pavement and the plant mix pavement has been in place less than 90 calendar days. Operate the roller in static mode. Do not use the roller if it causes the aggregate to break down.

- E. If necessary, wet the aggregate to eliminate or reduce the dust coating or to improve cohesion.
- F. Ensure an aggregate embedment depth of 50 to 75 percent.
- G. After the emulsion used to seal the road and bond the aggregate has cured, thoroughly broom the entire surface. Remove excess aggregate. Do not remove imbedded aggregate.
- H. When specified, apply an overshoot after placing the chip seal coat. When using a rapid set emulsion for the overshoot, have it diluted by the emulsified asphalt supplier at its facility. Do not allow traffic on the surface until the overshoot has sufficiently cured to prevent picking up or tracking. Cover excess quantities with blotter material.

PART 4 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.01 METHOD OF MEASUREMENT:

A. Standard Items:

1. 02527.01 CHIP SEAL

This item shall be measured by the number of square yards (SY) of chip seal aggregate applied based upon the neat lines defined in the Plans.

2. 02527.02 EMULSIFIED ASPHALT FOR CHIP SEAL

This item shall be measured by the number of square yards (SY) of emulsified asphalt placed, based upon the neat lines defined in the Plans or Specifications.

4.02 BASIS OF PAYMENT:

A. Standard Items:

1. 02527.01 CHIP SEAL

Payment shall constitute full compensation for all haul and placing. Price will also include quality control testing to determine suitability for use, and all costs to cover labor, equipment, tools and incidentals to complete the work in accordance with the Contract Documents.

2. 02527.02 EMULSIFIED ASPHALT FOR CHIP SEAL

Payment shall constitute full compensation for all haul and placing. Price will also include quality control testing to determine suitability for use, and all costs to cover labor, equipment, tools and incidentals to complete the work in accordance with the Contract Documents.

END OF SECTION 02527

PART1 – GENERAL

1.01 WORK INCLUDED:

The work covered by this Section of the Specifications includes paint striping on asphalt or concrete pavement.

1.02 RELATED WORK:

- A. Section 02060 - Temporary Traffic Control
- B. Section 02525 - Asphalt Pavement
- C. Section 03040 - Portland Cement Concrete Pavement

1.03 RESPONSIBILITY FOR MATERIAL:

- A. The CONTRACTOR shall be responsible for all such material furnished by him/her and shall replace, at his/her own expense, all such material found defective in manufacturing or damaged in handling after delivery by the manufacturer. This shall include the furnishing of all materials and labor required for the replacement of installed material discovered defective prior to the final acceptance of the work or during the guarantee period.
- B. The CONTRACTOR shall be responsible for the safe storage of material furnished by him/her or to him/her and accepted by him/her and intended for the Work, until it is incorporated in the completed project. Final colors used must be approved by the ENGINEER.
- C. The CONTRACTOR shall comply with paint manufacturer's requirements for handling, storage and application. The CONTRACTOR shall provide the ENGINEER with a copy of these requirements. The paint supplier shall provide a technical services representative to be available during the work to answer questions relating to the use of their products.
- D. The paint shall be packaged in suitable drums. Each drum shall be plainly marked with the gross, tare and net weights, the lot number, the producer's name, and the date of manufacture. The paint shall be applied without dilution.

1.04 SUBMITTALS:

- A. Submittals shall be in accordance with Section 01300 and these Specifications.

PART 2 - PRODUCTS

2.01 PAINT:

- A. This paint is a reflectorized yellow or white paint for edge lines, centerline, or other locations as required by the Contract Documents. Must meet the requirements of Federal Specification 1952-E”.

B. This Specification is for fast dry white and yellow acrylic latex traffic marking paint used for pavement marking. The paint shall be used with drop on or spray on glass beads for application to pavement.

C. The exact composition of the paint shall be as specified by the manufacturer and conform to the requirements outlined below:

Weight per gallon @ 77°F	
pounds, min.	12.0
(kg/cubic Liter @ 25°C)	(1.44)
Viscosity, Krebs Stormer,	
77°F (25°C), K.U.	80-100
Grind, Hegman, minimum	3
Total Solids, percent by weight, minimum	73
Non-volatile vehicles, percent	
by weight, minimum	43
Pigment, percent by weight, white	58-62
Pigment, percent by weight, yellow	57-59
Titanium Dioxide, white paint,	
lbs./gal., min.	1.0
(kg/Liter)	(0.12)
Dry Time, 12 min. (0.30 mm) wet film,	
@ 65% RH, minutes, max.	12
Dry Through, @ 90% RD,	
Daylight Directional Reflectance,	
white, minimum	83
Daylight Directional Reflectance,	
yellow, minimum	50
Contrast Ratio, minimum	0.98
Bleeding Ratio, minimum	0.97
Flexibility and Adhesion	No cracking or flaking
Water Resistance	No blistering or loss of adhesion
Settling	Rating of 6 or better
Skimming, 48 hrs.	None
Track Free Time, minutes, maximum	3
pH, minimum	9.6

D. The vehicle shall be composed of a 100 percent acrylic polymer such as Rohm and Haas E-2706, or approved equal.

E. Organic Yellow Pigment: The prime pigment in the organic yellow paint shall be Color Index Pigment Yellow Number 65 or 75.

F. Color: The color of the dry white paint shall be a pure flat white free of tint. The color of the yellow paint shall match Color Number 33538 of Federal Standard 595 and shall conform to the following CIE Chromaticity limits:

x	0.462	0.470	0.479	0.501
y	0.438	0.455	0.428	0.452

G. Heavy Metals: The white and organic yellow paints shall be free of lead, chromium, and other toxic heavy metals as defined by the U.S. Environmental Protection Agency.

2.02 ASTM REQUIREMENTS

Weight per Gallon (Liter)	ASTM D1475
Viscosity	ASTM D562
Fineness of Grind	ASTM D1210
Total Solids	ASTM D2369
Total Pigment	ASTM D3723
Titanium Dioxide	ASTM D4563, D1394
Medium Chrome Yellow	ASTM D126
Dry Time – 12 mils (0.30 mm) wet	ASTM D711 (modified)
Daylight Directional Reflectance	ASTM D2805
Contrast Ratio – 15 mils (0.381 mm) wet	ASTM D2805
Bleeding Ratio	Federal Specification TT-P-85
Color	ASTM D2805
pH ASTM E70	

2.03 TESTING REQUIREMENTS:

A. Flexibility and Adhesion: Apply 15 mil (0.381 mm) wet film thickness of paint to a 3-inch by 5-inch (75 mm by 125 mm) tin panel. Dry the sample at 77oF (25oC) for 24 hours followed by two hours at 122 °F (50 °C). When the sample is bent over a ½-inch (13 mm) mandrel, the paint shall adhere firmly without cracking or flaking.

B. Water Resistance: Apply 15 mil (0.381 mm) wet film thickness of paint to 4-inch by 8-inch (100 mm by 200mm) glass plates and dry at 77oF (25oC) for 72 hours. Immerse in distilled water at 77oF (25oC) for 24 hours and then allow the samples to air dry for two hours on a flat surface. The paint shall show no blistering or loss of adhesion.

C. Skinning: After 72 hours in a tightly sealed ¾ filled container, the paint shall be free of lumps and skins when strained through a No. 100 (150 um) sieve.

D. Settling: A homogeneous sample of paint in a full one pint (0.5 Liter) friction top shall be inverted for one hour to insure a complete seal between the cover and body of the can. After one hour the can shall be placed upright in an oven at 120oF (49oC). After five days the can shall be cooled to room temperature for four hours. When tested according to ASTM D869, the degree of settling shall have a rating of 6 or better.

E. Track Free Time: When applied under the following conditions, the paint line shall show no visual tracking when viewed from 50 feet (15 meters) after driving a passenger vehicle over the line at a speed from 25 to 35 miles per hour (40 to 55 kilometers per hour).

15 mils (0.38 mm) wet film thickness.

6 pounds of glass beads per gallon (720 kg/cubic meter) of paint.

Paint temperature at nozzle between 100°F to 120°F (37°C to 49°C).
Pavement temperature from 45°F to 120°F (7°C to 49°C).

- F. Dry Time: Test according to ASTM D711, except wet film thickness shall be 12+1 mils (0.30 mm + 0.02 mm). The applied film shall be immediately placed in an humidity chamber controlled at 65 percent +3 percent relative humidity and 72.5oF +2.5oF (22.5oC +1oC). The airflow across the sample shall be less than one foot (300 mm) per second.
- G. Dry Through: The film shall be applied to a non-absorbent substrate at a wet mil thickness of 12 mils +1 mils (0.30 mm + 0.02 mm) and placed in a humidity chamber controlled at 90 percent +5 percent relative humidity and at 72.5oF + 2.5oF (22.5oC + 1oC). The dry through time shall be determined by ASTM D1640, except that the pressure exerted shall be the minimum needed to maintain contact with the thumb and film.

2.04 GLASS BEADS:

- A. Glass beads for use with waterborne traffic paint shall be moisture resistant conforming to AASHTO M247, Type I. The glass beads shall also be treated with an adherence coating as recommended by the manufacturer. Beads shall be provided without floatation properties.
- B. Gradation: The glass beads shall meet the following gradation requirements when tested according to ASTM D1214:
- | | |
|--|-------|
| Percent Passing a No. 20 (850 um) sieve | 100 |
| Percent Passing a No. 30 (600 um) sieve | 75-95 |
| Percent Passing a No. 50 (300 um) sieve | 15-35 |
| Percent Passing a No. 100 (150 um) sieve | 0-5 |
- C. Beads shall be identified by manufacturer, content, weight, and lot number.
- D. Certifications for paint and glass beads shall be submitted to the ENGINEER a minimum of 14 calendar days prior to use on the project.

2.05 EQUIPMENT:

- A. The equipment to be used shall be of the type expressly built for the purpose of applying traffic line paint to highways. The unit shall be capable of applying at least 2 lines simultaneously with a wet film thickness of 16 mils at speeds of 5 to 10 miles per hour. The unit shall be capable of painting centerlines without encroaching into the lane of opposing traffic with the exception of a guide device and/or paint gun assembly.

PART 3 - EXECUTION

3.01 GENERAL:

- A. Painting shall not be performed any time the roadway surface is wet or damp, when the ambient air temperature is less than 40 °F, or when the wind causes the paint to drift.
- B. The centerline stripes shall be yellow and edge lines shall be white. Dashed centerlines shall be 4 inches wide, 10 feet long, and shall be separated by 30-foot gaps. Barrier lines for no-passing zones and edge lines shall be continuous and shall be 4 inches wide. Barrier stripes shall be separated by a clear distance of 4 inches. All lines shall be reflectorized by the use of reflective glass spheres, AASHTO M247 (Type I), applied to the paint lines immediately after the paint application by means of a pressurized sphere applicator.
- C. The road surface shall be cleaned prior to painting any lines. The method and extent of cleaning the road surface will be determined by the ENGINEER.
- D. Prior to any cleaning or painting, the ENGINEER shall be notified, in writing, a minimum of 7 days in advance of the desired start date. The notification shall include a detailed schedule of operations.

3.02 RATES OF APPLICATION:

- A. Paint shall be applied at a rate of 100 square feet per gallon (a wet thickness of 16 mils). This rate corresponds to a rate of 4.4 gallons per mile for a 4 inch broken line, and 17.6 gallons per mile for a 4-inch solid line. Reflective glass spheres shall be applied at a rate of 8 pounds per gallon of paint.
- B. The rate of application of paint and glass spheres shall be verified by comparing the quantities of materials actually used with the quantities desired based on the application rates of each section of roadway. A calibrated measuring device shall be furnished by the CONTRACTOR to be used to measure the total length of painted lines, total gallons of paint, and pounds of glass spheres used on each road section.

3.03 SAFETY PROVISIONS:

- A. Flag persons, advance and follow-up vehicles, and other traffic control devices required shall be furnished by the CONTRACTOR. All traffic control measures shall conform to the Contract Documents.

3.04 PEDESTRIAN CROSSWALKS:

- A. All markings for pedestrian crosswalks shall be installed as indicated per the contract. Refer to the Standard Details for additional guidance on longitudinal-line crosswalks and associated signage.

3.05 HORIZONTAL LINE CONTROL:

- A. The CONTRACTOR shall be responsible of establishing a horizontal line for center, barrier, and edge line markings. The centerline shall be established within 2 inches of its true position. The centerline, barrier line, and edge line markings shall not deviate more than 2 inches in 500 feet within the stripe width itself as applied. Location and layout for other striping shall be as directed by the ENGINEER.
- B. Failure to maintain the pavement markings within the specified tolerance limits shall require corrective action, including removal and replacement, as determined by the ENGINEER. All cost of such corrective action and/or replacement shall be at no additional cost to the OWNER.

PART 4 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.01 METHOD OF MEASUREMENT:

A. Standard Items:

1. 02530.01 BROKEN YELLOW CENTER STRIPE

This item shall be measured by the lineal foot (LF) of broken yellow center stripe installed along the centerline of the broken yellow center stripe.
2. 02530.02 SOLID DOUBLE YELLOW CENTER STRIPE

This item shall be measured by the lineal foot (LF) of solid double yellow center stripe installed along the centerline of the painted double stripe.
3. 02530.03 SOLID WHITE EDGE LINE

This item shall be measured by the lineal foot (LF) of solid single white edge line installed along the centerline of the painted line.
4. 02530.04 BROKEN WHITE LANE STRIPE

This item shall be measured by the lineal foot (LF) of broken single white edge line installed along the centerline of the painted broken line, including the unpainted length between lines.
5. 02530.05 SOLID WHITE STACKING LANE STRIPE

This item shall be measured by the lineal foot (LF) of solid single white stacking lane stripe installed along the centerline of the painted stripe.
6. 02530.06 YELLOW TWO-WAY TURN LANE STRIPE

This item shall be measured by the lineal foot (LF) of yellow turn lane stripe which includes the solid yellow and dashed yellow line installed along the centerline of the painted stripe.

7. 02530.07 SOLID WHITE SEPARATION STRIPE

This item shall be measured by the lineal foot (LF) of solid single white separation stripe installed along the centerline of the painted stripe.
8. 02530.08 DASHED WHITE ACCEL/DECEL STRIPE

This item shall be measured by the lineal foot (LF) of dashed white accel. / decel. stripe installed along the centerline of the painted stripe, including the unpainted length between lines.
9. 02530.09 REMOVE EXISTING STRIPE

This item shall be measure by the lineal foot (LF) of existing stripe removed along the centerline of the existing stripe.
10. 02530.10 STOP BARS

This item shall be measured by the lineal foot (LF) of white stop bars installed.
11. 02530.11 TURN ARROW

This item shall be measured by the numerical count of each (EA) white turn arrows installed.
12. 02530.12 PEDESTRIAN CROSSING STRIPES

This item shall be measured by the total square feet (SF) of white pedestrian crossing stripes installed.
13. 02530.13 SOLID CHEVRONS

This item shall be measured by the total square feet (SF) of chevrons installed.
14. 02530.14 INSTALL RUMBLE STRIP

This item shall be measured by the lineal foot (LF) of rumble strip installed.
15. 02530.15 CURB PAINT

This item shall be measured by the lineal foot (LF) of curb painted along the face of the curb.
16. 02530.16 "WORDS"

This item shall be measured by the numerical count of each (EA) word installed.

17. 02530.17 BICYCLE LANE SYMBOL

This item shall be measured by the numerical count of each (EA) bicycle Lane symbol installed.

18. 02530.18 SOLID WHITE BICYCLE LANE STRIPE

This item shall be measured by the lineal foot (LF) of solid white bicycle lane stripe installed along the centerline of the painted stripe.

4.02 BASIS OF PAYMENT

A. Standard Items:

1. 02530.01 BROKEN YELLOW CENTER STRIPE

Payment shall include furnishing and installing the paint and reflective beads; and all other items, equipment, tools and labor necessary for the completion of this item.

2. 02530.02 SOLID DOUBLE YELLOW CENTER STRIPE

Payment shall include furnishing and installing the paint and reflective beads; and all other items, equipment, tools and labor necessary for the completion of this item.

3. 02530.03 SOLID WHITE EDGE LINE

Payment shall include furnishing and installing the paint and reflective beads; and all other items, equipment, tools and labor necessary for the completion of this item.

4. 02530.04 BROKEN WHITE LANE STRIPE

Payment shall include furnishing and installing the paint and reflective beads; and all other items, equipment, tools and labor necessary for the completion of this item.

5. 02530.05 SOLID WHITE STACKING LANE STRIPE

Payment shall include furnishing and installing the paint and reflective beads; and all other items, equipment, tools and labor necessary for the completion of this item.

6. 02530.06 YELLOW TWO-WAY TURN LANE STRIPE

Payment shall include furnishing and installing the paint and reflective beads; and all other items, equipment, tools and labor necessary for the completion of this item.

7. 02530.07 SOLID WHITE SEPARATION STRIPE

Payment shall include furnishing and installing the paint and reflective beads; and all other items, equipment, tools and labor necessary for the completion of this item.

8. 02530.08 DASHED WHITE ACCEL/DECEL STRIPE

Payment shall include furnishing and installing the paint and reflective beads; and all other items, equipment, tools and labor necessary for the completion of this item.

9. 02530.09 REMOVE EXISTING STRIPE

Payment shall include grinding the existing painted surface; and all other items, equipment, tools and labor necessary for the completion of this item.

10. 02530.10 STOP BARS

Payment shall include furnishing and installing the paint and reflective beads; and all other items, equipment, templates, tools and labor necessary for the completion of this item.

11. 02530.11 TURN ARROW

Payment shall include furnishing and installing the paint and reflective beads; and all other items, equipment, templates, tools and labor necessary for the completion of this item.

12. 02530.12 PEDESTRIAN CROSSING STRIPES

Payment shall include furnishing and installing the paint and reflective beads; and all other items, equipment, templates, tools and labor necessary for the completion of this item.

13. 02530.13 SOLID CHEVRONS

Payment shall include furnishing and installing the paint and reflective beads; and all other items, equipment, templates, tools and labor necessary for the completion of this item.

14. 02530.14 INSTALL RUMBLE STRIP

Payment shall include saw cutting the pavement; hauling and disposal of the waste material; and all other items, equipment, tools and labor necessary for the completion of this item.

15. 02530.15 CURB PAINT

Payment shall include furnishing and installing the paint and reflective beads; and all other items, equipment, templates, tools and labor necessary for the completion of this item.

16. 02530.16 "WORDS"

Payment shall include furnishing and installing the paint and reflective beads; and all other items, equipment, templates, tools and labor necessary for the completion of this item.

17. 02530.17 BICYCLE LANE SYMBOL

Payment shall include furnishing and installing the paint and reflective beads; and all other items, equipment, templates, tools and labor necessary for the completion of this item.

18. 02530.18 SOLID WHITE BICYCLE LANE STRIPE

Payment shall include furnishing and installing the paint and reflective beads; and all other items, equipment, templates, tools and labor necessary for the completion of this item.

END OF SECTION 02530

PART 1 – GENERAL

1.01 WORK INCLUDED:

The work covered by this Section of the Specifications installing pre-formed pavement markings on asphalt or concrete pavement.

1.02 RELATED WORK:

- A. Section 02060 - Temporary Traffic Control
- B. Section 02525 - Asphalt Pavement
- C. Section 02530 - Paint Striping
- D. Section 03040 - Portland Cement Concrete Pavement

1.03 RESPONSIBILITY FOR MATERIAL:

- A. The CONTRACTOR shall be responsible for all such material furnished by him/her and shall replace, at his/her own expense, all such material found defective in manufacturing or damaged in handling after delivery by the manufacturer. This shall include the furnishing of all materials and labor required for the replacement of installed material discovered defective prior to the final acceptance of the work or during the guarantee period.
- B. The CONTRACTOR shall be responsible for the safe storage of material furnished by him/her or to him/her and accepted by him/her and intended for the Work, until it is incorporated in the completed project. Final colors used must be approved by the ENGINEER.
- C. The CONTRACTOR shall comply with manufacturer's requirements for handling, storage and application. The CONTRACTOR shall provide the ENGINEER with a copy of these requirements. The markings supplier shall provide a technical services representative to be available during the work to answer questions relating to the use of their products.
- D. The manufacturer shall be ISO certified and provide proof of current certification. The scope of the certification shall include manufacturer of reflective highway markings.

1.04 SUBMITTALS:

- A. Submittals shall be in accordance with Section 01300 and these Specifications.

PART 2 - PRODUCTS

2.01 PAVEMENT MARKINGS:

- A. The markings shall be a resilient white or yellow marking tape, with or without contrast, product with uniformly distributed, factory-applied glass beads throughout the entire cross sectional area. The markings shall be resistant to the detrimental effects of motor fuels, lubricants, hydraulic fluids etc. Lines,

legends and symbols are capable of being affixed to bituminous and/or Portland cement concrete pavements. Other colors shall be available as required.

- B. The markings shall be Premark® as manufactured by Flint Trading Inc. or approved equal.
- C. Temperature requirement: the markings shall be able to be applied in temperatures down to 40 degrees Fahrenheit without pre-heating of road surface before application.
- D. The markings shall be applied with the use of a propane heat torch.

2.02 ENVIRONMENTAL RESISTANCE:

- A. The material shall be resistant to deterioration due to exposure to sunlight, water, salt or adverse weather conditions and impervious to oil and gasoline

2.03 GLASS BEADS:

- A. Glass beads shall be factory-applied.

PART 3 - EXECUTION

3.01 APPLICATION:

- A. Application shall be in strict accordance with the manufacturer's directions as stated in the submittals. Apply a compatible primer/sealer as needed to ensure proper adhesion as directed by the manufacturer. Markings shall be applied using Premark SP-sealer as supplied by Flint Trading or an authorized dealer. Premark material must be laid in place and the heating process MUST be underway prior to sealer curing.
- B. All layout required in the construction of the pavement marking is the responsibility of the CONTRACTOR.
- C. **Concrete and Bituminous Pavement Application:** Grind inset grooves into pavement surfaces prior to the application of all pavement markings onto concrete and bituminous pavement. Ensure the grinding machine is equipped with a dust collection system or that wet grinding is performed so the discharge will meet current DEQ requirements. The depth of the groove shall be 125 mils ± 15 mils. The bottom of the groove shall have a rough flat grind finished surface. The width and length of the groove shall not be more than one inch (1") greater than the dimensions of the pavement marking. When grinding for an irregular shaped symbol, follow the width and length tolerances to the extent practicable as approved by the ENGINEER.

Remove loose particles, dirt, tar grease, residue of prior pavement markings, and other deleterious material from the surfaces to be marked.

3.02 TRAINING AND CERTIFICATION:

- A. All workers involved in installation must have completed installation training provided by the manufacturer. Certification of this training must be in writing.

3.03 SAFETY PROVISIONS:

- A. Flag persons, advance and follow-up vehicles, and other traffic control devices required shall be furnished by the CONTRACTOR. All traffic control measures shall conform to the Contract Documents.

3.04 PEDESTRIAN CROSSWALKS:

- A. All markings for pedestrian crosswalks shall be installed as indicated per the contract. Refer to the Standard Details for additional guidance on longitudinal-line crosswalks and associated signage.

3.05 PLACEMENT AND ACCEPTANCE:

- A. Marking tape shall be applied according to manufacturer's recommendations.
- B. The ENGINEER shall verify the placement and dimensions of finished markings. These marking shall be replaced to the nearest foot.
- C. Applied pavement markings shall be straight and close to the intended alignment without abrupt changes that result in an unacceptable appearance.
- D. Removal and replacement of unsatisfactory pavement marking shall be at no additional cost to the OWNER.
- E. Removal and replacement of pavement markings that do not meet the minimum retro-reflectivity requirements shall be at no additional cost to the OWNER.
- F. Chisel Test: After the material has cooled to near ambient temperature, inspect the recently applied material to ensure that complete bonding has occurred over the entire area. The ENGINEER shall perform a chisel test to verify bond. This shall be completed by cutting an area in the interior of the marking with a chisel where it appears that the marking material has received the least amount of heat. For white marking this area will appear the whitest in color. Using the tip of the chisel try and lift the edge of the marking material up off of the pavement surface. If the material can be lifted without evidence of asphalt on the underside, insufficient heat has been applied. The CONTRACTOR shall press the small section of material back into place and simply reapply heat until adequate bonding has occurred. Note: Do not leave the project until a sufficient bond has been established as attempts to reheat at a later date will be unsuccessful.

If applying to concrete, adequate bonding has occurred if the marking separates and part of the marking remains stuck to the pavement.

PART 4 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.01 METHOD OF MEASUREMENT:

A. Standard Items:

1. 02540.01 PRE-FORMED SOLID DOUBLE YELLOW CENTER STRIPE
This item shall be measured by the lineal foot (LF) of solid double yellow center stripe installed along the centerline of the pre-formed double stripe.
2. 02540.02 PRE-FORMED SOLID WHITE EDGE LINE
This item shall be measured by the lineal foot (LF) of solid single white edge line installed along the centerline of the pre-formed line.
3. 02540.03 PRE-FORMED BROKEN WHITE LANE STRIPE
This item shall be measured by the lineal foot (LF) of broken single white edge line installed along the centerline of the pre-formed broken line, including the unmarked length between lines.
4. 02540.04 PRE-FORMED BROKEN YELLOW CENTER STRIPE
This item shall be measured by the lineal foot (LF) of broken yellow center stripe installed along the centerline of the pre-formed broken stripe, including the unmarked length between lines.
5. 02540.05 PRE-FORMED SOLID WHITE STACKING LANE STRIPE
This item shall be measured by the lineal foot (LF) of solid single white stacking lane stripe installed along the centerline of the pre-formed stripe.
6. 02540.06 PRE-FORMED YELLOW TWO-WAY TURN LANE STRIPE
This item shall be measured by the lineal foot (LF) of yellow turn lane stripe which includes the solid yellow and dashed yellow line installed along the centerline of the pre-formed stripe.
7. 02540.07 PRE-FORMED SOLID WHITE SEPARATION STRIPE
This item shall be measured by the lineal foot (LF) of solid single white separation stripe installed along the centerline of the pre-formed stripe.
8. 02540.08 PRE-FORMED DASHED WHITE ACCEL/DECEL STRIPE
This item shall be measured by the lineal foot (LF) of dashed white accel. / decel. stripe installed along the centerline of the pre-formed stripe, including the unmarked length between lines.
9. 02540.09 REMOVE EXISTING PRE-FORMED STRIPE

This item shall be measured by the lineal foot (LF) of existing stripe removed along the centerline of the existing stripe.

10. 02540.10 PRE-FORMED STOP BARS

This item shall be measured by the lineal foot (LF) of white stop bars installed.

11. 02540.11 PRE-FORMED TURN ARROW

This item shall be measured by the numerical count of each (EA) white turn arrows installed.

12. 02540.12 PRE-FORMED PEDESTRIAN CROSSING STRIPES

This item shall be measured by the total square feet (SF) of white pedestrian crossing stripes installed.

13. 02540.13 PRE-FORMED SOLID CHEVRONS

This item shall be measured by the total square feet (SF) of chevrons installed.

14. 02540.14 PRE-FORMED "WORDS"

This item shall be measured by the numerical count of each (EA) word installed.

15. 02540.15 PRE-FORMED BICYCLE LANE SYMBOL

This item shall be measured by the numerical count of each (EA) bicycle lane symbol installed.

16. 02540.16 PRE-FORMED SOLID WHITE BICYCLE LANE STRIPE

This item shall be measured by the lineal foot (LF) of solid white bicycle lane stripe installed along the centerline of the pre-formed stripe.

4.02 BASIS OF PAYMENT

A. Standard Items:

1. 02540.01 PRE-FORMED SOLID DOUBLE YELLOW CENTER STRIPE

Payment shall include furnishing and installing the markings and reflective beads; and all other items, equipment, tools and labor necessary for the completion of this item.

2. 02540.02 PRE-FORMED SOLID WHITE EDGE LINE

Payment shall include furnishing and installing the markings and reflective beads; and all other items, equipment, tools and labor necessary for the completion of this item.

3. 02540.03 PRE-FORMED BROKEN WHITE LANE STRIPE

Payment shall include furnishing and installing the markings and reflective beads; and all other items, equipment, tools and labor necessary for the completion of this item.

4. 02540.04 PRE-FORMED BROKEN YELLOW CENTER STRIPE

Payment shall include furnishing and installing the markings and reflective beads; and all other items, equipment, tools and labor necessary for the completion of this item.

5. 02540.05 PRE-FORMED SOLID WHITE STACKING LANE STRIPE

Payment shall include furnishing and installing the markings and reflective beads; and all other items, equipment, tools and labor necessary for the completion of this item.

6. 02540.06 PRE-FORMED YELLOW TWO-WAY TURN LANE STRIPE

Payment shall include furnishing and installing the markings and reflective beads; and all other items, equipment, tools and labor necessary for the completion of this item.

7. 02540.07 PRE-FORMED SOLID WHITE SEPARATION STRIPE

Payment shall include furnishing and installing the markings and reflective beads; and all other items, equipment, tools and labor necessary for the completion of this item.

8. 02540.08 PRE-FORMED DASHED WHITE ACCEL/DECEL STRIPE

Payment shall include furnishing and installing the markings and reflective beads; and all other items, equipment, tools and labor necessary for the completion of this item.

9. 02540.09 REMOVE EXISTING PRE-FORMED STRIPE

Payment shall include grinding the existing marked surface; and all other items, equipment, tools and labor necessary for the completion of this item.

10. 02540.10 PRE-FORMED STOP BARS

Payment shall include furnishing and installing the markings and reflective beads; and all other items, equipment, templates, tools and labor necessary for the completion of this item.

11. 02540.11 PRE-FORMED TURN ARROW

Payment shall include furnishing and installing the markings and reflective beads; and all other items, equipment, templates, tools and labor necessary for the completion of this item.

12. 02540.12 PRE-FORMED PEDESTRIAN CROSSING STRIPES

Payment shall include furnishing and installing the markings and reflective beads; and all other items, equipment, templates, tools and labor necessary for the completion of this item.

13. 02540.13 PRE-FORMED SOLID CHEVRONS

Payment shall include furnishing and installing the markings and reflective beads; and all other items, equipment, templates, tools and labor necessary for the completion of this item.

14. 02540.14 PRE-FORMED "WORDS"

Payment shall include furnishing and installing the markings and reflective beads; and all other items, equipment, templates, tools and labor necessary for the completion of this item.

15. 02540.15 PRE-FORMED BICYCLE LANE SYMBOL

Payment shall include furnishing and installing the markings and reflective beads; and all other items, equipment, templates, tools and labor necessary for the completion of this item.

16. 02540.16 PRE-FORMED SOLID WHITE BICYCLE LANE STRIPE

Payment shall include furnishing and installing the markings and reflective beads; and all other items, equipment, templates, tools and labor necessary for the completion of this item.

END OF SECTION 02540

PART 1 – GENERAL

1.01 SUMMARY:

The work covered by this Section of the Specifications shall consist of locating and adjusting existing manholes, cleanouts, inlets, utility valves, gas valves, water valve boxes, water service curb stops, fire hydrants or other appurtenances to the grade shown in the Plans or as required in the Special Provisions.

PART 2 – PRODUCTS

2.01 MATERIAL

All material, such as concrete and grout shall meet specifications as required in the section on the particular material involved, or if the material is not covered in these Specifications, the material used for adjusting shall be equal, and comparable to that in the existing structure, as approved by the ENGINEER. If extensions for water valve boxes or services and fire hydrants are required beyond the length found to exist, extensions that comply with these Specifications shall be provided and shall be considered subsidiary to this Work.

PART 3 – EXECUTION

3.01 METHOD OF CONSTRUCTION

- A. All existing manholes, cleanouts, inlets, utility valves, gas valves, water valve boxes, water service curb stops, fire hydrants or other appurtenances shall be brought to grade by either lowering or raising, as required, to the grades shown in the Plans. Where lowering of manholes, cleanouts or inlets is required, care shall be used in removing the top portion of the masonry or pipe. Before the ring and cover is replaced, the top of the masonry on the manhole, cleanout, or inlet must be true to line and grade.
- B. Water valve boxes shall be excavated and exposed so as to readily determine whether height adjustment can be made without substituting a longer section. Water valve boxes shall be adjusted laterally so the valve stem can be operated by the extension. Vertical adjustment shall be made by raising or lowering the extension box as specified in the Standard Details, the Special Provisions, or as shown in the Plans.
- C. Manholes, cleanouts, utility valves, gas valves and water valve boxes shall be adjusted to final grade after completion of paving. Preliminary adjustment may be required to allow placing of base courses and paving over the manholes, cleanouts, water valves, or other appurtenances.
- D. Backfill shall be in conformance with Section 02221. There may be adjustments required in the horizontal location of some existing fire hydrants. At the time of construction staking, any hydrants that require horizontal adjustment will be located by the ENGINEER and the adjusted location will be staked by the ENGINEER as shown in the Plans.

- E. There may be minor adjustment required as indicated in the Plans in the height of some existing fire hydrants to insure that they are at a reasonable height behind the back of curb. At the time of construction staking, any existing hydrants that require vertical adjustment will be located by the ENGINEER and the adjusted height will be staked by the ENGINEER.
- F. Before final acceptance, all manholes, cleanouts, inlets and water valve boxes or services shall be cleaned, and water valve boxes or services and fire hydrants shall be operational.
- G. Concrete collars shall be placed around valve boxes and manhole covers as shown in the Standard Details in unpaved roadways (e.g. alleyways). In paved roadways, concrete collars shall not be placed. If settlement of the roadway around the manhole exceeds one quarter-inch (1/4") one year after installation, however, the CONTRACTOR will be required to adjust the manhole to grade and install a concrete collar at no cost to the OWNER. When installing concrete collars in pavement, the location of the valve boxes and manholes shall be determined (such as by surveying) prior to paving, so the cuts in the asphalt are in the correct location, and the size of these collars does not exceed that allowed.
- H. Rebar shall be placed in the concrete collars around valve boxes and manhole covers as shown in the Standard Details.

PART 4 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.01 METHOD OF MEASUREMENT:

A. Standard Items:

1. 02570.10 ADJUST EXISTING MANHOLES
This item shall be measured for payment by each number (EA) of manholes adjusted either up or down, complete and in place.
2. 02570.20 ADJUST EXISTING/NEW WATER VALVE BOXES
This item shall be measured for payment by each number (EA) of water valve boxes adjusted either up or down, complete and in place.
3. 02570.30 ADJUST EXISTING/NEW STREET FIXTURES
This item shall be measured for payment by each number (EA) of street fixtures adjusted either up or down, complete and in place.
4. 02570.40 CONCRETE COLLAR, 4' X 4', FOR MANHOLES
This item shall be measured for payment by each number (EA) of 4' x 4' concrete collars installed around manholes in unpaved roadways, complete and in place.
5. 02570.50 CONCRETE COLLAR, FOR WATER VALVES
This item shall be measured for payment by each number (EA) of concrete collars installed around water valves in unpaved roadways, complete and in place.

4.02 BASIS OF PAYMENT:

A. Standard Items:

1. 02570.10 ADJUST EXISTING MANHOLES

Payment shall be made at the contract unit price bid for each (EA) manhole lid adjusted to the correct elevation and shall constitute full compensation of all materials, adjusting rings, excavation, backfill, removal and disposal of existing concrete collars (where applicable), , compaction, cleaning, labor, tools and incidentals necessary to complete each item.

2. 02570.20 ADJUST EXISTING/NEW VALVE BOXES

Payment shall be made at the contract unit price bid for each (EA) water valve box adjusted to the correct elevation and shall constitute full compensation of all materials, adjusting rings, excavation, backfill, removal and disposal of existing concrete collars (where applicable), , compaction, cleaning, labor, tools and incidentals necessary to complete each item.

3. 02570.30 ADJUST EXISTING/NEW STREET FIXTURES

Payment shall be made at the contract unit price bid for each (EA) curb stop box, sewer cleanouts, water meter pits, and other similar street fixtures adjusted to the correct elevation and shall constitute full compensation of all materials, adjusting rings, excavation, backfill, removal and disposal of existing concrete collars (where applicable), compaction, cleaning, labor, tools and incidentals necessary to complete each item.

4. 02570.40 CONCRETE COLLAR, 4' X 4', FOR MANHOLES

Payment shall be made at the contract unit price bid for each (EA) concrete collar for manholes in unpaved roadways and shall constitute full compensation of all materials (including concrete and rebar), compaction, cleaning, labor, tools and incidentals necessary to complete each item. No payment shall be made for concrete collars placed as a corrective measure.

5. 02570.50 CONCRETE COLLAR, FOR WATER VALVES

Payment shall be made at the contract unit price bid for each (EA) concrete collar for water valves in unpaved roadways and shall constitute full compensation of all materials (including concrete and rebar), compaction, cleaning, labor, tools and incidentals necessary to complete each item. No payment shall be made for concrete collars placed as a corrective measure.

END OF SECTION 02570

PART 1 - GENERAL

1.01 WORK INCLUDED:

The work covered by this Section of the Specifications includes the locating, uncovering, crossing, protection of, repair to, relocation of, or any other work associated with crossing under any underground utilities encountered during the excavation and subsequent installation of pipe or other appurtenances.

CONTRACTOR shall provide insurance adequate to cover the cost of all claims against the OWNER by private or public utility owners and for damage to utilities. All claims shall be paid and lien releases provided prior to the release of retainage (lien releases required only if claims are filed). If not settled by the CONTRACTOR, the OWNER will pay the utility companies out of any progress payment or remaining retainage.

The CONTRACTOR shall be aware of time requirements for utility companies to complete their work. The CONTRACTOR cannot file a "damage for delay" claim due to any activities by a utility company. The CONTRACTOR is responsible for all coordination with the utility company.

1.02 RELATED WORK:

- A. Section 01010 - Summary of Work
- B. Section 01560 - Temporary Controls
- C. Section 02221 - Trenching, Backfilling and Compacting
- D. Section 02450 - Grading
- E. Section 02641 - Valves and Valve Boxes
- F. Section 02644 - Fire Hydrants
- G. Section 02645 - Water Service Lines and Appurtenances
- H. Section 02710 - Water Main
- I. Section 02712 - Sanitary Sewer
- J. Section 02714 - Storm Drain Pipe and Fittings
- K. Section 02722 - Manholes
- L. Section 13900 - Corrosion Protection for Plastic Pipe Systems

PART 2 – PRODUCTS None

PART 3 - EXECUTION:

3.01 GENERAL:

The Contractor shall have full responsibility for reviewing and checking all information and data regarding any underground facility, for locating all underground facilities for coordination of the work with the Owners of such Underground Facilities (utilities) during construction, for the safety and protection thereof and repairing any damage thereto resulting from the Work, the cost of all of which will be included in the contract unit bid price.

If a utility is encountered that is not shown in the Plans and is not located in the field by the utility company despite requests for locates, the cost of repair materials only, will be paid in addition to bid prices, if the utility is damaged.

After the utility companies have completed their field locates, the CONTRACTOR is responsible for recording and preserving this information. The utility companies may charge the CONTRACTOR for "excessive locates" based on the respective utility company's policies. The CONTRACTOR is responsible for contacting each utility company to verify any policies and/or charges. Any charges incurred for "excessive locates" shall be at the expense of the CONTRACTOR.

Utility contacts are shown in Section 01010. This may not be a complete or current list.

3.02 UNDERGROUND UTILITY LOCATIONS:

The CONTRACTOR shall locate (uncover) all buried utilities prior to crossing them. This requirement pertains to both utilities that are shown in the plans and those that are marked in the field by the utility owners. The CONTRACTOR is responsible for contacting the utility owners to provide these markings; see Subsection 1.03 of Section 01010. Location procedures and information gathered by the CONTRACTOR shall comply with all state laws regarding utility locations.

The CONTRACTOR shall provide access to the buried utility that he has located for the ENGINEER to survey and inspect.

Utility locations shall be completed prior to excavation necessary to install the improvements. This requirement will be waived and utility locations may be performed in conjunction with the water, sanitary sewer, or storm drain line installation provided the CONTRACTOR furnishes a written statement indicating that he understands the requirements of the Contract Documents relating to utility locations, acknowledges that the utility locations performed in conjunction with the water, sanitary sewer, and storm drain line installation constitute elevation information that is made part of the plan by which the CONTRACTOR operates, waives all claims against the OWNER and ENGINEER relating to buried utilities and accepts all risks associated with the locating of utilities while excavating for the water, sanitary sewer, or storm drain line as opposed to locating them prior to commencing installation.

If the CONTRACTOR elects to locate buried utilities as part of the pipeline installation process, he must still excavate ahead of the installation when a utility or other obstacle is expected to be encountered at the approximate depth of the pipeline, to allow for adjustments in the grade of the pipeline; see Subsection 1.03 of Section 01010. Utility locations cover underground utilities that are close to the facilities being installed. Locating of water, sanitary sewer, or storm drain lines that are to be connected into, are subsidiary to their associated bid items.

3.03 EXISTING UNDERGROUND UTILITIES:

Existing underground utility lines and service connections are generally shown in the Plans, but the Contractor shall be solely responsible for locating all existing underground utilities, by contacting the utilities listed in Section 01010, or other utility companies as required.

After locates (marking on the ground) have been performed by the utility owner, CONTRACTOR shall locate (uncover) the utility, by careful prospecting. Contractor is solely responsible for supporting the existing utilities if support is needed or as directed by the ENGINEER. CONTRACTOR is solely responsible for protection of and repair of any damage thereto as a result of his excavation. Upon discovery of the utility, the Contractor shall notify the ENGINEER of its location. The CONTRACTOR shall record the size, location and depth of the utility crossing for the compilation of Record Drawings and allow the ENGINEER the opportunity to do the same.

The CONTRACTOR shall be aware that water curb stop and sanitary sewer service locations shown in the Plans are approximate. Some prospecting is likely required for locating these in the field.

PART 4 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.01 METHOD OF MEASUREMENT:

A. Standard Items:

1. 02600.10 UNDERGROUND UTILITY CROSSING

Measurement for this item will be made in the field for each (EA) underground utility or culvert crossing encountered during installation of the buried utilities including water mains, sanitary sewer mains, storm drain trunk lines and laterals and private utility trenches. If multiple utilities lie within 18 inches of one or more other utilities, payment for only one utility crossing will be made. This includes only utilities actually crossed.

2. 02600.20 UNDERGROUND UTILITY IDENTIFICATION

Measurement for this item will be made in the field for each (EA) locate performed for each underground utility located that may be in conflict with the installation of pipe on the Project, and complies with the following requirements. This pertains to qualifying utilities either shown in the Plans or marked by the utility owner during construction. Locating the utility shall include determining the buried utility's horizontal location, its elevation, its type, and providing this information to the ENGINEER. No payment will be made for locating abandoned utilities, or for utilities or structures whose location, elevation and type can be determined without excavation, such as culverts, overhead utilities or utilities at the ground surface. No payment will be made for locating utilities that were installed under the Project.

Each utility line or pipe will be counted for payment each time it enters the trench. Multiple lines that are combined in a single pipe or other encasement will have each pipe or encasement counted as one (not each line). A utility which parallels the pipeline, will be counted as one each time it enters the excavation from the ditch bank, regardless of the length in the excavation. Utilities shall not be counted under this bid item if they are not marked in the field by the utility owner, not known to exist by the CONTRACTOR, and cut or damaged during the excavation for the pipeline.

Payment for the item shall constitute full compensation for contacting of utility owners and their field marking of buried utilities, preserving these markings and documenting the location for future work, locating the utility including all excavation, shoring, dewatering, backfill, compaction and surface restoration, maintaining an open trench until the ENGINEER has had an opportunity to survey the buried utility that has been exposed,

providing safe access to the work site for surveying of the buried utility by the ENGINEER, and providing a rodman to assist the ENGINEER with the surveying of the buried utility, repair of utilities damaged during the location process, and providing all labor, equipment, tools, materials and other incidentals necessary to satisfactorily complete this work.

4.02 BASIS OF PAYMENT:

A. Standard Items:

1. 02600.10 UNDERGROUND UTILITY CROSSING

Payment for this item at Contract unit price shall constitute full compensation for production slowdown, costs to repair any utility damaged by the CONTRACTOR including materials, utility relocation costs to the utility company if relocation is requested by the CONTRACTOR, and other costs associated with the utility crossing, including excavation, shoring, supporting and protecting existing utility while crossing, backfill, compaction, and associated work necessary to complete the item. No payment will be made for utility crossings which are either abandoned as a result of the Project or have been abandoned prior to the start of the Project, or for crossing utilities installed under the Project. If the previously existing utility is live when the crossing is made, it will be counted for payment. If multiple utilities lie within 18 inches of one or more other utilities, payment for only one utility crossing will be made. There shall be no measurement of surface or overhead facility crossings or for crossing over the top of buried utilities, if encountered. No payment will be made for paralleling adjacent utilities, regardless of the space horizontally or vertically between the existing utility and the improvement. No payment will be made for restraint or support of utility poles during excavation. This work shall be considered subsidiary to the work.

2. 02600.20 UNDERGROUND UTILITY IDENTIFICATION

Payment for the item shall constitute full compensation for contacting of utility owners and their field marking of buried utilities, preserving these markings and documenting the location for future work, locating the utility including all excavation, shoring, dewatering, backfill, compaction and surface restoration, maintaining an open trench until the ENGINEER has had an opportunity to survey the buried utility that has been exposed, providing safe access to the work site for surveying of the buried utility by the ENGINEER, and providing a rodman to assist the ENGINEER with the surveying of the buried utility, repair of utilities damaged during the location process, and providing all labor, equipment, tools, materials and other incidentals necessary to satisfactorily complete this work.

END OF SECTION 02600

PART 1 - GENERAL

1.01 SUMMARY:

- A. This Work shall consist of the removal and/or relocation or installation of new street signs, traffic control signs, utility poles, street lights and mailboxes. No separate payment will be made for this work.
- B. Location of street signs and private mailboxes "to be removed", are approximate only. The survey for streets, curb and gutter, or sidewalk alignment as a part of actual construction shall be the determining factor as to which of these facilities are to be moved or removed by the CONTRACTOR or others.
- C. Utility poles owned by a utility company are only to be moved by that company.

PART 2 - PRODUCTS

2.01 SIGN PANELS:

- A. Plywood: Plywood shall be high-density, exterior Grade A-A, 60-60, overlaid fir plywood sheets minimum of 3/4-inch thick, conforming to the requirements of the Products Standards PSI-74 for fir plywood published by the U.S. Department of Commerce.

The edges of plywood panels shall be painted with one coat of priming paint and one coat of exterior white enamel paint prior to the application of reflective sheeting.

- B. Sheet Aluminum: Aluminum sheet shall be 5052-H38 or 6061-T6 alloy conforming to the requirements of ASTM B209. The metal shall not be in contact with grease, oils, or other contaminants after being cleaned and etched and prior to the application of reflective sheeting.

The treatment of the aluminum surface shall be done by a chemical conversion method. The panels may be anodized or chemically treated by an approved process. Any chemical immersion baths shall be of adequate capacity and shall be maintained within correct limits of operating strength by reliable control methods.

- C. Aluminum Alloy Channels and Tubing: Aluminum alloy channels and tubing shall conform to the requirements of ASTM B221 for alloy 6061-T6.

- D. Reflective Sheeting (High Intensity): The reflective background on sign panels shall be wide-angle, flat-top reflective sheeting, and colors shall be as shown in the Plans. Reflective sheeting shall consist of glass spheres embedded between a smooth, flexible, transparent plastic and suitable non-cellulosic backing material. The reflective sheeting shall meet the following requirements:

**MINIMUM BRIGHTNESS VALUES AT -4° and
40° DIVERGENCE**
Unit-average candle power per footcandle per sq. ft.

Div. Ang.	Silver White		Yellow		Red		Brown	
	0.2°	0.5°	0.2°	0.5°	0.2°	0.5°	0.2°	0.5°
Inc. Ang. -4° 30°	70.0	30.0	50.0	25.0	14.5	7.5	2.0	1.0
	30.0	15.0	22.0	13.0	6.0	3.0	1.0	0.5
Div. Ang.	Blue		Green		Orange			
	0.2°	0.5°	0.2°	0.5°	0.2°	0.5°		
Inc. Ang. -4° 30°	4.0	2.0	9.0	4.5	25.0	13.5		
	1.7	0.8	3.5	2.2	7.0	4.0		

The color and allowable tolerance of the reflective sheeting shall conform to the specifications as detailed on the "Color Tolerance Charts for Standard Highway Sign Colors." Order Stock No. PB-169 553 and No. PB-202000 COLOR TOLERANCE CHARTS from National Technical Information Service, Port Royal Road, Springfield, Virginia 22151. Inspections to assure that reflective sheeting meets the above requirements may be made by the ENGINEER. For sheeting colors not referred to herein, see manufacturers recommended color specifications.

The brightness of the sheeting when totally wet shall be not less than 90 percent of the above values. Wet performance measurements shall be conducted in conformance with standard rainfall test specified in Federal Specification L-S-300C, "Sheeting and Tape, Reflective, Non-exposed Lens Adhesive Backing.

The sheeting shall be pre-coated with an adhesive which will, after application, be elastic enough to resist shocking off when struck at a temperature of -10°F. When subjected to the peeling test as outlined in ASTM D903, the adhesive shall resist peeling with a force of five pounds per inch in width. The adhesive shall have no staining effect on the reflective sheeting and shall be mildew resistant.

Reflective sheeting used for all background material on signs shall be applied in conformance with the manufacturer's requirements. Sheeting shall be applied to properly treated base panels with mechanical equipment in a manner specified for the manufacturer of traffic control signs by the sheeting manufacturer. Type II adhesive coated sheeting shall be pre-perforated.

Sign faces comprising two or more panels of reflective sheeting shall be carefully matched for color to provide uniform appearance and brilliance, day and night.

Alternate successive width sections of either sheeting or panels shall be reversed to insure that corresponding edges of reflective sheeting lie adjacent on the finished sign. Non-uniform shielding and as undesirable contract between adjacent widths of applied sheeting will not be acceptable.

Type II adhesive coated sheeting may be spliced with overlap not less than 3/16 inch or butted with the gap not to exceed 1/32 inch. Only butt splices shall be permitted on signs screen processed with transparent color. Sheeting applied to extruded sections, or plywood panels, shall extend over the top edges and down the side legs a minimum of 1/16 inch.

Reflective sheeting splices and sign edges shall be sealed with material supplied and specified by the sheeting manufacturer.

2.02 SIGN SUPPORTS:

- A. Steel Pipe: Steel pipe sign posts shall conform to the requirements of ASTM A 53 for Schedule 40, Grade B. Steel plates and shapes shall conform to the requirements of AASHTO M183 (ASTM A36). Unless otherwise specified, posts and all steel parts shall be galvanized.

Tubular steel sign posts shall be roll-formed from galvanized, cold-rolled sheet steel, and shall meet the requirements of ASTM A446 for Grade A. The cold-rolled steel, including all connecting hardware, will be hot-dipped galvanized in accordance with ASTM A525, Des. G-90. Corner welds shall be zinc-coated following the scarfing operation. Post sizes and gauges shall be shown in the Plans or Standard Details.

2.03 BOLTS AND FASTENERS:

These materials shall meet the requirements of ASTM A307, Grade A. Sign panel elevator bolts and sign bolts shall be galvanized.

2.04 MAILBOXES:

- A. Posts: Posts shall be commercial quality, weldable steel made by open-hearth, basic-oxygen or electric-furnace process. Plates and bars shall be of the same quality of steel as the posts. Bolts and fasteners shall be a good quality commercial grade. Baseboards shall be constructed of a good quality redwood. The metal parts shall be painted with two coats of good quality paint. The color shall be approved by the ENGINEER.
- B. Mailboxes: All mailboxes shall be moved as necessary, maintained during construction, and kept accessible to the mail carriers at all times, as approved by the post master general. Mailboxes which are reset shall be mounted on new posts and fastened as shown, unless the old posts and mounting comply with the current Department standards. The existing mailboxes shall be reset whenever possible. Replacement mailboxes, meeting U.S. Postal Department requirements, shall be furnished and erected by the Contractor. Any posts removed, ornamental or otherwise, which are not reused, shall be offered to the landowner first. Any unclaimed posts shall be disposed of by the CONTRACTOR.

- C. Temporary Mailboxes: All mailboxes that need to be temporarily placed shall be located and temporarily installed by the contractor at the direction of the Post Master General or as directed by the ENGINEER. All temporary mailboxes shall be maintained during construction and kept accessible to the mail carriers at all times, as approved by the post master general.

PART 3 - EXECUTION

3.01 CONSTRUCTION METHODS:

- A. Street and traffic control signs. The ENGINEER's decision to relocate or install new street or traffic control signs shall be based on the location of the sign with respect to curb line, sidewalk line and the staked grading limits.
- B. Signs within the staked grading limits whose existing location does not conform to final plan location tolerance above will be relocated. Signs within the staked grading limits whose existing location (both vertically and horizontally) conform to final plan location within a six-inch tolerance will not be relocated. Signs outside the staked grading limit shall also be relocated to conform to final plan location.
- C. The preservation of the street, stop and other traffic control and direction signs that are to remain in place shall be the responsibility of the CONTRACTOR while the job is under construction. Should any of the signs need to be moved for the CONTRACTOR's convenience, they shall be removed by the CONTRACTOR, either temporarily reinstalled or stored, and permanently reinstalled when construction is completed. The CONTRACTOR shall be held liable for any damage to these signs caused by neglect on his part and no extra compensation will be allowed for preserving, removing or replacing stop and other traffic control and direction signs designated to remain in place, but rather this work shall be considered as included in the contract unit prices for the various items of the contract.
- D. Street, stop and other traffic control and direction signs designated to be relocated shall be removed and reinstalled in the locations shown in the Plans or designated by the ENGINEER. The cost of removing, temporarily reinstalling, storing, and permanently reinstalling these signs, will be compensated for at the unit price bid for relocating such signs.
- E. Street signs or mailboxes designated as new shall be installed with new materials conforming to these Specifications at locations designated by the ENGINEER or shown in the Plans. The cost of furnishing, erecting and installing these signs or mailboxes shall be compensated for at the unit price for each item.
- F. The following procedures will be followed in removing and relocating both signs removed by the CONTRACTOR for his convenience, and signs, designated by the ENGINEER for relocation:
1. After it has been determined which signs shall be relocated, the CONTRACTOR will notify the ENGINEER as to which street, stop and traffic direction signs are to be removed and reinstalled.

2. Upon receiving the CONTRACTOR's notification, a representative of the OWNER or ENGINEER will inspect the signs with the CONTRACTOR to determine the condition of the signs. Signs which require repair will be delivered by the CONTRACTOR to the OWNER. Signs not requiring repair will be removed and reinstalled as specified below.
 3. Where stop signs and traffic direction or control signs are removed, the CONTRACTOR shall provide temporary traffic control in compliance with the traffic control plan.
 4. Street signs may be installed temporarily upon approval by the ENGINEER.
 5. Signs not required or used for temporary installation shall be stored.
 6. All stop, traffic direction, street signs or control signs shall be reinstalled in the permanent location shown in the Plans or designated by the ENGINEER as soon as possible after the construction is completed. Signs which have been damaged after removal shall be replaced with new signs at the CONTRACTOR's expense.
- G. All sign locations and provisions for breakaway shall conform to the latest issue of the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD) published by the U.S. Department of Transportation.
- H. Failure of the CONTRACTOR to permanently reinstall signs within 48 hours after written notice will result in the OWNER reinstalling the sign, and withholding the cost of the work from the CONTRACTOR's estimate.
- I. Private Mailboxes. Private mailboxes within the staked grading limits generally are not shown in the Plans. Mailboxes within the staked grading limits designated for relocation by the ENGINEER shall be removed by the CONTRACTOR and temporarily installed outside, but immediately adjacent to the construction limits. Mailboxes shall be reinstalled in accordance with U.S. Post Office regulations.
- J. Power, Street Lights and Telephone Poles. It shall be the CONTRACTOR's responsibility to coordinate the removal or relocation of utility poles with the utility owner.
- K. CONTRACTOR shall install sign support anchors at the locations specified or as directed by the ENGINEER. The sign anchors will be supplied by the OWNER along with one post to be used for leveling purposes. All work and concrete materials shall conform to the Standard Details, or as shown in the Plans.

PART 4 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.01 METHOD OF MEASUREMENT:

A. Standard Items:

1. 02605.10 SIGN AND POST REMOVAL

This item shall be measured on a per each (EA) basis.

2. 02605.20 SIGN AND POST INSTALLATION

This item shall be measured on a per each (EA) basis.

3. 02605.30 REMOVE AND RESET SIGN

This item shall be measured on a per each (EA) basis.

4. 02605.40 REMOVE AND RESET MAILBOX

This item shall be measured on a per each (EA) basis.

4.02 BASIS OF PAYMENT:

A. Standard Items:

1. 02605.10 SIGN AND POST REMOVAL

This item shall be paid for at the contract unit price bid, which price and payment shall constitute full payment for removal of the sign and post combinations designated in the Plans, labor, and all other work necessary or incidental for completion of the item.

2. 02605.20 SIGN AND POST INSTALLATION

This item shall be paid for at the contract unit price bid, which price and payment shall constitute full payment for furnishing and installing sign anchor, concrete, signs, post and sleeve materials, nuts, bolts, labor, and all other work necessary or incidental for completion of the item.

3. 02605.30 REMOVE AND RESET SIGN

This item shall be paid for at the contract unit price bid, which price and payment shall constitute full payment for removal and protection of existing sign and post materials designated in the Plans, for all excavation, backfill and compaction, and placement of new concrete, and for all labor and other work necessary or incidental for completion of the item. CONTRACTOR shall replace the existing sign with a new owner approved sign if any damage occurs to the existing sign.

4. 02605.40 REMOVE AND RESET MAILBOX

This item shall be paid for at the contract unit price bid, which price and payment shall constitute full payment for removal and protection of existing mailboxes designated in the Plans, for temporary setting of mailboxes during construction, and for installation of mailboxes and posts in final locations according to the Plans, and for all labor and other work necessary or incidental for completion of the item. CONTRACTOR shall replace the existing mailbox with a new owner approved mailbox if any damage occurs to the existing mailbox.

END OF SECTION 02605

PART 1 – GENERAL

1.01 SUMMARY

- A. This item shall consist of removing and relocating existing fences where their location conflicts with the other Work at locations as shown in the Plans. Also included are repairs to fences damaged by the CONTRACTOR and installing temporary fencing at locations shown on the plans.

PART 2 – PRODUCTS

2.01 MATERIALS:

- A. Existing fence materials may be re-used when approved by the ENGINEER.
- B. New materials (when required) shall match the type and quality of the existing materials.
- C. New materials shall be provided at the CONTRACTOR's expense when existing materials are damaged by the CONTRACTOR's Work.
- D. Temporary fence material shall consist of a minimum 10 gage woven wire fabric capable of withstanding wind and snow loads and containing small pets. Posts shall be approved by the ENGINEER and placed such to support the fence throughout construction.

PART 3 – EXECUTION

3.01 GENERAL:

- A. Removed fence materials shall be stored and protected from damage prior to re-installation.
- B. Excess existing fence materials not used for re-installation shall be salvaged to the landowner if wanted. If the landowner does not want any portion or in its entirety, the existing fence materials shall be removed at the CONTRACTOR's expense and become the property of the CONTRACTOR.
- C. Fence installation methods and materials used shall match the existing fence.
- D. Fence relocation configurations will be determined in the field by the ENGINEER.
- E. Temporary fence shall be placed as shown on the plans. Posts should be spaced not more than 10 feet apart with the fabric firmly attached and placed to adequately support the fence. All wire shall be stretched taut and be installed to the required elevations. The fence shall generally follow the contour of the ground with the bottom of the fence fabric no less than one inch or more than three inches from the ground surface.

PART 4 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.01 METHOD OF MEASUREMENT:

A. Standard Items:

1. 02620.50 REMOVE FENCE

This item shall be measured on a lineal foot (LF) basis. Measurement will be along the top of the fence section being removed, excluding the length occupied by gate openings.

2. 02620.60 REMOVE AND RESET FENCE

This item shall be measured on a per linear foot (LF) basis of the reset fence in its final position. Measurement shall be along the fence centerline from end post to end post, including corner panels, brace panels, any man gates or vehicle gates. CONTRACTOR shall be responsible for protecting all items needed to reset the existing fence. If any of these items are damaged beyond repair, the CONTRACTOR shall replace these items at no additional cost to the OWNER.

3. 02620.15 TEMPORARY FENCE

This item shall be measured on a lineal foot (LF) basis. Measurement will be along the top of the fence section, including any gates installed.

4.02 BASIS OF PAYMENT:

A. Standard Items:

1. 02620.50 REMOVE FENCE

This item shall be paid for at the contract unit price bid, which price and payment shall constitute full payment for all work necessary or incidental for completion of the item.

2. 02620.60 REMOVE AND RESET FENCE

This item shall be paid for at the contract unit price bid, which price and payment shall constitute full payment for removal and salvage of the existing fence as indicated, for disposal of existing fence materials that won't be reused, for clearing and grading the fence line, for furnishing and installing additional posts, rails, brace panels, fabric, miscellaneous fittings and hardware, for installing existing gates and other salvaged materials, post hole excavations, concrete bases, and all other work necessary or incidental for completion of the item. CONTRACTOR shall be responsible for protecting all items needed to reset the existing fence. If any of these items are damaged beyond repair, the CONTRACTOR shall replace these items at no additional cost to the OWNER.

3. 02620.15 TEMPORARY FENCE

This item shall be paid for at the contract unit price bid, which price and payment shall constitute full payment for furnishing all materials, preparation, erection, and installation of these materials and for all labor, equipment, tools and incidentals necessary to complete the item.

END OF SECTION 02620

PART 1 - GENERAL

1.01 WORK INCLUDED:

The work covered by this Section of the Specifications includes the furnishing and installation of exterior mainline valves and appurtenances. Also included are air release/vacuum relief valves and accessories in manholes, and pressure reducing valves and accessories in vaults.

1.02 RELATED WORK:

- A. Section 02401 - Dewatering
- B. Section 02221 - Trenching, Backfilling, and Compacting
- C. Section 02644 - Fire Hydrants
- D. Section 02710 - Water Main
- E. Section 02766 - Testing, Cleaning, and Sterilizing of Waterline Systems
- F. Section 03010 - Concrete Work
- G. Section 13900 - Corrosion Protection of Plastic Pipe Systems

1.03 RESPONSIBILITY FOR MATERIALS:

The CONTRACTOR shall be responsible for all such material furnished by him/her and shall replace, at his/her own expense, all such material found defective in manufacture or damaged in handling after delivery by the manufacturer. This shall include the furnishing of all materials and labor required for the replacement of installed material discovered defective prior to the final acceptance of the work or during the one-year correction period.

The CONTRACTOR shall be responsible for the safe storage of materials furnished by him/her or to him/her and accepted by him/her and intended for the Work. The interior of all pipe and other accessories shall be kept free from dirt and foreign matter at all times.

1.04 SUBMITTALS:

Submittals are required for all materials and shall be in accordance with these Specifications.

PART 2 - PRODUCTS

2.01 BURIED VALVES AND ACCESSORIES:

- A. Gate Valves: All buried valves 12-inch and smaller shall be gate valves, unless shown otherwise in the Plans. Gate valves shall be the resilient seat or resilient wedge type. The gate valves shall meet all provisions and requirements of the latest editions of the AWWA C509 or C515. Valves shall have iron bodies, and be equipped with nonrising bronze stems and double "O" ring seals. The wedge or gate shall be completely encapsulated in rubber or other acceptable material. All bolts, nuts, and washers shall be series 300 stainless steel.

Iron and steel valves shall be coated inside and out per Section 13900. A manufacturing affidavit or certification shall be provided which states that coatings furnished are fusion bonded epoxy complying with the appropriate standards referenced in Section 13900, and that all required inspections and

tests, and surface preparation called for by Section 13900 have been completed. The coating thickness shall be as specified in Section 13900.

Valves shall be designed for a minimum working pressure of 250 psi. Wrench nuts shall be 2 inches square at the base, 1-15/16 inches square at the top, and shall be 1¾ inches high. Valve operating nut shall be bronze, stainless steel or fusion bonded epoxy coated. The direction of opening shall be counter-clockwise, and the word "OPEN" shall, in 1/2 inch or larger letters, be cast on the wrench nut to indicate clearly the direction to turn the wrench nut when opening the gate valve. Valves shall be Mueller "Super Seal" Resilient Seat or Wedge Gate Valves, A-2360, or approved equal.

Valve ends are to be restrained. Valves may either be mechanical joint, restrained with EBAA Iron series 2000 restraints, or approved equal; or be push on and restrained with EBAA Iron series 1600, or 15/19PF00 (using the lugs on the valve), or approved equal. Valves shall be flanged, if specifically called out in the Plans.

Valves are to be placed on a concrete support blocks, as shown in the Standard Details. Valves on branch runs of a swivel tee are to be bolted to the swivel tee.

B. Valve Boxes: Valve boxes shall be cast iron, adjustable, screw type, round base, 5¼-inch stem opening with necessary extensions to adjust the box height from the valve to the ground level, or future finished street level. Lids for valve boxes shall be cast iron and shall have the word "WATER" clearly cast on the top surface of the lid. Boxes shall be painted in accordance with the provisions and requirements set forth in AWWA Standard C550, latest edition. Valve boxes shall be Tyler 6855, or approved equal. Boxes shall be double wrapped in an 8-mil thick sheet of polyethylene encasement.

Valve boxes of the length required to reach the ground surface, while maintaining a 6-inch overlap in height adjustment, shall be provided. If the top of the operating nut is more than 8 feet from the ground surface, an extension shall be provided. The nut on the extension shall be centered in the box and attached to the operating nut on the valve.

C. Valve Box Adaptors: All valve boxes shall be installed plumb and centered above the valve using a Valve Box Adaptor II as manufactured by Adaptor Inc., or an approved equal.

D. Butterfly Valves: Isolation valves greater than 12-inches shall be Butterfly Valves unless shown otherwise in the Plans. Butterfly valves shall be iron body butterfly valves conforming to AWWA C504. Seats shall be Buna N molded in and bonded to the valve body. Valve discs shall rotate 90° from the fully open position to fully closed position. Shafts shall be one piece stainless steel extending full size through the valve discs and bearings. Shaft packing shall be self-adjusting, permanent. Wrench nuts shall be 2-inches square at the base, 1-15/16 inches square at the top, and shall be 1¾ inches high. Valve operating nut shall be bronze, stainless steel or fusion bonded epoxy coated. Valves shall be equipped with nonrising stems. The direction of opening shall be counterclockwise, and the word "OPEN" shall, in 2 inch or larger letters, be cast in the lid to clearly indicate the direction to turn the wrench nut when opening the

valve. Valves shall be designed for a minimum working pressure of 200 psi. Butterfly valves shall not be tested above their design working pressure, with pressure only on one side of the valve. The butterfly valves shall be Mueller Lineal XP CL.200B, or approved equal.

Iron and steel valves shall be coated inside and out per Section 13900. A manufacturing affidavit or certification shall be provided which states that coatings furnished are fusion bonded epoxy complying with the appropriate standards referenced in Section 13900, and that all required inspections and tests, and surface preparation called for by Section 13900 have been completed. The coating thickness shall be as specified in Section 13900. All bolts, nuts, and washers shall be series 300 stainless steel.

E. Tapping Sleeve Valves: Valves attached to tapping sleeves shall be iron body, resilient wedge tapping valves with flange by mechanical joint ends. They shall be specifically designed for this purpose. Operating nut shall be 2 inches square at the base, 1-15/16 inches at the top, and shall be 1¾ inches high. Valve operating nut shall be bronze, stainless steel or fusion bonded epoxy coated. The direction of the opening shall be counterclockwise, and the word "OPEN" shall, in 2-inch or larger letters, be cast into the wrench nut to indicate clearly the direction to turn the wrench nut when opening the valve. The stuffing box shall be O-ring sealed. Valves should be designed for a working pressure of 200 psi. Valves shall be Mueller A-2360-16, or approved equal in sizes as shown in the Plans.

Iron and steel valves shall be coated inside and out per Section 13900. A manufacturing affidavit or certification shall be provided which states that coatings furnished are fusion bonded epoxy complying with the appropriate standards referenced in Section 13900, and that all required inspections and tests, and surface preparation called for by Section 13900 have been completed. The coating thickness shall be as specified in Section 13900. All bolts, nuts and washers shall be series 300 stainless steel.

F. Tie Rods: Tie rods, when called for in the Plans, shall be 3/4" diameter. Tie rods shall be series 300 stainless steel or fusion bonded epoxy coated.

G. Restraints: Restraints on valve ends or adjacent joints of pipe or fittings, shall be EBAA Iron, or approved equal, as called out in the appropriate specification.

All metal in the restraint shall be stainless steel or coated as noted below. T-bolts and gland bolts shall be stainless steel or coated with 8 mils of fusion bonded epoxy. The installed device shall have a pressure rating equal to that of the pipe.

H. Flange Adaptor with Gap: If called for in the Plans, a flange adaptor shall be used which provides a gap for future disassembly. This shall be an EBAA Iron 2100, or approved equal.

I. Coatings: The coating on mechanical restraints shall be electrostatically applied polyester, 4 mils minimum, following surface preparation of a minimum of an iron phosphate bath, rinse and heat drying, or approved equal. The coating shall be

EBAA-Iron Mega-Bond, or approved equal. Wedge assemblies may be Xylan fluoropolymer coated, 2 coats minimum.

2.02 AIR/VACUUM VALVE ASSEMBLIES FOR WATER MAINS:

A. The valve shall have a cast or ductile iron body and cover, stainless steel float, fasteners and guide shaft, Buna-N needle and seat. The valve shall be designed to operate at pressures of at least 150 psi, however shall have components rated for the pressure where the valve is installed. The valve shall have a ball valve in the drain hole for periodic flushing. The valve shall meet all provisions and requirements of AWWA C512. The combination air/vacuum valve shall be Cla-Val Series 36, Apco Bulletin 623, or approved equal. Valve sizes shall be as shown in the Plans. The valve inlet shall be of the same diameter as the air vacuum combination valve. The valve shall be fusion-bonded or polyamide epoxy coated to a minimum 8 to 10-mils thick, inside and out, and comply with Section 13900. All bolts, nuts, washers and screws shall be series 300 stainless steel.

The valve shall be a combination valve that releases both large quantities of air during pipe filling, and small quantities of air accumulate. It shall also provide vacuum relief.

B. PIPE

1. General. Pipe shall be either Polyethylene (PE) pipe, according to Item B2, or Polyvinyl Chloride (PVC) pipe, according to Item B3. Care must be taken to assure connections to corp. stops, curb stops, transitions to other pipe materials, etc. are properly made. All connections shall be per manufacturer's design for the specific pipe type. No connections to corp. stops, curb stops, fittings, etc. shall be "forced" or field modified to fit a pipe type for which it was not designed. All connections shall be watertight.
2. Polyethylene (PE) Pipe shall be PE 3408 high-density polyethylene pipe (HDPE) meeting the requirements of ASTM D3350 cell classification PE 345434C. HDPE shall be manufactured in accordance with NSF Standard #14. Polyethylene pipe shall have a minimum pressure rating of 200 psi with a minimum DR of 7 (iron pipe size). Polyethylene pipe shall meet the requirements of AWWA C901.

Joints: The polyethylene pipe shall be of continuous construction in rolls of the manufacturer's standard length. Pipe rolls shall be joined with couplings or butt fused. Pipe ends shall be cut square and joined in accordance with the manufacturer's recommendations. Joints shall be butt fused where possible. The procedures of the pipe manufacturer and the fusion machine manufacturer shall be followed. The wall thickness at the joint shall have the same DR as the pipe.

Fittings: For connecting polyethylene pipe sections shall be brass, rubber insert or compression type fittings recommended by the manufacturer. Two stainless steel clamps are required for insert type fittings. Flared fittings will not be allowed. All fittings shall be tape coated.

3. Polyvinyl Chloride (PVC) Pipe: PVC pipe shall be Class 200 (SDR21) (IPS). The pipe material shall conform to ASTM D1784-Type 1, Grade 1. Hydrostatic design basis shall be ASTM D2837. Materials shall conform to designation PVC 1120. Pipe shall be free of holes, foreign inclusions, foreign materials, surface blemishes, or scratches deeper than 10% of the wall thickness. The pipe shall not exhibit excessive weathering or evidence of sun degradation.

Pipe shall be manufactured in accordance with ASTM D2241. The pipe shall bear the following markings: Pipe nominal size, material code designation, SDR, pressure rating, manufacturer's name or trademark, run number, NSF seal, and ASTM numbers.

Buried pipe shall have gasketed joints, which comply with ASTM D3139. Rubber gaskets shall comply with ASTM F477. Spigot ends shall be factory beveled and marked with the homeline. Lubricant for gasketed joints shall be approved by the pipe manufacturer.

Pipe shall be approved for potable water per NSF 14 or 61. Certification by an independent accredited testing laboratory (FM or as approved by the ENGINEER) that the pipe complies with ASTM D2241, shall be provided.

Fittings shall be SDR 21 of the same pressure rating, material specifications and gaskets as provided for pipe.

C. Service Saddles. Shall be used on all PVC water mains. Saddles shall be stainless steel or brass with an O-ring or Buna-N gasketed seal. All stainless steel service saddles bolts and nuts shall be 304 stainless steel. Brass service saddles shall have brass bolts with brass alloy nuts. Nuts shall be coated to prevent galling. Washers shall be stainless steel, Nylatron or approved equal. Clamps shall be a Ford FS 303, Romac 306, or approved equal.

D. Corporation Stops. Corporation stops shall be brass corporation stops having a compression connection outlet with gasket and inlet end with CC thread to suit tapping requirements. Corporation stops shall comply with AWWA C800 and be the ball valve design rated at 300-psi working pressure. They shall be Ford FB 1001-4 for PE pipe and Ford FB 1002-6 for PVC pipe, or approved equal. An appropriate stainless steel insert stiffener shall be used with the HDPE or PVC pipe.

E. Manholes. Manholes shall meet the provisions and requirements of Subsection 2.01 of Section 02722, or as shown in the Plans. Manhole cover shall be a frost-free design (inner lid), and shall conform to Section 02722.

F. Shut-off Valve. Valves shall be a brass or bronze gate valve as manufactured by ITT Grinnell, or approved equal. Valves shall have a 300 W.O.G. pressure rating. Valves shall be handwheel operated and have a double wedge disc. This valve shall be accessible from the ground surface with a forked tool for emergency shut off.

G. Washed Gravel: Shall be a washed, well graded mixture of crushed stone, or crushed or uncrushed gravel, conforming to the following grading requirements:

SIEVE NO. OR SIZE	PERCENT PASSING BY WEIGHT
1 IN	100
¾ IN	50 – 100
NO. 4	20 - 40
NO. 16	7 - 20
NO. 50	0 - 5
NO. 100	0 - 2

H. Support Bracing: The support bracing for the air release/vacuum relief valve shall be as shown in the Standard Details, or as indicated in the Plans. The support will be a galvanized pipe welded to two 3"x3" pipe saddles. The pipe shall have a threaded union with height adjustment capabilities.

I. Insulation Blanket: A 6'x6' insulation blanket shall be provided for each AR/VR valve manhole to provide insulation for the valve. The blanket shall be ¾-inch thick with a minimum R value of 2.75. The insulation shall be closed-cell polypropylene, with a 6-mil (min.) woven polyethylene covering. The blanket shall be a Conkure blanket, as manufactured by Raven Industries, or approved equal. If the blanket is cut, all edges shall be stitched or sewn to ensure insulation doesn't fall out.

2.03 PRESSURE REDUCING VALVES AND ACCESSORIES IN VAULTS

A. Pressure Reducing Valves: Pressure reducing valves shall automatically reduce the inlet pressure to a steady, lower downstream pressure regardless of changing flow rate or inlet pressure. The downstream pressure shall be easily adjustable. The valve shall be pilot operated with a regulator capable of holding pressure to a predetermined level. The valve shall be a globe pattern. The valve body shall be ASTM A48 cast iron or ASTM A536 ductile iron and have a pressure rating of 200 psi minimum. Valve ends shall be flanged (ANSI 125/150). Valve trim and fasteners shall be 303 stainless steel. The pilot system tubing and fittings shall be stainless steel. The valve shall include a position indicator.

The valve shall contain a resilient disc, corrosion resistant disc insert, and a diaphragm assembly that is guided by bearings or bushings at both ends. All necessary valve repairs shall be possible without removing the valve from the line. The pilot control shall be direct acting, normally open, spring loaded and field adjustable for downstream pressure. It shall be possible to isolate the control system with two shutoff valves. A wye strainer and opening and closing speed controls shall be included in the control system.

The valve shall be coated inside and out with two coats, 10 mils minimum (DFT) of Kopcoat Hi Guard epoxy, fusion bonded epoxy, or approved equal, and shall comply with Section 13900. The PRVs shall be Cla-Val 90-01, or as indicated in the Supplemental Provisions.

A manufacturer's representative shall be on hand at startup, to verify the operation of the valves and provide instruction in their operation and maintenance.

B. Pressure gauges: Pressure gauges shall be installed as shown in the vault. Gauge case and ring shall be stainless steel. Bourdon tube shall be stainless steel or bronze, and socket shall be stainless steel or brass. Tube and socket shall be brazed and stress relieved. Movement shall be stainless steel or bronze. Dial shall be aluminum with white background and black lines and numerals. Dial face shall be 3½ or 4-inch diameter. Gauges shall be connected with a ¼-inch NPT, and be preceded by a valve to isolate from the line. These shall be Jomar System 4, Model T-100, or approved equal. Gauges shall be designed for this application. Case shall be hermetically sealed and glycerin filled.

Gauges shall be direct reading dials, with an accuracy of ± 1% full scale range (ANSI Grade 1A). Gauges upstream of the valves shall read from 0 to 200 psi and downstream gauges shall read from 0 – 100 psi. Figure increments shall be 20 psi and minor graduations of 2 psi.

C. Gate Valves: Unless noted differently in the Plans or Special Provisions, Gate Valves shall comply with Subsection 2.01 above, except handwheels shall be provided on the valves.

D. Manhole or Vault: Shall comply with the Plans and Section 02722, as appropriate.

E. Pipe and Connections: Pipe shall be C900 DR18, or SDR 21 or Schedule 80 for <4-inch pipe. Pipe stands shall be provided as shown in the Plans. Connections shall be flanged, ANSI Class 125/150, unless shown otherwise in the Plans. Flange adaptors may be used with the PVC pipe. Where required in the Plans, an adaptor that allows a gap, such as an EBAA Iron 2100 shall be used. All bolts, nuts and washers, including those in the flanges, shall be series 300 stainless steel.

2.04 CONCRETE SUPPORT BLOCKS:

Concrete shall be Class B concrete in accordance with Section 03010 unless otherwise specified. Refer to the Standard Details for concrete block dimensions.

2.05 MARKER POSTS:

Markers (if called for in the Plans) shall be constructed of a composite polyethylene material and be 3¾-inch wide and 6-feet in length. The markers shall be colored blue with a white decal indicating a water valve. Lettering shall be blue. Markers shall be Carsonite CRM375 Composite Utility Marker or an approved equal. Markers shall be labeled as per the Standard Details, or as shown in the Plans. Letters shall not fade for a minimum of five years.

PART 3 - EXECUTION

3.01 INSTALLATION OF VALVES:

A. Valves: Valves shall be installed as nearly as possible in the positions indicated in the Plans. When valves are located in conjunction of a tee or cross, the number of valves installed shall be one less than the number of legs extending from the tee or cross. All valves shall be carefully erected and supported in their respective positions free from all distortion and strain of appurtenances during handling and installation. All materials shall be carefully inspected for defects in workmanship and materials, all debris and foreign material shall be cleaned out of valve openings and seats, all operating mechanisms operated to check their proper functioning, and all nuts and bolts checked for tightness. Valves which do not operate easily or are otherwise defective shall be repaired or replaced at the CONTRACTOR's expense. Valves shall be set plumb and supported adequately in accordance with the manufacturer's instructions.

B. Valve location: All valves shall be placed within 2' of the tee or cross (measured from the closest flange to flange), unless otherwise directed by the ENGINEER.

3.02 INSTALLATION OF VALVE BOXES:

Valve boxes shall be installed with the use of an Adaptor Inc. Valve Box Adaptor II, or approved equal, to ensure installation directly over the valve operating wrench nut, in plumb position and supported adequately. Care shall be taken during backfilling to ensure that the valve box remains in a vertical position, that no dirt, rocks, or debris are dumped into the valve box. In paved streets, the top of the valve box shall be brought to within ¼-inch of the finished street grade as approved by the ENGINEER. In gravel or dirt roads, the top of the valve box shall be 6 inches below grade. The base of the valve box must not touch the valve. A rubber valve box adaptor may be used between the box and valve. When the valve box is in place, it must be capable of allowing the operator key to be placed on the valve nut with no difficulty. If the valve nut is not operable due to improper installation of the valve box, the box shall be re-installed at the CONTRACTOR's expense.

3.03 AIR RELEASE/VACUUM RELIEF VALVES:

The air release/vacuum relief valve shall be installed as shown in the Standard Details or as shown in the Plans. A standard or offset setting shall be used as requested by the ENGINEER.

Manholes shall be constructed to the general dimensions shown in the Plans and will not have a precast concrete base. Manholes shall be placed on washed gravel. At the horseshoe shaped blockouts where the pipe protrudes through the manhole wall, a preformed insulated modular rubber wall seal shall be placed around the pipe. The seal must not allow any contact between the pipe and the concrete. See Section 02722.

The manhole frame and cover shall be adjusted to within ¼-inch finished grade through the use of precast concrete grade rings. The manhole installation including the use of adjusting rings shall be per Section 02722.

3.04 TIE ROD ASSEMBLIES:

Where noted in the Plans or these Specifications, the valves shall be tied back to the tee or fitting from which it is installed. The tie rod assemblies shall be of stainless steel. They shall be of the number required to securely anchor the valve to the water main, or as shown in the Plans.

3.05 THRUST/SUPPORT BLOCKS:

Concrete shall be Class B concrete in accordance with Section 03010 unless otherwise specified. Refer to the Standard Details for thrust block dimensions.

For valves that are 12" or less; a 6" thick by 18" length by 18" wide precast concrete support block, made with a minimum 4,000 psi concrete, shall be placed under the valve.

For valves that are larger than 12"; the support block size shall be determined by the ENGINEER and made with a minimum 4,000 psi concrete and shall be placed under the valve.

Washed Gravel shall be placed under all support blocks with a minimum depth of 4" and shall be at a minimum the same length and width of the support block used.

Encasement of any valve in concrete is unacceptable and shall be removed and replaced immediately.

3.06 PRESSURE REDUCING VALVES:

Valves shall be installed as nearly as possible in the position indicated in the Plans. All valves shall be carefully installed and supported in their respective positions free from all distortion and strain of appurtenances during handling and installation. All materials shall be carefully inspected for defects in workmanship and materials, all debris and foreign material cleaned out of valve openings and seats, all operating mechanism operated to check their proper functioning, and all nuts and bolts checked for tightness. Valves which do not operate easily or are otherwise defective shall be repaired or replaced at the CONTRACTOR's expense. Valves shall be set plumb and supported as shown in the Plans. They shall be installed in accordance with the manufacturer's instructions. The valves shall be set at pressures provided by ENGINEER.

Manhole and accessories shall be assembled as shown in the Standard Details, or as shown in the Plans. Manholes and vaults are to include a daylight floor drain, unless the ENGINEER determines this to be impractical. Drains are to be 3-inches Schedule 80 PVC.

3.07 VALVE RESTRAINTS:

All valves shall be restrained per Part 2 of this Section. Joints near the valve shall also be restrained as determined by the ENGINEER to satisfy restrained length calculations based on the circumstances of the particular installation. The ENGINEER shall determine and have available a restrained joint plan for the Project. As a minimum, the joint on any fitting or bend adjacent to the valve within one pipe length of the valve shall be restrained in the same manner as the valve, and there shall be no joints between the valve and the fitting. This is a minimum

and in no way states that this alone is a sufficient restrained joint system for the particular installation.

PART 4 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.01 METHOD OF MEASUREMENT:

A. Standard Items:

1. 02641.0X X" GATE VALVE

This item shall be measured on a per each (EA) basis. Measurement for this item will be made in the field with the quantity for payment determined by the actual number of X" gate valves furnished and installed.

2. 02641.1X X" BUTTERFLY VALVE

This item shall be measured on a per each (EA) basis. Measurement for this item will be made in the field with the quantity for payment determined by the actual number of X" butterfly valves furnished and installed.

3. 02641.2X X" PRESSURE REDUCING VALVE AND VAULT

This item shall be measured on a per each (EA) basis. Measurement of pressure reducing valves and vault shall be made by each PRV vault and valve assembly completed and installed.

4. 02641.30 AIR/VACUUM ASSEMBLY

This item shall be measured on a per each (EA) basis. Measurement of air vacuum and air release valve shall be made by each unit being completed and installed.

5. 02570.50 CONCRETE COLLAR, FOR WATER VALVES

This item shall be measured for payment by each number (EA) of concrete collars installed around water valves in unpaved roadways, complete and in place.

4.02 BASIS OF PAYMENT:

A. Standard Items:

1. 02641.0X X" GATE VALVE

Payment will be made at the Contract Unit Bid price per each valve and will constitute full compensation for excavation, bedding material, shoring, bracing, compaction, valve, valve box and cover, valve box adaptor, cathodic protection (anode), fittings, joint bonding, thrust blocking and/or joint restraints, support blocks, testing and disinfection, haul, placing, dewatering, and valve rods (if required). Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

2. 02641.1X X" BUTTERFLY VALVE

Payment will be made at the Contract Unit Bid price per each valve and will constitute full compensation for excavation, bedding material, shoring, bracing, compaction, valve, valve box and cover, cathodic protection (anode), fittings, joint bonding, thrust blocking and/or joint restraints, support blocks, testing and disinfection, haul, placing, dewatering, and valve rods (if required). Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

3. 02641.2X X" PRESSURE REDUCING VALVE AND VAULT

Payment shall include all locating and cutting of existing pipe (if applicable), excavation, shoring, dewatering, backfilling, compaction, final grading and surface restoration, support aggregate under the vault, bedding, and thrust blocks; and furnishing and installing the vault, pipe, fittings, couplings, valves and anodes; PRV's; air/vacuum valve, daylight drain; pressure gauges with saddles and isolation valves, hose bib; all the vault accessories such as the support gravel, cover, steps, vent, pipe stands, insulation, and connections to the existing pipe. Also included is all piping, fittings and valve required for the vault bypass (if applicable). Fittings include the tees and reducers outside of the vault. Also included is all testing, flushing, disinfection, start-up, warranty, operator training, O&M manuals, drain pipe, drain rock, joint sealer, splash gutter, tees, bends, reducers, gate valves within the vault, pressure gages, and all other incidentals required to complete the item. Payment shall be made at the contract unit price per each.

4. 02641.30 AIR/VACUUM ASSEMBLY

Payment shall include furnishing and installing the combination air/vacuum valve, the isolation valve, corporation stop (where required), saddle, tap, flange, pipe, valves, insulation blanket, marker post (marked accordingly), and the pipe and fittings. Payment will also include the manhole, ring, and locking cover, vent, insulation, the washed gravel floor, fittings and all labor, equipment, tools, all excavation, backfilling, compaction, dewatering, final grading, sheeting, shoring, and incidentals required to complete this item in accordance with the Contract Documents.

5. 02570.50 CONCRETE COLLAR, FOR WATER VALVES

Payment shall be made at the contract unit price bid for each (EA) concrete collar for water valves in unpaved roadways and shall constitute full compensation of all materials (including concrete and rebar), compaction, cleaning, labor, tools and incidentals necessary to complete each item. No payment shall be made for concrete collars placed as a corrective measure.

END OF SECTION 02641

PART 1 - GENERAL

1.01 WORK INCLUDED:

The work covered by this Section of the Specifications includes the furnishing and installation of fire hydrant assemblies.

1.02 RELATED WORK:

- A. Section 02060 - Temporary Traffic Control
- B. Section 02110 - Clearing and Grubbing
- C. Section 02221 - Trenching, Backfilling, and Compacting
- D. Section 02401 - Dewatering
- E. Section 02641 - Valves and Valve Boxes
- F. Section 02710 - Water Main
- G. Section 02766 - Testing, Cleaning, and Sterilizing Waterline Systems
- H. Section 03010 - Concrete Work
- I. Section 13900 - Corrosion Protection of Plastic Pipe Systems

1.03 RESPONSIBILITY FOR MATERIAL:

The CONTRACTOR shall be responsible for all such material furnished by him/her and shall replace, at his/her own expense, all such material found defective in manufacturing or damaged in handling after delivery by the manufacturer. This shall include the furnishing of all materials and labor required for the replacement of installed material discovered defective prior to the final acceptance of the Work or during the guarantee period.

The CONTRACTOR shall be responsible for the safe storage of material furnished by him/her or to him/her and accepted by him/her and intended for the Work, until it is incorporated in the completed Project. The interior of all pipe and other accessories shall be kept free from dirt and foreign matter at all times.

1.04 SUBMITTALS:

Submittals shall be in accordance with Section 01300 and these Specifications.

PART 2 - PRODUCTS

2.01 FIRE HYDRANT:

Fire hydrants shall be Centurion model as manufactured by Mueller Co., Decatur, Illinois and shall conform to AWWA Standard for Dry-Barrel Fire Hydrants, AWWA C 502, latest edition.

The hydrants shall have a 5¼-inch main valve opening with one 4½-inch pumper connection and two 2½-inch hose connections, and an auxiliary gate valve and valve box of the size required for the inlet pipe. Hose and pumper nozzle threads shall be in conformity with ASA Specifications B26 for National Standard Fire Hose Coupling Screw Thread. Operation nut shall be National Standard 1½-inch pentagon, made of bronze, and shall open counter-clockwise and shall have an arrow and the word "OPEN" cast in relief on the top of the hydrant to designate the direction of opening. The hydrant shall have a minimum 6-foot bury and be equipped with breakaway safety flanges. Some hydrants may require deeper bury. Refer to the Plans and field verify hydrant length before ordering.

Hydrants shall be compression type with safety flange and safety stem coupling above the ground line so that they can be repaired without shutting off the water. Hydrants shall be of the Dry Top Design with two or more O-rings sealing the water from the operating mechanism. The operating mechanism shall be automatically lubricated from a sealed, self-contained lubricating reservoir. The portion of the hydrant above the ground line shall be painted with red enamel. All chipped or damaged paint shall be repaired to the satisfaction of the ENGINEER. All bolts, nuts and washers in the hydrant shall be Series 300 stainless steel. The hydrant shoe and barrel shall be coated per Section 13900.

2.02 FLUSHING HYDRANT: (For use in rural areas only). The hydrant shall have a 2½-inch NST nozzle and a 2-inch FIP inlet. The interior working parts shall be brass and shall be accessible without excavation. The hydrant shall drain down to prevent freezing after flushing. The flushing hydrant shall be a Model 77 Mainguard hydrant as manufactured by Kupferle Foundry Company, (800) 231-3990, or approved equal.

The hydrant shall have a minimum 6-foot bury and be equipped with a breakaway coupling. Some hydrants may require deeper bury. Refer to the Plans and field verify hydrant length before ordering.

2.03 OTHER MATERIALS:

- A. Fire Hydrant Pipe: The pipe portion of the fire hydrant assembly shall conform to Section 02710 in material and workmanship.
- B. Fire Hydrant Valve: The valves in the fire hydrant assembly shall conform to Section 02641, except they shall be restrained by bolting them to the swivel tee. A restrained joint per Subsection 2.01 of Section 02710 on the opposite side shall be provided, if required by the Details. If a swivel tee is not used for a reason approved by the ENGINEER, the upstream side of the valve shall be restrained by a means approved by the ENGINEER.
- C. Joint Bond Wires and Anode: See Section 13900.
- D. Tie Rods: Tie rods where required shall be ¾" diameter. Tie rods shall be series 300 stainless steel.
- E. Thrust / Support Blocks: Concrete thrust blocking and support pad shall be installed on all hydrants. Concrete shall be Class B concrete in accordance with Section 03010. All sizing of thrust blocks and support pad/blocks shall be specified in the Standard Details. All thrust blocks are to be formed and poured against undisturbed soil.
- F. Swivel Tee: Mainline tees shall be Class 250 and be in accordance with all of Section 02710 with the exception that they shall be mechanical joint or push-on by swivel. If swivel tees are not available in the main line pipe size, use a mechanical joint tee with restrained joints per Section 02710, as approved by the ENGINEER.
- G. Guard Posts: Guard posts shall be 6 feet in length and be composed of 6-inch diameter schedule 40 steel pipe filled with concrete and painted reflective yellow. Coating shall be in accordance with Section 13900. The post shall be embedded

3 feet and encased in a 10-inch diameter concrete base. Concrete shall be Class B concrete in accordance with Section 03010. A set of guard posts shall be provided where designated by the ENGINEER. Generally guard posts shall be provided at all hydrant locations where not behind a curb section, unless specifically deleted by the ENGINEER.

PART 3 - EXECUTION

3.01 GENERAL:

The fire hydrants and valves shall be installed as shown in the Plans. The final location of the hydrant shall be determined in the field. The ENGINEER shall approve the staked location of the hydrant before it is installed.

3.02 FIRE HYDRANT INSTALLATION:

The fire hydrant and valve shall be installed in a plumb position with the pumper nozzle facing the street or as directed by the ENGINEER. Final hydrant location, elevation and direction of pumper nozzle shall be approved by the ENGINEER. The hydrants shall be installed at such an elevation that the bury line is at the same elevation as the finished grade or rear face of curb whichever is higher.

Drainage shall be provided at the base of the hydrant by placing clean washed gravel around the concrete block and base of the hydrant. Sufficient gravel shall be used to provide a minimum of 1 foot on all sides of the base of the elbow to a point at least 6 inches above the drain opening. A thrust block and support block of dimensions required shall be poured at the base of the hydrant as shown in the Standard Details.

3.03 HYDRANT PIPE AND VALVE INSTALLATION:

Installation of hydrant pipe shall be in conformance with Section 02710 while valves shall be in conformance with Section 02641.

3.04 CATHODIC PROTECTION:

Joint bonds and anodes are to be provided in accordance with Section 13900 and the Plans.

3.05 REMOVAL OF EXISTING FIRE HYDRANTS:

Existing fire hydrants as shown in the Plans shall be removed, including the hydrant, barrel and shoe. If the water line is to remain live, a plug and thrust block shall be installed. Some existing fire hydrants to be removed may not be equipped with an isolation valve. The CONTRACTOR shall be aware of this prior to any removal so as to comply with shut down durations allowed. Removed hydrants shall be made available to the OWNER for salvage. If the OWNER does not want the hydrant, the CONTRACTOR shall dispose of the removed materials off the site.

PART 4 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.01 METHOD OF MEASUREMENT:

A. Standard Items:

1. 02644.00 FIRE HYDRANT ASSEMBLY

This item shall be measured on a per each (EA) basis. Measurement for this item will be made in the field with the quantity for payment determined by the actual number of each fire hydrant assembly furnished and installed.

2. 02644.10 FLUSHING HYDRANT

This item shall be measured on a per each (EA) basis. Measurement for this item will be made in the field with the quantity for payment determined by the actual number of each flushing hydrant furnished and installed.

4.02 BASIS OF PAYMENT:

A. Standard Items:

1. 02644.00 FIRE HYDRANT ASSEMBLY

For the purpose of measurement, a fire hydrant assembly shall be defined to include the tee on the mainline, any bends on the hydrant leg, all 6-inch piping from the tee on the mainline, the 6-inch valve with box, any additional extensions or barrel if required, the hydrant and any additional barrel sections if required for height adjustments and connecting to an existing waterline, if required.

This item shall be paid for at the contract unit price bid, which price and payment shall constitute full payment for all trench excavation, bedding material, shoring, dewatering, backfill, compaction, thrust blocking, washed gravel, polyethylene wrap, thrust restraint, testing and disinfection, cathodic protection, joint bond wires, tracer wire, the complete hydrant assembly and all other work necessary or incidental for completion of the item.

2. 02644.10 FLUSHING HYDRANT

This item shall be paid for at the contract unit price bid, which price and payment shall constitute full payment for all trench excavation, furnishing and installing the water service line from the main up to and including the flushing hydrant, curb stop and box, tapping the main, corporation stops, tapping saddle and other necessary materials, shoring, dewatering, backfill, compaction, thrust blocking, washed gravel, polyethylene wrap, tracer wire, testing and disinfection, cathodic protection, marker posts, and all other work necessary or incidental for completion of the item.

END OF SECTION 02644

PART 1 - GENERAL

1.01 WORK INCLUDED:

The Work covered in this Section includes furnishing and installing service clamps, corporation stops, service line piping, curb stops, and boxes. This section also includes meter pits and components, and water quality sampling stations, if required.

Unless obtained by the ENGINEER, a permit for the service line work shall be obtained from the City of Sheridan Utility Department. All service line work shall comply with City Codes and the currently adopted Plumbing Code. Inspection by the City shall be arranged for when required.

1.02 RELATED WORK:

- A. Section 01300 - Submittals
- B. Section 01560 - Temporary Controls
- C. Section 02766 - Testing, Cleaning, and Sterilizing Waterline Systems
- D. Section 02060 - Temporary Traffic Control
- E. Section 02110 - Clearing and Grubbing
- F. Section 02221 - Trenching, Backfilling, and Compacting
- G. Section 02401 - Dewatering
- H. Section 02480 - Reclamation
- I. Section 02710 - Water Mains
- J. Section 13900 - Corrosion Protection of Plastic Pipe Systems

1.03 RESPONSIBILITY FOR MATERIALS:

The CONTRACTOR shall be responsible for all such material furnished by him/her and shall replace, at his/her own expense, all such material found defective in manufacture or damaged in handling after delivery by the manufacturer. This shall include the furnishing of all materials and labor required for the replacement of installed material discovered defective prior to the final acceptance of the Work or during the one year correction period.

The CONTRACTOR shall verify that all various service line components supplied from the various sources have compatible threads, couplings, and types of end connections, and that the end product is a complete, watertight unit that functions as intended by this design.

The CONTRACTOR shall be responsible for the safe storage of material furnished by him/her or to him/her and accepted by him/her and intended for the work. The interior of all pipe and other accessories shall be kept free from dirt and foreign matter at all times.

1.04 SUBMITTALS:

Submittals shall be in accordance with Section 01300 and these Specifications.

1.05 BACKFLOW PREVENTION

All services are to be equipped with appropriate backflow prevention device per Wyoming Department of Environmental Quality requirements (Chapter 12 of Water Quality Rules and Regulations). If specific backflow preventers, location and method of installation are not included in the Special Provisions for the Project, materials and work shall comply with City and State

Requirements relating to Backflow Prevention. The CONTRACTOR shall provide a submittal for the proposed backflow prevention measures. This shall be approved by the City prior to installation.

PART 2 - PRODUCTS

2.01 PIPE:

A. Copper Water Service Line: Copper pipe used for water service lines shall be Type K, soft temper, meeting the requirements and provisions of AWWA Standard C800, latest edition. Corrosion protection shall be in accordance with Section 13900.

B. HDPE Water Service Line. HDPE shall be PE 3408 high-density polyethylene pipe (HDPE) meeting the requirements of ASTM D3350 cell classification PE 345434C. HDPE shall be manufactured in accordance with NSF Standard #14, and meet the requirements of AWWA C901. PE pipe shall have a minimum pressure rating of 200 psi with a DR or SDR of 9. PE pipe shall be copper tube size.

1. Joints: The polyethylene pipe shall be of continuous construction in rolls of the manufacturer's standard length. Pipe ends shall be cut square and joined in accordance with the manufacturer's recommendations. The water service line shall be a continuous run of pipe from the water main to the curb stop, no joints shall be allowed. The water service line shall be a continuous run of pipe from the curb stop to the meter, no joints shall be allowed. Joints shall be butt fused. The procedures of the pipe manufacturer and the fusion machine manufacturer shall be followed. The wall thickness at the joint shall have the same DR as the pipe.
2. Fittings: For connecting polyethylene pipe sections shall be brass, rubber insert or compression type fittings recommended by the manufacturer. Two stainless steel clamps are required for insert type fittings. Flared fittings will not be allowed. All fittings shall be tape coated per Section 13900.

C. Connections. Care must be taken to assure connections to corp. stops, curb stops, meter pits, transitions to other pipe materials, etc. are properly made. All connections shall be per manufacturer's design for the specific pipe type. No connections to corp. stops, curb stops, meter pits, etc. shall be "forced" or field modified to fit a pipe type for which it was not designed. All connections shall be water tight, and shall not easily pull apart.

When connecting to an existing metallic water service line, CONTRACTOR shall install a 17-lb. magnesium anode on the service line.

D. Tracer Wire. Where non-metallic pipe is used, tracer wire conforming to Subsection 2.13A of Section 13900 shall be installed with each service line beginning at the main, and brought up by the curb box (outside of box by lid). A minimum of 6" of excess tracer wire is to be coiled up under the lid and shall not be left exposed to the elements.

2.02 STOPS AND BOXES:

- A. Corporation Stops: Corporation stops shall be brass corporation stops having a compression connection outlet with gasket, and inlet end with CC thread to suit tapping requirements. Corporation stops shall comply with AWWA C800 and for copper tubing shall be Mueller H-15008 or H-15013, or approved equal. For HDPE pipe, corp. stops shall be Ford FB 1001, or approved equal. An appropriate stainless steel insert stiffener shall be used with the HDPE pipe.
- B. Service Saddles: Shall be used on all PVC water mains. Saddles shall be stainless steel or brass with an O-ring or Buna-N gasketed seal. All stainless steel service saddles bolts and nuts shall be 304 stainless steel. Brass service saddles shall have brass bolts with brass alloy nuts. Nuts shall be coated to prevent galling. Washers shall be stainless steel, Nylatron or approved equal. Clamps shall be a Ford FS 303, Romac 306, or approved equal.
- C. Curb Stops: Curb stops for 1-inch to 2-inch copper water service shall comply with AWWA C800, have compression connections, be the electrically insulated ball type, and be Mueller Series 35000, or approved equal. For HDPE pipe, curb stops shall be Mueller H-15209, or approved equal.
- D. Curb Boxes: Curb boxes for water services shall be cast iron, arch pattern base with a stationary 4' rod. Curb boxes for 1-inch curb stops shall be Mueller Type H10314, or approved equal, while curb boxes for curb stops greater than 1-inch shall be Mueller H10386, or approved equal. All curb boxes shall be within 3 inches of the middle of the adjustment when its top is set at finished ground elevation. Curb boxes shall include a 300 stainless steel stationary 4' rod and pin that are sized appropriately to the size of the curb stop. The stationary rod shall be bolted to the curb-stop. The rod length shall be 4' in length. All curb boxes shall be double wrapped in 8-mil polyethylene encasement.
- E. Curb Box Sleeve: In concrete or asphalt pavement, curb box sleeves shall be installed around the top of the curb box. Curb box sleeves shall be Mueller H-10342, or approved equal.
- F. Insulating Unions: Refer to Section 13900, for the description.

Note: Insulating unions are only required if a new curb stop is not installed, or if a 1½ or 2" curb stop is used and they are not available in the insulating style. Curb stops are to be insulating when available.

2.03 ANODES:

- A. Anodes: Anodes shall be in accordance with Section 13900 on copper lines.
- B. Ground Clamps: Clamps shall be bronze. Clamps and nuts and bolts shall be in accordance with Section 13900.

2.04 METERS AND METER PITS:

A. Meter Pits: Meter pits shall be Mueller Thermal-Coil Meter Box, or an approved equal. Meter pits shall have an inlet angle ball valve, outlet angle dual check valve, and a straight ball valve on the outlet. The meter size shall be 5/8" x 3/4", unless called out in the Special Provisions or Plans, and approved by the City. Inlet and outlet connections shall be threaded brass. These connections shall be fastened securely to the pit wall. The meter pits shall be 18-inch in diameter with a 0.30-inch minimum PVC wall, and a minimum height of 72-inches. A larger pit shall be provided with larger meters. Coiled tubing shall be 3/4-inch polybutylene, complying with ASTM D2666. Tubing shall be Class 250. Tubing shall be long enough to easily allow the meter to be pulled up to the ground surface. The meter and PRV shall be mounted on a 1/2-inch thick ABS plastic platform. Ridges to hold the platform shall be located at the top of the pit and at a depth of 48-64 inches. A brass U-bar shall run from the outlet side of the PRV to the inlet side of the meter. A 4-inch thick polypropylene insulation pad shall fit snugly into the pit. This pad shall not absorb water. A looped 1/4" nylon rope handle shall be provided on the insulation pad. The lid shall be cast iron and be securely fastened in place with a pentagon nut. The lid shall be designed to accommodate the Touch-Read pit lid and MXU radio read system.

The above specifications for the structural aspects of meter pit are a minimum. If additional wall thickness or other structural enhancements are needed to keep the pit round after backfill and allow for the easy removal and replacement of the lid and internal components in the pit, they shall be provided. Pit lids and locking mechanisms shall operate easily and be easily removed and replaced. Any ridges and internal lips in the pit that are attached to the wall shall be firmly and permanently attached to the wall with corrosion resistant fasteners. The fasteners shall remain securely in-place as lids and internal components in the pit are removed and replaced.

The angle ball valve shall be a Mueller B24265, angle dual check valve shall be a Mueller H-14244-A, straight ball valve shall be a Mueller B20200, and quarter bend couplings to be Mueller H14210, all or approved equal.

Type II meter pits contain a meter and individual PRV in series mounted in a dual yoke, while a Type 1 meter pit contains only a meter.

B. Meters: All meters shall be installed by the City of Sheridan.

C. Individual Pressure Reducing Valves: Individual PRV's for meter pits or mounted with the meter in a building, shall have cast bronze body; stainless steel seat ring; strainer with clean out plug; maximum inlet pressure of 200 psi; adjustable outlet pressure of 75 to 90 psi. All springs, trim and fasteners shall be stainless steel. The PRV is to be a Watts 5M3Z6-HP, or approved equal.

2.05 WATER QUALITY SAMPLING STATION:

Water sampling stations shall be designed for a 6-foot bury and include 3/4-inch inlet and 3/4-inch hose bib threaded nozzle. All stations shall be enclosed in a lockable, non-removable aluminum cast housing. When opened, the station shall require no key for operation, and the water shall flow in an all brass waterway. All working parts shall also be brass. A copper vent tube shall enable each station to be pumped free of standing water to prevent freezing. The water sampling station

shall be an Eclipse No. 88 as manufactured by Kupferle Foundry, St. Louis, Missouri, or approved equal. Stations location shall be determined in the field by the ENGINEER. One standard utility bilge pump compatible with a sampling station vent tubing shall be provided.

PART 3 - EXECUTION

3.01 INSTALLATION:

Trenching, backfilling, imported bedding material and compaction shall conform to Section 02221. Corporation stops, curb stops, piping, curb boxes, meter pits, and all miscellaneous material shall be handled and installed with care to prevent damage to the pipe and fittings. All materials shall be laid on a firm, uniform foundation. A short loop in the service pipe at the corporation stop shall be provided for expansion and contraction of the service pipe. Service pipe shall be buried 6.0 feet below finished ground surface, including where the service line passes under a ditch.

Water services to be installed are indicated in the Plans. Additional services could be added. Locations, size and number to be installed are given based upon best available information. Some service locations may change in the field after consultation with the property owners. Existing service locations or curb stops near the property line shall be located in the field by the CONTRACTOR, with some assistance provided by the OWNER. The CONTRACTOR is ultimately responsible that each required service is installed.

Water service lines shall be connected no closer than two feet (2') from the closest main line fitting.

CONTRACTOR shall be responsible for locating existing curb stops to be connected into or to be replaced, and the ENGINEER shall verify the location prior to connecting to the existing line.

In those areas where lawns have been established within the right-of-way or easement, the CONTRACTOR shall take efforts to reduce the disturbance to these lawn areas to that area necessary for service installation only. These areas shall be restored as per Sections 02221 and 02480. The CONTRACTOR shall protect, restore, or replace any fence sections disturbed during service installation. No extra payment will be made for this work.

The CONTRACTOR shall protect all existing curb and gutters and sidewalks and shall replace all sections damaged during construction unless the section is shown to be removed.

A galvanic anode shall be attached to the copper service line by a bronze ground clamp adjacent to the corporation stop as called for in the Plans and Section 13900 of the Specifications.

Direct tapping of the metallic pipe will be allowed, provided the pipe wall thickness allows for at least 2 full threads in DIP and 3 threads in other metals. Use service clamps on PVC pipe. All taps shall be full sized taps. No undersized taps will be allowed.

Where meter pits are called for, they shall be installed on firm ground. Meters shall be connected to the service line and installed in a plumb position. All meter pit lid locks shall be fully operable with an operator wrench, after installation. The CONTRACTOR shall notify the OWNER or ENGINEER at least eight hours prior to backfilling so that measurements and dimensions can be taken to locate them for future use.

Pipe installation shall comply with AWWA C901 or C800, as appropriate.

3.02 CURB STOPS/BOXES:

If the stop is broken on the curb stop or it can be rotated 360°, it shall be replaced at the CONTRACTOR's cost.

A 12"x12"x4" concrete pad shall be placed under curb stops as per the Standard Details.

A curb stop shall be installed in the copper service line at a distance of 1' outside of the property line or as shown in the Plans. The curb box with a minimum of 6.0 feet bury, shall be installed plumb and centered over the operating nut of the curb stop. The curb box shall be placed so its final position allows for vertical adjustment. The curb box lid shall be marked with the word "WATER" cast into the lid. The curb box shall extend from the curb stop to, and not above, the finished grade. Curb box shall be double wrapped with polyethylene encasement. Copper service line shall connect curb stop to the existing service line. When service is for future use, a short (12-18 inches) piece of line shall be stubbed out from the stop.

3.03 PVC PIPE WRAP TAPE

Where HDPE pipe is used or where the corp. stop, saddle or curb stop are not otherwise protected by an anode, the corp. stop, service saddle and curb stop may be wrapped in PVC pipe tape with a minimum of 10 mil thickness in lieu of Petrolatum Tape, when approved by the engineer.

3.04 SURFACE RESTORATION:

Water services shall have the trench surfaces restored as specified in Sections 02221 and 02480 and restored as asphalt, gravel, or unsurfaced trench restoration to match the existing conditions unless the area is shown to be resurfaced. Restoration of crushed base and asphalt surfacing for service lines shall be paid for in the same manner as main lines. Seeding or dirt grading resurfacing for service lines will not be paid for separately and this cost must be included in the unit cost of the service line.

PART 4 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.01 METHOD OF MEASUREMENT:

A. Standard Items:

1. 02645.0X X" WATER SERVICE LINE

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of lineal feet (LF) of X" water service line furnished and installed as measured along the top centerline of the pipe from the main to the point of connection to the existing service line.

2. 02645.5X X" METER PIT

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of each (EA) X" water meter pit furnished and installed.

3. 02645.2X X" CURB STOP/BOX

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of each (EA) X" curb stop / box furnished and installed.

4.02 BASIS OF PAYMENT:

A. Standard Items:

1. 02645.0X X" WATER SERVICE LINE

Payment will be made at the Contract Unit Bid price per lineal feet (LF) and will constitute full compensation for excavation, removal and disposal of any existing pipe being replaced, shoring, backfill, compaction, cathodic protection (if required), construction staking, testing and disinfection, furnishing and installing tracer wire, furnishing and installing an 18-lb. anode on the private property owner's metallic service line, corp., saddle, water main tap, haul, placing, and dewatering. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents. Where curb and gutter will not be replaced above the new service line, no "bridging" by the existing curb and gutter will be allowed. The existing curb and gutter must be replaced (for the full curb and gutter section – existing joint to existing joint) or boring will be required at the CONTRACTOR's expense. No extra payment will be made for this work.

2. 02645.5X X" METER PIT

Payment will be made at the Contract Unit Bid price per each (EA) vault and will constitute full compensation for excavation, shoring, backfill, compaction, connection to the service line provided, meter pit, polyethylene wrap and other cathodic protection, thrust restraint, testing and disinfection, construction staking, haul, placing, and dewatering. Price will also include the cost to remove and reset any existing irrigation control box and remove any existing meter pit. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

3. 02645.2X X" CURB STOP/BOX

Payment will be made at the contract unit bid price per each (EA) and will constitute full compensation for excavation, backfill, compaction, connection to the service line provided, curb stop and box, stainless steel rod and pin, polyethylene wrap and other cathodic protection, thrust

restraint, testing and disinfection, construction staking, haul, placing and dewatering.

END OF SECTION 02645

PART 1 - GENERAL

1.01 WORK INCLUDED:

The work covered by this Section of the Specifications consists of the construction of water mains, including fittings, and other appurtenances normally used for water supply and distribution systems, including those distribution system components installed by horizontal directional drilling. This item shall consist of furnishing and installing pipe and fittings, construction of thrust blocking, and other related work.

1.02 RELATED WORK:

- A. Section 02060 - Temporary Traffic Control
- B. Section 02110 - Clearing and Grubbing
- C. Section 02221 - Trenching, Backfilling and Compacting
- D. Section 02401 - Dewatering
- E. Section 02480 - Reclamation
- F. Section 02641 - Valves and Valve Boxes
- G. Section 02644 - Fire Hydrants
- H. Section 02645 - Water Service Lines and Appurtenances
- I. Section 02766 - Testing, Cleaning, and Sterilizing Waterline Systems
- J. Section 03010 - Concrete Work
- K. Section 13900 - Corrosion Protection of Plastic Pipe Systems

1.03 RESPONSIBILITY FOR MATERIALS:

The CONTRACTOR shall be responsible for all such material furnished by him/her and shall replace, at his/her own expense, all such material found defective in manufacture or damaged in handling after delivery by the manufacturer. This shall include the furnishing of all materials and labor required for the replacement of installed material discovered defective prior to the final acceptance of the Work or during the guarantee period.

The CONTRACTOR shall be responsible for the safe storage of material furnished by him/her or to him/her, and accepted by him/her, and intended for the Work, until it has been incorporated in the completed Project. The interior of all pipe and other accessories shall be kept free from dirt and foreign matter at all times.

1.04 SUBMITTALS:

Submittals shall be in accordance with Section 01300 and these Specifications. For pipe installed by horizontal directional drilling methods, also see additional submittals required in Part 2 – Products.

PART 2 - PRODUCTS

2.01 PVC PUSH-ON PIPE:

All PVC pipe 4" through 12" shall meet the requirements of the latest editions of ASTM D2241 and AWWA C900. Pipe shall be DR18, unless called out otherwise in the Plans. Pipe shall be NSF approved for potable water and shall be colored blue. Gasketed bell and spigot couplings complying with ASTM D3130, ASTM F477 and AWWA C900 shall be used. Laying lengths shall be 20-feet ±1-inch. Pipe shall be marked as specified in AWWA C900. Certification by an independent accredited testing laboratory suitable to the ENGINEER that the pipe complies with AWWA C900 shall be provided.

Pipe 4-inch through 12-inch may also comply with AWWA C909 for molecularly oriented PVC. Pipe shall be pressure class 235, unless called out otherwise in the Plans.

PVC pipe greater than 12-inch shall be DR18, complying with AWWA C905. Certification by an independent accredited laboratory suitable to the ENGINEER that the pipe complies with AWWA C905 shall be provided.

Pipe material shall conform to ASTM D1784-Type 1, Grade 1 (12454-B). Hydrostatic design basis (HDB) of 4,000 psi per ASTM 2837, service factor of 0.5 for hydrostatic design stress (HDS) of 2,000 psi. Material shall be manufactured with all virgin material or reworked material from the same plant which produces the pipe. Use of reworked material shall be within the requirements of AWWA C900. Pipe shall be free of holes, foreign inclusions, foreign material, surface blemishes or scratches deeper than 10 percent of the wall thickness. Pipe interior shall not be rough. Not less than minimum wall thickness shall be maintained through the entire pipe length. Pipe shall not exhibit excessive weathering or evidence of sun degradation. The ENGINEER may reject any pipe due to concerns of defects including, but not limited to worn gaskets, scratches to the pipe, cracks in the pipe, or other defects as seen by the ENGINEER. The OWNER may reject any pipe which was manufactured more than one year prior to delivery, or for other causes.

All PVC pipe shall be covered to keep exposure to sunlight at a minimum whenever pipe is stockpiled for more than 4 months.

All pipe shall be CIP size.

Pipe shall be transported with front ends covered. Pipe shall be palleted with protective boards to prevent damage from banding. Bands and boards shall be placed not more than 10 feet apart (5 sets per 40 foot length) or such other manufacturer's standard arrangement as well as provide adequate support for material. No loose or unpalleted pipe shall be delivered.

2.02 DUCTILE IRON PIPE:

Ductile iron pipe may only be used if specifically allowed in the Plans and then only with the coating, lining and cathodic protection measures required by Section 13900.

2.03 RESTRAINED JOINT PVC PIPE:

When restrained joint PVC pipe is called for in the Plans, the pipe shall be Certa-Lok by Certaineed Corporation, or approved equal. It shall have a minimum pressure class of 235, or as required in the Plans.

The pipe, fittings and accessories shall conform to the following standards as applicable: AWWA C900, ASTM D3139, and ASTM F477. Joints shall be restrained. The joints shall be made by utilizing machined grooves on the pipe and in the coupling and nylon spline. A flexible elastomeric seal (O-ring) shall be used inside the coupling to provide a hydraulic pressure seal.

2.04 HORIZONTAL DIRECTIONAL DRILLING:

When horizontal directional drilling is called for in the Plans, any of the following materials may be used:

A. HDPE Pipe: Fused joint High Density Polyethylene (HDPE) pipe may be used for horizontal directional drilling or pipe bursting operations. The pipe shall be Plexco Bluestripe or approved equal. Pipe shall be cast iron pipe size. The minimum pressure rating shall be:

- SDR 9 (pressure rating of 200 psi)
- SDR 7 for pipe bursting applications or if the manufacturer recommends SDR 7 for the particular directionally boring application.

If HDPE is used, the Contractor shall provide acceptable restrained joint transition fittings to PVC pipe (or the existing ductile iron pipe) at both ends of the HDPE. All joints and connections within the HDPE section shall be fusion welded, or restrained per these specifications.

The pipe, fittings and accessories shall conform to the following standards as applicable:

- AWWA C901 - Polyethylene (PE) Pressure pipe and Tubing, ½" – 3" for Water Service.
 - AWWA C906 - Polyethylene (PE) Pressure Pipe and Fittings, 4" – 63" for Water Distribution.
 - ASTM D2683 - Socket Type Polyethylene fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing.
 - ASTM D3261 - Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
 - ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
 - PPI TR-3 - Policies and Procedures for Developing Recommended Hydrostatic Design Stresses for Thermoplastic Pipe Materials.
 - PPI TR-4 - Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Pipe and Fittings Compounds
 - NSF Standard #14 - Plastics Piping Components and Related Materials.
1. Material: Materials used for the manufacturing of polyethylene pipe and fittings shall be PE3408 High Density Polyethylene (HDPE) meeting the ASTM D3350 cell classification of 345434C.

The material shall have a minimum Hydrostatic Design Basis (HDB) of 1600 psi at 75°F when tested in accordance with PPI TR-3 and shall be listed in the name of the pipe and fitting manufacturer in PPI TR-4.

The material used in the production of potable water pipe shall be approved by the National Sanitation Foundation (NSF).

The Manufacturer shall certify that the materials used to manufacture pipe and fittings meet the requirements of this specification.

2. Other requirements specific to HDPE:
 - a. All joints and connections to other pipe must be restrained.
 - b. The pipe pressure rating and ID must be the same or better as the PVC, unless approved by the Engineer.

3. Manufacturer's Quality Control: The pipe Manufacturer shall have an established quality control program responsible for inspecting incoming and outgoing materials. Incoming polyethylene materials shall be inspected for density, melt flow rate, and contamination. The cell classification properties of the material shall be certified by the supplier. Incoming materials shall be approved by Quality Control before processing into finished goods. Outgoing products shall be tested as required in AWWA C901 or C906.

The Manufacturer shall maintain permanent Quality Control (QC) and Quality Assurance (QA) records. Certification or copy of these records shall be made available to the Engineer on request.

4. Installation and Testing: The Manufacturer shall supply an Installation Manual to the Project Engineer which outlines guidelines for handling, joining, installing, embedding and testing of polyethylene pipeline. These guidelines shall be followed.

Joints between plain ends of polyethylene pipe shall be made by butt fusion when possible. The pipe manufacturer's fusion procedures shall be followed at all times as well as the recommendations of the fusion machine manufacturer. The wall thicknesses of the adjoining pipes shall have the same DR at the point of fusion.

When saddle connections are fusion welded, the Manufacturer's recommended saddle fusion procedures shall be used.

If mechanical fittings (which are designed for, or tested and found acceptable for use with polyethylene pipe) are utilized for transitions between pipe materials, repairs, joining pipe sections, saddle connections, or at other locations; the recommendation of the mechanical fitting manufacturer must be followed. These procedures may differ from other pipe materials.

On the first day butt fusions are to be made, the first fusion of the day shall be a trial fusion. The trial fusion shall be allowed to cool completely, then fusion test straps shall be cut out. The test strap shall be 12" or 30 times the wall thickness in length (minimum) and 1" or 1.5 times the wall thickness in width (minimum). Bend the test strap until the ends of the strap touch. If the fusion fails at the joint, a new trial fusion shall be made, cooled completely and tested. Butt fusion of pipe to be installed shall not commence until a trial fusion has passed the bent strap test.

Socket and Saddle fusions shall be tested by a bent strap test as described by the pipe manufacturer. The pipe manufacturer shall provide visual guidelines for inspecting the butt, saddle, and socket fusion joints.

Pressure testing shall be conducted in accordance with the manufacturer's recommended procedures and Section 02766-Testing, Cleaning and Sterilizing Waterline Systems.

- B. Restrained Joint PVC Pipe: Restrained joint PVC pipe may be used for horizontal directional drilling. The pipe shall be Certa-Lok by Certainteed Corporation, or approved equal. It shall have a minimum class of 150 (DR 18), unless DR14 is required on the drawings or if the manufacturer recommends DR14 for the particular directionally boring application.

Pipe shall be joined using non-metallic couplings to form an integral system for maximum reliability and interchangeability. High-strength, flexible thermoplastic splines shall be inserted into mating, precision machined grooves in the pipe and coupling to provide full 360° restraint with evenly distributed loading. Couplings shall be designed for use at or above the pressure class of the pipe with which they are utilized, and shall incorporate twin elastomeric sealing gaskets meeting the requirements of ASTM F477. Joints shall be designed to meet the zero leakage test requirements of ASTM D 3139.

The pipe, fittings and accessories shall conform to the following standards as applicable: ASTM D1784, ASTM D3139, and ASTM F477. Twelve-inch and smaller pipe shall comply with AWWA C900, while 16-inch pipe shall comply with AWWA C905. The outside diameter of the pipe shall be DIPS. Joints shall be restrained using machined grooves in the pipe and coupling, with locking splines. The joint shall have a pressure rating equal to that of the pipe. A flexible elastomeric seal (o-ring) shall be used inside the coupling to provide a hydraulic pressure seal.

- C. Fusible PVC Pipe: Fusible PVC pipe may be used for horizontal directional drilling. The pipe shall conform to all standards and procedures, and meet all testing and material properties as described below:

1. GENERAL:

- a. Fusible PVC pipe shall conform to AWWA C900. Testing shall be in accordance with AWWA standards for all pipe types.
- b. Rework material shall be allowed per AWWA C900 and standards.
- c. Fusible PVC pipe shall be extruded with plain ends. The ends shall be square to the pipe and free of any bevel or chamfer. There shall be no bell or gasket of any kind incorporated into the pipe.
- d. Fusible PVC pipe shall be manufactured in a standard 20', 30' or 40' nominal length.
- e. Fusible PVC pipe shall be blue in color for potable water use.
- f. Pipe generally shall be marked per AWWA C900, and shall include as a minimum:
 - i. Nominal pipe size
 - ii. PVC
 - iii. Dimension Ratio, Standard Dimension Ratio or Schedule

- iv. AWWA pressure class or standard pressure rating for non-AWWA pipe
 - v. NSF-61 mark verifying suitability for potable water service
 - vi. Extrusion production-record code
 - vii. Trademark or trade name
 - viii. Cell Classification 12454 and/or PVC material code 1120 may also be included
 - ix. Pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters, or other visible deleterious faults.
2. **Manufacturer Requirements:** Fusible PVC pipe shall be tested at the extrusion facility for properties required to meet all applicable parameters as outlined in either AWWA C900, AWWA C905, applicable sections of ASTM D2241, ASTM D3034, or ASTM F679. Testing priority shall be in conformance with AWWA C900 and AWWA C905, except for pipe made to the ASTM D3034 or ASTM F679 standards, which shall be tested to those standards. All piping shall be made from a PVC compound conforming to cell classification 12454 per ASTM D1784.
3. **Fusion Technician Requirements:** Fusion Technician shall be fully qualified by the pipe supplier to install fusible PVC pipe of the type(s) and size(s) being used. Qualification shall be current as of the actual date of fusion performance on the project.
4. **Specified Pipe Suppliers:** Fusible PVC pipe shall be used as manufactured under the trade names Fusible C-900®, Fusible C-905®, and FPVC™, for Underground Solutions, Inc., Poway, CA, (858) 679-9551. Fusion process shall be as patented by Underground Solutions, Inc., Poway, CA, Patent No. 6,982,051, or approved equal.

D. Additional Submittal Requirements for Horizontal Directional Drilling:

1. **Pre-Construction Submittals:** In addition to the submittals required per Section 01300, they shall also include, as a minimum, the items listed below. Similar experience in the last three years for the Contractor doing this work must be provided with the bid. The CONTRACTOR shall present evidence to prove to the satisfaction of the ENGINEER that he, or the subcontractor performing the work, has had previous experience in pipe installation of this nature. CONTRACTOR shall employ a superintendent able to furnish acceptable similar evidence and shall keep such supervisor continuously employed until the directionally bored installations on the project are satisfactorily completed.

Presentation of similar experience in the last three years shall include:

- a. Owner name, address, telephone number, contact person, date and duration of work, location, pipe information, and contents handled by pipeline.

- b. Supervisory field personnel and historical information of HDD experience. At least one of the field supervisors listed must be at site when HDD operations are in progress.
- c. Working Drawings and written procedure describing in detail proposed methods and entire operation for information only, including but not limited to:
 - i. Size, capacity and arrangement of equipment.
 - ii. Location and size of drilling and receiving pits.
 - iii. Dewatering and methods of removing spoils material.
 - iv. Method of installing tracer wire and pipe.
 - v. Type, location and method of installing tracer wire locator stations.
 - vi. Method of fusion pipe segment and type of equipment.
 - vii. Type of cutting head.
 - viii. Method of monitoring and controlling line and grade.
 - ix. Detection of surface movement.
 - x. Bentonite drilling mud for information only:
 - 1) Products information, material specifications, and handling procedures.
 - 2) Material safety data sheet and special precautions required.
 - 3) Method of mixing and application.

2. The following PRODUCT DATA is required from the pipe supplier and/or fusion provider:

- a. Pipe Size
- b. Dimensionality
- c. Pressure Class per applicable standard
- d. Color
- e. Recommended Minimum Bending Radius
- f. Recommended Maximum Safe Pull Force
- g. Pipe and fusion services warranty information.
- h. Written procedural documentation for piping products including proper handling and storage, installation, tapping, and testing.
- i. Fusion technician qualification indicating conformance with this specification.

3. The following WORK PLAN AND INFORMATION is required from the contractor and/or horizontal directional drilling Contractor. This WORK PLAN AND INFORMATION shall also be supplied to the pipe supplier, should it be requested:

- a. Work plan shall include for each HDD installation any excavation locations and dimensions, interfering utilities, bore dimensions and locations including bend radii used, and traffic control schematics.
- b. A project safety and contingency plan which shall include but shall not be limited to drilling fluid containment and cleanup procedures, equipment and plan for compromised utility installations including

- electrical and power lines, water, wastewater and any other subsurface utility in the area.
 - c. An HDD schedule identifying daily work hours and working dates for each installation.
4. Post-Construction Submittals: The following AS-RECORDED DATA is required from the contractor and/or fusion provider to the Owner or pipe supplier upon request:
- a. Fusion report for each fusion joint performed on the project, including joints that were rejected. Specific requirements of the Fusion Technician's joint report shall include:
 - i. Pipe Size and Thickness
 - ii. Machine Size
 - iii. Fusion Technician Identification
 - iv. Job Identification
 - v. Fusion Joint Number
 - vi. Fusion, Heating, and Drag Pressure Settings
 - vii. Heat Plate Temperature
 - viii. Time Stamp
 - ix. Heating and Cool Down Time of Fusion
 - x. Ambient Temperature

E. As-built Information: The as-built plan and profile will reflect the actual installed alignment, and reflect the horizontal offset from the baseline and depth of cover.

All fittings, valves, or other appurtenances will also be referenced and shown.

A daily project log, along with tracking log sheets, should they be used, shall be provided. Tracking log sheet data, should it be employed, shall include any and all that apply, including inclination, depth, azimuth, and hydraulic pull-back and rotational force measured.

2.05 FITTINGS:

A. Ductile Iron Fittings: Fittings shall have a minimum Class 250 wall thickness and shall meet all requirements of the latest edition of AWWA C110/A21.10 (standard fittings) or be Class 350 complying with AWWA C153/A21.53 (compact fittings). Fittings shall be fusion-bonded epoxy coated and lined per Subsection 2.16l of Section 13900. Cement mortar lining is also acceptable, per AWWA Standard C104. Gaskets shall be per AWWA C111. Fittings shall be either push on or mechanical joint. Flanged fittings may be required in certain applications if called out in the Plans. If MJ or flange fittings are used, all bolts, nuts, and washers shall be series 300 stainless steel.

B. PVC Fittings: PVC fittings may be used with 4-inch through 12-inch AWWA PVC pipe. The fittings shall be Pressure Class 235 (minimum), injection-molded fittings with push-on rubber gaskets, complying with ASTM D3139, ASTM F472 and AWWA C900 or C907. No glued fittings shall be accepted.

C. HDPE Fittings. HDPE fittings shall be used only along with HDPE pipe and shall be made from material meeting the same requirements as the pipe. They shall be molded or fabricated by the manufacturer of the pipe. Where applicable, fittings shall meet the requirements of AWWA C906.

Molded fittings shall be manufactured in accordance with either ASTM D2683 (socket fused) or ASTM D3261 (butt fused) and shall be so marked.

Mechanical Fittings used with HDPE pipe shall be specifically designed for, or tested and found to be acceptable for use with HDPE pipe. Mechanical fittings designed for other materials shall not be used unless authorized by the mechanical fittings manufacturer. Special precautions may exist with certain mechanical fittings or additional components may be required. Consult the manufacturer of the fitting prior to its use.

D. Fittings for Use with Fusible PVC Pipe:

1. Ductile Iron Mechanical and Flanged Fittings
 - a. Acceptable fittings for use with fusible PVC pipe shall include standard ductile iron fittings.
 - b. Connections to fusible PVC pipe may be made using a restrained or non-restrained retainer gland product for PVC pipe, as well as for MJ or flanged fittings.
 - c. Bends, tees and other ductile iron fittings shall be restrained with the use of thrust blocking or other means as indicated in the construction documents.
 - d. All fittings and glands must be installed per the manufacturer's guidelines.
2. PVC Gasketed, Push-on Fittings
 - a. Acceptable fittings for use with fusible PVC pipe shall include standard PVC pressure fittings conforming to AWWA C900 or AWWA C907, and shall include gasketed PVC, push-on type couplings and fittings, including bends, tees, and couplings as shown in the drawings.
 - b. Bends, tees and other PVC fittings shall be restrained with the use of thrust blocking or other restraint products as indicated in the construction documents.
 - c. PVC gasketed, push-on fittings and mechanical restraints, if used, must be installed per the manufacturer's guidelines.
3. Fusible PVC Sweeps or Bends
 - a. Fusible PVC sweeps or bends shall conform to the same sizing convention, diameter, dimensional tolerances and pressure class of the pipe that they are joining together.
 - b. Fusible PVC sweeps or bends shall be manufactured from the same fusible PVC pipe being used for the installation, and shall

have at least 2 feet of straight section on either end of the sweep or bend to allow for fusion of the sweep to the pipe installation.

- c. Standard fusible PVC sweep or bend angles shall not be greater than 22.5 degrees, and shall be used in nominal diameters ranging from 4 inch through 16 inch.

E. Plugs: Plugs shall comply with AWWA C110 or AWWA C153, with coatings per AWWA C104 and AWWA C111, plugs shall be Tyler 5-152 or approved equal.

F. Couplings: Flexible Couplings shall be of ASTM A53, ASTM A512, or carbon steel having a minimum yield strength of 30,000 psi. Coating shall be fusion bonded epoxy coated and be a minimum of 10-mils thick or coated with 14-20 mils dry film thickness of high-build epoxy, applied in 2 coats. Surface preparation to be SSPC-SP-10 (near white). Couplings shall be Dresser Style 38 (or 39 insulating couplings, if called for). Bolts, nuts and washers are to be series 300 stainless steel.

Materials used to make the connection between HDPE and PVC shall be restrained. Restraint can be made using a butt-fused flange onto the HDPE end and a Meg-a-lug (or approved equal) connection on the PVC end, as well as a fused restraining gland and thrust block on the HDPE pipe. The CONTRACTOR shall submit the coupling and the restraint system to the ENGINEER for approval.

2.06 TAPPING SLEEVE

Tapping sleeves shall be made of ¼-inch carbon steel meeting ASTM A285, with a fusion bonded epoxy coating with minimum thickness of 10 mils, per Section 13900. Flanges shall be Class D ANSI 150 lb., complying with AWWA C207. A properly sized gasket is to be provided to create a watertight seal. Bolts and nuts are to be series 300 stainless steel. The tapping sleeves are to be Smith-Blair 622 series, or approved equal.

2.07 RESTRAINED JOINTS:

A. PVC Pipe: Restraints on pipe or fittings shall be EBAA Iron, or approved equal. They shall be 2000PV, 1500, 1600, 2800, 2600, 2500, or 15/19PF00, as appropriate for the installation and whether the restraint is across a pipe joint or connecting a pipe to a fitting or valve. All metal in the restraint shall be stainless steel or coated as noted below. T-bolts and gland bolts shall be stainless steel or coated with 8 mils of fusion bonded epoxy. The installed device shall have a pressure rating of at least 150 psi.

B. Coatings: The coating on mechanical restraints shall be electrostatically applied polyester, 4 mils minimum, following surface preparation of a minimum of an iron phosphate bath, rinse and heat drying, or approved equal. The coating shall be EBAA-Iron Mega-Bond, or approved equal. Wedge assemblies may be Xylan fluoropolymer coated, 2 coats minimum

2.08 INSULATION BOARD

Where a minimum depth of 6-feet of cover cannot be maintained, or as shown in the Plans, over the water line, rigid, extruded polystyrene insulation board is to be provided. The board is to comply with ASTM C578 Type IV. The board shall have a minimum aged R-value per inch of

5.0 per ASTM C518, a minimum compressive strength of 25 psi per ASTM D1621; a maximum water absorption per ASTM C272 of 0.2% by volume, and a maximum linear change according to ASTM D2126 of 3%. The board is to be 2 inches thick with a composite thickness of 4 inches and is to extend out 3 feet from the center of the pipe, unless the depth of cover over the pipe is less than 3.5 feet, then it is to extend 4 feet from the center of the pipe. The board is to be Dow Styrofoam Brand, or approved equal.

2.09 WARNING TAPE AND TRACER WIRE:

- A. Detectable Warning Tape: Detectable Warning Tape shall be provided in accordance with Subsection 2.14A of Section 13900.
- B. Tracer Wire: Tracer wire shall be provided in accordance with Subsection 2.12A of Section 13900.

2.10 OTHER

- A. Joint Bond Wires and Anodes: Joint Bond Wires shall be single-conductor, stranded copper wire with 600-volt HMWPE insulation. Wires and anodes shall be per Section 13900.
- B. Concrete: Concrete shall be Class B in accordance with Section 03010.

PART 3 - EXECUTION

3.01 PIPE INSTALLATION (OPEN-CUT METHOD):

- A. Excavation and Backfill: Excavation, backfill and compaction for pipe shall conform to the applicable portions of Section 02221.
- B. Handling of Pipe: All pipe furnished by the CONTRACTOR shall be delivered and distributed at the site by the CONTRACTOR. Pipe, fittings, and accessories shall be loaded and unloaded by lifting with hoists or skidding so as to avoid shock or damage. Under no circumstances shall materials be dropped. Pipe handled on skidways shall not be skidded or rolled against pipe already on the ground. Handling of pipe is to comply with manufacturer's recommendations. Bands on bundled pipe are to be cut with a handheld snips.

In distributing the material at the site of the Work, each piece shall be unloaded opposite or near the place where it is to be installed. All material shall be stored in a neat and orderly manner.

Pipe with joint rings shall be handled in such a manner that no weight, including the weight of the pipe, will bear on or be supported by the joint rings at any time. Care shall be taken to avoid dragging the spigot ring on the ground or allowing it to come in contact with gravel, crushed stone, rocks, or other hard objects. Joint rings which have been damaged in any way will not be accepted and shall not be incorporated in the Work. Pipe shall be so handled that the coating and lining will not be damaged. If, however, any part of the coating or lining is damaged, the repair shall be made by the CONTRACTOR at his expense in a manner

satisfactory to the ENGINEER. All repairs are to comply with manufacturer's recommendations and these Specifications.

C. Laying Pipe: Before installation, the pipe and pipe coating shall be inspected for defects. Any damage to pipe or coatings shall be repaired as recommended by the pipe manufacturer before laying the pipe. All pipe shall be laid and maintained to the required lines and grades with fittings and tees installed at the required locations, except as adjusted in the field by the ENGINEER. When obstructions are encountered during the progress of the work and they are not shown in the Plans, and the obstructions interfere to such an extent that an alteration in the alignment is required, the ENGINEER shall have the authority to change the alignment and order a deviation from the line and grade or arrange for the removal, relocation or reconstruction of the obstructions. If the change from the plans results in a change in the amount of work by the CONTRACTOR, such altered work shall be done on the basis of payment to the CONTRACTOR for extra work or credit to the OWNER for less work.

Proper implements, tools, and facilities satisfactory to the ENGINEER shall be provided and used by the CONTRACTOR for the safe and convenient prosecution of the Work. All pipe and fittings shall be carefully lowered into the trench piece by piece by means of a derrick, ropes or other suitable tools or equipment, in such a manner as to prevent damage to pipe. Under no circumstances shall materials be dropped or dumped into position.

Water shall not be allowed to accumulate in the trench during the laying of the pipe or in the initial backfill operations. The trench shall be dewatered in accordance with Section 02401. The CONTRACTOR shall take all necessary precautions to prevent surface water from entering the pipeline trench.

Pipe shall be protected from lateral displacement by means of pipe embedment material installed as provided in Section 02221. Under no circumstances shall pipe be laid in water and no pipe shall be laid under unsuitable weather or trench conditions.

Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the trench. If the pipe laying crew cannot put the pipe into the trench and in place without getting earth into it, the ENGINEER may require that before lowering the pipe into the trench, a heavy, tightly woven canvas bag of suitable size shall be placed over each end and left there until the connection is to be made to the adjacent pipe. Before final acceptance the CONTRACTOR shall remove from the pipe any foreign material which may have gotten into the line.

During laying operations, no debris, tools, clothing or other material shall be placed in the pipe. At times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other means approved by the ENGINEER. Preparatory to making the joints, the pipe grade and alignment shall be checked and all dirt or other foreign matter shall be removed from the bell or coupling. Trenching, backfill, and compaction shall conform to Section 02221.

Ductile iron pipe shall be installed in accordance with AWWA C600 - latest edition. PVC pipe shall be installed in accordance with AWWA M23 - latest edition. PE pipe shall be installed in accordance with AWWA C906 - latest edition.

All water lines shall be laid with a minimum cover over top of pipe of 6.0 feet unless otherwise specified in the Plans. The minimum cover shall be measured from the final grade or interim grade, whichever is lower.

D. Mechanical Joints: The inside of the bell and the outside of the spigot of the mechanical joint fittings shall be brushed thoroughly with a wire brush to remove all loose rust or other foreign material just prior to assembly. The cleaned surfaces shall be brushed with soapy water just prior to slipping the gasket over the spigot end and into the bell.

The spigot end of the pipe or fitting shall be accurately centered in the bell before jointing is begun. After the gasket is in place, the gland shall be brought up toward the pipe flange evenly, maintaining approximately the same distance between the gland and the face of the flange at all points around the gland. Bolts shall be partially tightened, alternately around the gland, maintaining approximately equal tension until the final tension is reached. The minimum distance between mechanical joint flanges shall be 2.0 feet. The maximum distance shall be 5 feet when fittings are identified as being installed close to each other.

The normal range of bolt torques to be applied to the bolts in the joints shall be as follows:

Bolt Size - (Inch)	Range of Torque (Ft. - Lb.)
5/8	40 - 60
3/4	60 - 90
1	70 - 100
1¼	90 - 120

The manufacturer shall confirm and document the torque required for a certain installation when requested by the ENGINEER. The above torque loads may be applied with torque measuring or indicating wrenches, or they may be applied using regular socket wrenches and checked with torque wrenches.

If effective sealing is not attained at the maximum torque indicated above, the joint shall be disassembled and reassembled after thorough cleaning. Overstressing of bolts to compensate for poor installation practice will not be permitted. Anti-seize lubricant shall be used with stainless steel bolts. All bolts shall be of the style, length and diameter called for by the manufacturer for the particular application. Nuts shall seat fully and be fully threaded. Also see Section 13900.

E. Pipe Deflection: Wherever it is necessary to deflect pipe from a straight line, either in the vertical or horizontal plane to avoid obstructions where long-radius curves are permitted, the amount of deflection allowed shall not exceed that required for satisfactory jointing and shall not exceed the applicable material and

joint specifications of the latest edition of AWWA C600 and Manual M23, nor shall they exceed the recommendations of the pipe manufacturer whichever is more stringent. Bending of smaller diameter pipe is allowed, if allowed by the manufacturer and M23, up to the more stringent limits of the two. Care must be taken to not deflect or bend the pipe past the allowable amount. Additional excavation shall be made when necessary to reduce vertical joint deflections to acceptable levels, and to avoid high points in the line, other than those shown in the Plans. All high points are to occur at air release valves, hydrants, or service lines.

F. Rubber Gasketed Joints: Jointing of pipe made with a rubber gasket joint shall be made as recommended by the manufacturer. The rubber gasket and gasket seats inside the bell shall be wiped clean with a cloth. A thin film of lubricant, furnished with the pipe, shall be applied to the inside surface of the gasket, per manufacturer's requirements. The plain end of the adjoining pipe shall be wiped clean and inserted on a straight line into the bell a sufficient distance to make contact with the gasket. The plain end shall then be forced "home" by the use of a crow bar, fork tool or jack assembly. Care must be taken to not insert the pipe past the home line.

The Contractor shall not over-stab the pipe joint by inserting the spigot past the "home line" marked on the spigot end. Hand stabbing or stabbing using manual lever-type devices are preferable for making joint connections. All over-stabbed joints shall be removed and reinstalled. If power equipment is used to perform the pipe stabbing operation and results in the movement of the pipe into which the spigot end is being inserted, the CONTRACTOR shall expose a minimum of three previously installed joints to allow the inspector to verify if previous joints are past the "home line". If CONTRACTOR's method of installation results in previously installed pipe joints moving such that the "home line" is not visible, then the CONTRACTOR shall modify his installation method to result in an acceptable installation.

G. Testing and Disinfection: Pipelines and appurtenances shall be tested and disinfected as specified in Section 02766.

H. Separation with Sewers: Water mains and water service lines shall be installed to provide at least a 10-foot horizontal separation from any existing sanitary or storm sewer. This distance shall be measured from edge-of-pipe to edge-of-pipe. These requirements include service lines. At crossings, a minimum vertical distance of 18-inches from edge-of-pipe to edge-of-pipe shall be maintained between the water and the sewer pipes. This shall be the case when the water main is either above or below the sewer. At crossings, one full length of water main shall be located so both joints are as far as possible from the sewer.

At all crossings, pipe and backfill shall be properly installed to support the pipes. Flowable fill is to be used at the crossing to full support both pipes. The material is to be tamped and rodded to fill all voids adjacent to and below both pipes and to compact the fill material.

Where the 10-foot horizontal separation cannot be maintained, this separation may be reduced to 5 feet provided the bottom of the water main is at least 18-

inches higher than the top of the sewer. Where the requirements for the bottom of the water line to be at least 18 inches higher than the top of the sewer cannot be met, the installation is allowable only if the proposed water line is lowered to at least 3 feet below the invert of the sewer pipe when measured from the top of the waterline pipe.

When the required separations between water lines and sewer cannot be met, it shall be brought to the attention of the ENGINEER. A method for separating the lines, such as encasing in a minimum of 6 inches of flowable fill, in accordance with Section 02228, around the pipe, extended out a distance of 10 feet on both sides of the crossing, shall be approved in writing by the ENGINEER. The pipe shall be placed on blocks to allow the Flowable Fill under the pipe. The pipe shall be fully supported, and stakes used to hold it from lateral movement, to assure it is not displaced during the placement of the Flowable Fill.

Where it is not possible to maintain the 18-inch vertical separation at crossings, the existing sewer shall pass a pressure test or shall be replaced for a distance of at least 10-feet on either side of the crossing with the new pipe length(s) installed so that joints are as far as possible from the water main. The sewer shall be pressure tested with a minimum 3-foot head of water to assure that the joints within 10 feet of the water line do not leak.

Where unusual situations are encountered that make it impossible to follow the requirements of this Section a different approach might be required. That approach is to be designed on a case-by-case basis with the design for that particular separation approved by the OWNER and the Wyoming Department of Environmental Quality. The CONTRACTOR shall be paid for this particular work as required as a changed site condition.

- I. Thrust Blocking or Joint Restraints: Thrust blocking or joint restraints shall be installed at all vertical and horizontal fittings such as plugs, caps, tees, crosses, valves and bends greater than or equal to 11¼ degrees. See the Standard Details for requirements. All concrete thrust blocks shall be formed and poured against undisturbed earth as indicated in the Standard Details. After the thrust block is in place, all pipe joints and bolts shall still be accessible. The concrete thrust blocks should be allowed to cure before hydrostatically testing the pipe. The concrete shall attain at least 80 percent of its design strength as documented by compressive strength test results or allow seven days to elapse if compressive strength testing is not done. The heights of the thrust blocks should not exceed one-half of the depth from the ground surface elevation to the bottom of the thrust block.
- J. Detectable Warning Tape: Detectable Warning Tape shall be buried 18" to 24" below the finish surface grade shown in the Plans unless specified otherwise.
- K. Tracer Wire: Tracer wire shall be installed above all pipes as shown in the Standard Details. The tracer wire shall be insulated and brought to the surface in tracer wire access boxes at all hydrants.. The continuing wire shall also have a lead which begins at the surface and follows hydrant to the underground pipe. Tracer wire shall be attached to top of pipe with polyethylene tape at 10-foot maximum intervals. Tracer wire shall be tested prior to final acceptance of the water line in accordance with Section 13900, and approved by the ENGINEER.

The system of tracer wire shall be continuous. Splicing or other means used to provide a continuous wire, along with leads for testing, shall be as specified in Section 13900, or as approved by the ENGINEER.

Tracer wire for service lines shall not connect to the main line tracer wire. Tracer wire for water service lines shall be installed per the Standard Details.

L. Temporary Water. CONTRACTOR shall install a temporary water service main and temporary individual water service lines to each affected resident or business during water main and service line replacement. CONTRACTOR shall coordinate with the ENGINEER prior to transitioning to the temporary water system. A minimum 1 week notice shall be provided to the ENGINEER. CONTRACTOR shall provide a plan for installation, operation, and maintenance of the temporary system. The temporary water system shall be installed in accordance with all applicable water system specifications of this Section. CONTRACTOR shall also provide an executed "Temporary Water Service Line Alteration Sheet" within 24 hours of connection to temporary water. The temporary system may be supplied by direct connection to the City's water distribution system at the ends of construction, may utilize connection points at existing fire hydrants or as approved by the OWNER and/or ENGINEER. Individual water service lines shall be complete with isolation valves, metering, and backflow prevention. Connection of temporary service shall be identified in the field after consultation with the property owners.

The CONTRACTOR is ultimately responsible that each required service is installed. CONTRACTOR shall be responsible for cleaning debris from water meters, filters, etc. if problems arise. The temporary water service system shall not have any leaks. If leaks arise, they shall be immediately remedied. The ENGINEER shall notify the CONTRACTOR of any leaks found.

If the temporary water service system will be in operation during seasonal periods during which it may be subject to freezing, CONTRACTOR will provide a plan to prevent freezing. CONTRACTOR shall be responsible to prevent freezing and promptly repair damage and icing at no additional cost.

Any temporary or permanent plugging of existing lines in order to install temporary water systems, or to otherwise allow for construction of the water system, shall also be considered incidental to the construction and not paid for separately.

The CONTRACTOR must submit plans for any water shut-offs required to install the temporary or permanent water system. A minimum of one week must be provided to the City prior to any water shut-off, and a minimum of 48 hours' notice must be provided to any affected customers. No water may be shut off for more than four (4) hours, except water may be shut off during non-business hours for affected businesses.

3.02 PIPE INSTALLATION (HORIZONTAL DIRECTIONAL DRILLING METHOD):

A. Fusion Joints:

Unless otherwise specified, fusible PVC and HDPE pipe lengths shall be assembled in the field with butt-fused joints. The Contractor shall follow the pipe supplier's guidelines for this procedure. All fusion joints shall be completed as described in this specification.

B. Fusion Process:

1. General:

- a. Fusible PVC pipe shall be handled in a safe and non-destructive manner before, during, and after the fusion process and in accordance with this specification and pipe supplier's guidelines.
- b. Fusible PVC pipe shall be fused by qualified fusion technicians, as documented by the pipe supplier.
- c. Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) affixed to the fusion machine.
- d. Only appropriately sized and outfitted fusion machines that have been approved by the pipe supplier shall be used for the fusion process. Fusion machines must incorporate the following properties, including the following elements:

HEAT PLATE - Heat plates shall be in good condition with no deep gouges or scratches. Plates shall be clean and free of any debris or contamination. Heater controls shall function properly, cord and plug shall be in good condition. The appropriately sized heat plate shall be capable of maintaining a uniform and consistent heat profile and temperature for the size of pipe being fused, per the pipe supplier's guidelines.

CARRIAGE – Carriage shall travel smoothly with no binding at less than 50 psi. Jaws shall be in good condition with proper inserts for the pipe size being fused. Insert pins shall be installed with no interference to carriage travel.

GENERAL MACHINE - Overview of machine body shall yield no obvious defects, missing parts, or potential safety issues during fusion.

DATA LOGGING DEVICE - The current version of the pipe supplier's recommended and compatible software shall be used. Datalogging device operations and maintenance manual shall be with the unit at all times. If fusing for extended periods of time, an independent 110V power source shall be available to extend battery life.

- e. Other equipment specifically required for the fusion process shall include the following:

- i. Pipe rollers shall be used for support of pipe on either side of the machine.
 - ii. A weather protection canopy that allows full machine motion of the heat plate, fusion assembly and carriage shall be provided for fusion in inclement and /or windy weather.
 - iii. Fusion machine operations and maintenance manual shall be kept with the fusion machine at all times.
 - iv. Facing blades specifically designed for cutting the specific pipe material shall be used.
- f. Joint Recording: Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) connected to the fusion machine. The fusion data logging and joint report shall be generated by software developed specifically for the butt-fusion of thermoplastic pipe. The software shall register and/or record the parameters required by the pipe supplier and these specifications. Data not logged by the data logger shall be logged manually and be included in the Fusion Technician's joint report.

C. Drilling Operations:

1. General:

- a. The boring equipment shall include a boring head whose position can be controlled, and electronically determined from the ground surface at all times.
- b. The general approach shall be to locate underground utilities in the area, excavate drilling and receiving pits, drill a pilot hole, ream, and then pull through the pipe. The Contractor's submittal shall confirm the approach used and describe additional steps, as needed.
- c. Bore path and alignment are as indicated in the contract documents. The path of the bore may be modified based on field and equipment conditions as approved by the Engineer.
- d. At no time shall the CONTRACTOR exceed the 80% of the manufacturer's specified maximum yield strength in longitudinal or bending. CONTRACTOR will continuously monitor the forces and they will become part of the as-constructed documents.
- e. All pilot holes that are not acceptable shall be filled with a material acceptable to the ENGINEER.
- f. Monitor for any settlement or displacement of the surface or adjacent facilities. If such settlement or displacement occurs, temporarily cease operations, prepare a plan acceptable to the ENGINEER that corrects the settlement or displacement.
- g. Follow pipe manufacturer's recommendations for all bends, joints, and attachments. Follow all State, local and Federal laws and regulations controlling safety and pollution of the environment as well as requirements included in Section 01560. Properly contain and dispose of drilling muds and other fluids. Take precautions to prevent pollution of streams, lakes, ponds, reservoirs, and wetlands with silt, fuels, oils, bitumens, chemicals or other harmful materials.

D. HDPE Installation: Since HDPE pipe may contract after pulling it through the bore holes and pressurizing it, it shall be allowed to “relax” for 3 days after pulling through, and the connection to the pipe on the opposite side of the pull shall not be made until the pipe through the section has been pressurized. Once these segments satisfactorily pass the pressure test, the connection on the other side of the bore and to the adjoining pipe shall be made similarly to that discussed above and as shown on the Drawings. The CONTRACTOR is responsible for adequately restraining all pipe and connections and confirming the plan for installing and bringing the pipe on line, including consideration of pipe manufacturer’s requirements.

E. Location and Protection of Underground Utilities:

1. Correct location of all underground utilities that may impact the HDD installation is the responsibility of the Contractor, regardless of any locations shown on the drawings or previous surveys completed.
2. Utility location and notification services shall be contacted by the Contractor prior to the start of construction.
3. All existing lines and underground utilities shall be positively identified, including exposing those facilities that are located within an envelope of possible impact of HDD installation as determined for the project specific site conditions. It is the Contractor and HDD system operator’s responsibility to determine this envelope of safe offset from existing utilities. This will include, but is not limited to, soil conditions and layering, utility proximity and material, HDD system and equipment, and foreign subsurface material.

F. Site Location Preparation:

1. Work site as indicated on drawings shall be graded or filled to provide a level working area. No alterations beyond what is required for operations are to be made. All temporary grading or filling shall be returned to pre-existing conditions.
2. Contractor shall confine all activities to designated work areas.

G. Drilling Layout and Tolerances:

1. The drill path shall be accurately surveyed with entry and exit areas placed in the appropriate locations within the areas indicated on drawings. If using a magnetic guidance system, drill path will be surveyed for any surface geomagnetic variations or anomalies.
2. Instrumentation shall be provided and maintained at all times that accurately locates the pilot hole,(within 3 inches of its true position) measures drill-string axial and torsional loads and measures drilling fluid discharge rate and pressure. The Contractor shall track the position of the pipe and verify its correct location. The vertical position of the pipe shall be within 1-foot of its correct position at all locations and no additional high points shall be created as a result of the installation. Record pipe position at 25’ intervals and show this information on project record drawings.
3. Entry and exit areas shall be drilled so as not to exceed the bending limitations of the pipe as recommended by the pipe supplier.

4. The plan for the depth of the new pipe must be approved by the Engineer if it is to deviate from the plan.

H. Pilot Hole Bore:

1. Pilot hole shall be drilled along bore path. In the event that the pilot bore does deviate from the bore path, it may require contractor to pull-back and re-drill from the location along bore path before the deviation.
2. The Contractor shall limit curvature in any direction to reduce force on the pipe during pull-back. The minimum radius of curvature shall be no less than that specified by the pipe supplier and as indicated on the drawings.

I. Reaming

1. After successfully completing the pilot hole, the bore hole shall be reamed to a diameter which meets the requirements of the pipe being installed.

The following table is offered as an estimated guide:

Nominal Pipe Diameter	Bore Hole Diameter
< 8 inches	Pipe Dia. + 4 inches
8 inches to 24 inches	Pipe Dia. X 1.5
> 24 inches	Pipe Dia. + 12 inches

2. Multiple reaming passes shall be used at the discretion of the Contractor and shall conform to this specification.
3. In the event of a drilling fluid fracture, returns loss or other loss of drilling fluid, the Contractor shall be responsible for restoring any damaged property to original condition and cleaning up the area in the vicinity of the damage or loss.

J. Pipe Pull-Back and Insertion:

1. Pipe shall be fused prior to insertion, if the site and conditions allow, into one continuous length.
2. Contractor shall handle the pipe in a manner that will not over-stress the pipe prior to insertion. Vertical and horizontal curves shall be limited so that the pipe does not bend past the pipe supplier's minimum allowable bend radius, buckle, or otherwise become damaged. Damaged portions of the pipe shall be removed and replaced.
3. The pipe entry area shall be graded as needed to provide support for the pipe and to allow free movement into the bore hole.
4. The pipe shall be guided into the bore hole to avoid deformation of, or damage to, the pipe.

5. The pipe may be continuously or partially supported on rollers or other Owner and Engineer approved friction decreasing implement during joining and insertion, as long as the pipe is not over-stressed or critically abraded prior to, or during installation.
6. A swivel shall be used between the reaming head and the pipe to minimize torsion stress on the pipe assembly.
7. Buoyancy modification shall be at the sole discretion of the Contractor, and shall not exceed the pipe supplier's guidelines in regards to maximum pull force or minimum bend radius of the pipe. Damage caused by buoyancy modifications shall be the responsibility of the Contractor.
8. Once pull-back operations have commenced, the operation shall continue without interruption until the pipe is completely pulled through the bore hole.
9. The pipe shall be installed in a manner that does not cause upheaval, settlement, cracking, or movement and distortion of surface features. Any damages caused by the Contractor's operations shall be corrected by the Contractor.

K. Installation Cleanup:

1. Following the installation, the project site shall be returned to a condition equal to or better than the pre-construction condition of the site. All excavations will be backfilled and compacted per the construction documents and jurisdictional standards. All pavement and hardscape shall be repaired per applicable jurisdictional standards, excess materials shall be removed from the site, and disturbed areas shall be re-landscaped. All drilling fluid shall be properly disposed of per these specifications and all applicable jurisdictional laws.
2. Contractor shall verify that all utilities, structures, and surface features in the project area are sound.

L. Preparation Prior To Making Connections Into Existing Piping Systems:

1. Approximate locations for existing piping systems are shown in the construction documents. Prior to making connections into existing piping systems, the Contractor shall:
 - a. Field verify location, size, piping material and piping system of the existing pipe.
 - b. Obtain all required fittings, which may include saddles, sleeve type couplings, flanges, tees, or others as shown in the construction documents.
 - c. Have installed all temporary pumps and/or pipes in accordance with established connection plans.

- d. Unless otherwise approved, new piping systems shall be completely assembled and successfully tested prior to making connections into existing pipe systems.

M. Installation and Pressure Testing:

1. Fused joint pipe shall be installed in accordance with these specifications and the manufacturer's recommendations. This work shall be performed by operators experienced with this work.
2. A technical representative for the pipe manufacturer shall be on site for the installation of the first 600 feet of pipe or 3 days of fused installation, whichever is more. The technical representative shall also be present for longer periods or return as necessary to provide training and observe procedures of the CONTRACTOR'S pipe installation processes. He shall also return if requested by the ENGINEER, if the ENGINEER believes the processes used have changed from those observed by the representative. His observations shall include but not necessarily be limited to pipe handling and installation, pipe deflection and measurement, installation of fittings, fusion procedures, test methods and repair procedures.
3. Following the initial field visit, the manufacturer's representative shall provide a letter to the ENGINEER stating that the CONTRACTOR'S installation procedures are acceptable. If any deficiencies in installation are found or changes in methods are required or recommended, these must be put in writing to the CONTRACTOR and ENGINEER. Manufacturer's letter shall itemize and describe changes to CONTRACTOR's installation procedures which will result in acceptance by the manufacturer. The pipe manufacturer's representative shall also be available to respond to the ENGINEER'S questions regarding this pipe and its installation. The ENGINEER may contact the representative directly and they shall respond directly to the ENGINEER. All responses shall be in writing within 3 working days.
4. CONTRACTOR shall perform pressure testing of installed pipe at least once every three weeks or at intervals not to exceed 2,000 feet of installed pipe, whichever is more often. Pressure tests shall be per section 02766. Temporary plugs, thrust restraint, air release and means of filling with water, shall be provided by the CONTRACTOR as required. The cause of each leak discovered shall be determined and leak(s) shall be acceptably repaired.

N. Adherence to Open Cut Method of Piping Installation Specifications: The specifications for the following subsections of the section entitled Piping Installation (Open-cut Method) shall be adhered to when using the horizontal directional drilling method of piping installation:

1. Testing and Disinfection
2. Separation with Sewers
3. Tracer Wire.

PART 4 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.01 METHOD OF MEASUREMENT:

A. Standard Items:

1. 02710.0X – X” PVC WATER MAIN

This item shall be measured on a lineal foot (LF) basis. Measurement of water mains shall be made along the centerline of pipe through all valves, fittings and appurtenances.
2. 02710.0Y – Y” HORIZONTAL DIRECTIONALLY DRILLED WATER MAIN

This item shall be measured on a lineal foot (LF) basis. Measurement of horizontal directionally drilled water mains shall be made along the centerline of pipe through all valves, fittings and appurtenances.
3. 02710.1XY – X” x Y” REDUCER

This item shall be measured on a per each (EA) basis. Measurement for this item will be made in the field with the quantity for payment determined by the actual number of each fitting furnished and installed.
4. 02710.2XY – X” x Y° BEND

This item shall be measured on a per each (EA) basis. Measurement for this item will be made in the field with the quantity for payment determined by the actual number of each fitting furnished and installed.
5. 02710.3X – X” PLUG

This item shall be measured on a per each (EA) basis. Measurement for this item will be made in the field with the quantity for payment determined by the actual number of each fitting furnished and installed.
6. 02710.4XYZ – X” x Y” x Z” TEE

This item shall be measured on a per each (EA) basis. Measurement for this item will be made in the field with the quantity for payment determined by the actual number of each fitting furnished and installed.
7. 02710.5XY – X” x Y” CROSS

This item shall be measured on a per each (EA) basis. Measurement for this item will be made in the field with the quantity for payment determined by the actual number of each fitting furnished and installed.
8. 02710.6XX – CONNECT TO EXISTING XX” WATERLINE

This item shall be measured on a per each (EA) basis. Measurement for this item will be made in the field with the quantity for payment determined by the actual number of each connection made to an existing X" waterline.

9. 02710.80 -- TEMPORARY WATER SYSTEM

This item shall be paid as a Lump Sum (LS). Measurement for this item will be made in the field with the quantity for payment determined by the percentage of the Temporary Water System constructed.

4.02 BASIS OF PAYMENT:

A. STANDARD ITEMS

1. 02710.0X – X" PVC WATER MAIN

This item shall be paid for at the contract unit price bid, which price and payment shall constitute full payment for all trench excavation, imported pipe bedding material, backfill, compaction, shoring, dewatering, furnishing and installing material for trench plugs when required, furnishing and installing pipe, warning tape and tracer wire, installation of cathodic protection test stations as identified in the Plans, cleaning, testing and disinfecting the water main and all other work necessary or incidental for completion of the item.

2. 02710.0Y – Y" HORIZONTAL DIRECTIONALLY DRILLED WATER MAIN

This item shall be paid for at the contract unit price bid, which price and payment shall constitute full payment for all trench excavation, bore pit and surface restoration or existing structure/feature removal or repair not paid under other bid items, shoring, dewatering, bedding, backfill, compaction, construction staking, temporary controls, water pipe, thrust blocking and joint restrainers, tracer wire, testing, disinfection and flushing, temporary water service if need, final grading, and all other materials, tools, fittings, equipment, labor and performance of all work necessary or incidental for satisfactory completion of these items.

3. 02710.1XY – X" x Y" REDUCER

Payment will be made at the Contract Unit Bid price per each fitting and will constitute full compensation for all trench excavation, shoring, backfill, compaction, construction staking, warning tape, tracer wire, thrust restraint, nuts and bolts, cathodic protection (if required), polyethylene wrap (if required), providing all testing and disinfection, haul, placing, and dewatering. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

4. 02710.2XY – X” x Y° BEND

Payment will be made at the Contract Unit Bid price per each fitting and will constitute full compensation for all trench excavation, shoring, backfill, compaction, construction staking, warning tape, tracer wire, thrust restraint, cathodic protection (if required), polyethylene wrap (if required), providing all testing and disinfection, haul, placing, nuts and bolts and dewatering. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

5. 02710.3X – X” PLUG

Payment will be made at the Contract Unit Bid price per each fitting and will constitute full compensation for all trench excavation, shoring, backfill, compaction, construction staking, warning tape, tracer wire, thrust restraint, cathodic protection (if required), polyethylene wrap (if required), providing all testing and disinfection, haul, placing, and dewatering. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents. Any temporary or permanent plugging of existing lines in order to install temporary water systems, or to otherwise allow for construction of the water system, shall be considered incidental to the construction and not paid for separately.

6. 02710.4XYZ – X” x Y” x Z” TEE

Payment will be made at the Contract Unit Bid price per each fitting and will constitute full compensation for all trench excavation, shoring, backfill, compaction, construction staking, warning tape, tracer wire, thrust restraint, nuts and bolts, cathodic protection (if required), polyethylene wrap (if required), providing all testing and disinfection, haul, placing, and dewatering. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

7. 02710.5XY – X” x Y” CROSS

Payment will be made at the Contract Unit Bid price per each fitting and will constitute full compensation for all trench excavation, shoring, backfill, compaction, construction staking, warning tape, tracer wire, thrust restraint, cathodic protection (if required), polyethylene wrap (if required), providing all testing and disinfection, nuts and bolts, haul, placing, and dewatering. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

8. 02710.6XX – CONNECT TO EXISTING XX” WATERLINE

Payment will be made at the Contract Unit Bid price per each connection and will constitute full compensation for locating existing pipe, connecting to existing piping, connecting coupling, restrained joints, disposal of pipe,

fittings, reducer(s), tees, all trench excavation, shoring, backfill, compaction, warning tape, tracer wire, thrust restraint, nuts and bolts, providing all testing and disinfection, haul, placing, and dewatering. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

9. 02710.80 -- TEMPORARY WATER SYSTEM

Payment will be made at the Contract Unit Bid price for the Temporary Water System and will constitute full compensation for all tools, equipment, materials, labor and incidentals necessary to install, maintain and remove the Temporary Water System.

END OF SECTION 02710

PART 1 - GENERAL

1.01 WORK INCLUDED:

The work covered by this Section of the Specifications includes furnishing and installing all sanitary sewer piping on the Project.

This Section also includes sanitary sewer services. Unless obtained by the Engineer, a permit for the sanitary service line work shall be obtained from the City of Sheridan Building Department. All sanitary service line work shall comply with City Codes and the currently adopted Plumbing Code. Inspection by the City Plumbing Inspector shall be arranged for when required.

1.02 RELATED WORK:

- A. Section 02221 - Trenching, Backfilling and Compacting
- B. Section 02401 - Dewatering
- C. Section 02722 - Manholes

1.03 RESPONSIBILITY FOR MATERIALS:

The CONTRACTOR shall be responsible for all material furnished by him/her, and shall replace at his/her own expense, all such material found defective in manufacture or damaged in handling after delivery by the manufacturer. This shall include the furnishing of all material and labor required for the replacement of installed material discovered defective prior to the final acceptance of the Work, or during the 1-year warranty period.

The CONTRACTOR shall be responsible for the safe storage of material furnished by him/her or to him/her and accepted by him/her and intended for the Work, until it has been incorporated in the completed Project. The interior of all pipe and other accessories shall be kept free from dirt and foreign matter at all times.

Pipe shall be carefully inspected for soundness before being installed in the trench. Rejected pipe and fittings shall be removed from the site immediately and permanently.

1.04 SUBMITTALS:

Submittals will be required for all materials in accordance with this Section and Section 01300.

PART 2 - PRODUCTS

2.01 SANITARY SEWER PIPE:

- A. PVC Pipe: All polyvinyl chloride sewer pipe shall be manufactured of PVC plastic having a minimum cell classification of 12354-B as determined by ASTM D1784. All PVC pipe shall have a minimum SDR of 35 and be manufactured in accordance to ASTM D3034. Pipe shall be bell and spigot type with rubber gasket type joints conforming to ASTM F477. The pipe shall comply with ASTM Standards F794 and D2412.
- B. Service Wyes: All service tees shall be manufactured of the same material as the main line pipe. The connection to the main shall be made by a 45° wye, except

for in the case of tapping a lined main, detailed in the following section. The service connection shall be in-line type for new construction or a saddle type for existing installations, as approved by ENGINEER. All service connections shall be 4" diameter, unless 6" is required by the Plans.

C. Service Tees—Tapping Lined Mains: When the main to be tapped has been previously lined, the Inserta Tee ® Fatboy fitting shall be used for the tap.

D. Service Line Pipe: The pipe and fittings used for sanitary sewer services shall be Schedule 40 PVC. All service pipes shall be 4" diameter unless 6" is required by the Plans. Appropriate connections/gaskets must be used to both ends of the service line so all connections are water tight and fit properly
A cleanout shall be installed on all sanitary service lines at the property line. Cleanouts shall be the same size as the service line.

Copperhead tracer wire, or approved equal in accordance with Subsection 2.12A of Section 13900, "Tracer Wire," shall be installed along all sanitary service lines. Tracer wire for sanitary service lines shall be colored green in accordance with the American Public Works Association (APWA) Uniform Color Code . The tracer wire shall be brought up at the cleanout. At least 1 foot of extra wire shall be wrapped around the top of the cleanout. All cleanouts shall have a minimum of 12" length section of #4 reinforcing steel bar placed beside the cleanout for locating purposes.

E. Manholes: Manholes shall be constructed of precast reinforced concrete in accordance with Section 02722.

F. Plugs and Markers: Sanitary sewer service lines shall be capped or plugged if not put into service immediately. The cap or plug shall be gasketed, watertight injection molded PVC caps or plugs compatible for use with gasketed sanitary sewer pipe. The end of the sanitary sewer services shall be marked with a 2"x4" wooden stud, four feet in length (minimum), buried as shown in the Standard Details. The 2"x4" shall be located immediately adjacent to the plug or cap, painted green and shall have a 2 foot piece of #4 reinforcing steel bar placed next to the 2"x4" for future locating purposes. The #4 bar shall not extend above finished grade and the 2"x4" shall only extend 1-foot above finished grade.

G. Couplings: Connections from the existing sanitary sewer main to the new sanitary sewer main shall be a double band reinforced Fernco coupling or approved equal.

Couplings for service lines of dissimilar materials shall be rubber or elastomeric sleeve and stainless steel band assembly fabricated to match outside diameters of pipes to be joined.

Sleeves: ASTM C425, rubber for vitrified clay pipe and ASTM F477, elastomeric for plastic pipe. Sleeves for dissimilar or other pipe materials shall be compatible with pipe materials being joined.

Couplings shall be Indiana Seal ShearGuard or approved equal.

H. Future stub-outs: Any future stub-out for a newly installed sanitary sewer main shall end with a clean out of the same size diameter as the mainline pipe or with a manhole.

I. Force Mains: The pipe and fittings used for force mains shall be SDR21 conforming to the requirements of ASTM D 2241 and D 1784 with rubber gaskets conforming to ASTM D 1869 and F 477. Force main cleanouts shall be installed at the locations identified in the Plans. Cleanouts shall be the same size as the main line and of the same material. Gate valves associated with force main cleanouts shall meet the requirements of Section 02641.

2.02 WARNING TAPE:

A. Warning tape shall be heavy-gauge, 4 mil minimum thickness, plastic tape for use in trenches.

1. Warning tape shall be non-traceable type. Warning tape shall be resistant to corrosive soil and intended for extended direct burial service.
2. Tape shall meet A.P.W.A. national color code and shall be imprinted with an appropriate legend to define the type of utility. Tape shall be labeled with bold black letters for full length of tape.
3. Warning tape for plastic pipelines shall be a minimum of 12-inch width. Warning tape shall be green, and labeled "CAUTION: SEWER LINE BURIED BELOW".
4. Acceptable products are available from ITT Blackburn; Allen Systems, Inc.; Griffolyn Co.; or approved equal.

PART 3 - EXECUTION

3.01 PIPE INSTALLATION:

A. Excavation and Backfill: Excavation, backfill and compaction shall conform to the applicable portions of Section 02221. Bedding pertains to both mains and service lines.

B. Handling of Pipe: All pipe furnished by the CONTRACTOR shall be delivered and distributed at the site by the CONTRACTOR. Pipe and accessories shall be loaded and unloaded by lifting with hoists or skidding so as to avoid shock or damage. Under no circumstances shall such materials be dropped. Pipe handled on skid-ways shall not be skidded or rolled against pipe already on the ground. Metal bands around pipe bundles shall be cut with a hand-held snips.

Pipe shall be so handled that the pipe, coating and lining will not be damaged. If, however, any part of the coating or lining is damaged, the repair shall be made by the CONTRACTOR at his expense in a manner satisfactory to the ENGINEER.

C. Laying Pipe: All pipe shall be laid and maintained to the required lines and grades with fittings and tees installed at the required locations. Pipe runs shall be installed where indicated if the piping is dimensioned. Where piping is not dimensioned, the CONTRACTOR shall install the pipe as close as possible to the locations indicated, as approved by the ENGINEER.

Wherever obstructions not shown in the Plans are encountered during the progress of the Work and interfere to such an extent that an alteration in the plan is required, the ENGINEER shall have the authority to change the Plans and order a deviation from the line and grade or arrange for the removal, relocation or reconstruction of the obstructions. If the change from the Plans results in a change in the amount of Work by the CONTRACTOR, such altered Work shall be done on the basis of payment to the CONTRACTOR for extra work or credit to the OWNER for less work.

Proper implements, tools, and facilities satisfactory to the ENGINEER shall be provided and used by the CONTRACTOR for the safe and convenient execution of the Work. All pipe and fittings shall be carefully lowered into the trench piece by piece by means of a derrick, ropes or other suitable tools or equipment, in such a manner as to prevent damage to pipe. Under no circumstances shall materials be dropped or dumped into position.

Water shall not be allowed to accumulate in the trench during the laying of the pipe or the initial backfill operations. The trench shall be dewatered in accordance with Section 02401. The CONTRACTOR shall take all necessary precautions to prevent surface water from entering the sewer trench. The cost of dewatering the trench shall be included in the CONTRACTOR's bid.

Pipe shall be protected from lateral displacement by means of pipe embedment material installed in accordance with Section 02221. Under no circumstances shall pipe be laid in water and no pipe shall be laid under unsuitable weather or trench conditions.

Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the line. If the pipe laying crew cannot put the pipe into the trench and in place without getting earth into it, the ENGINEER may require that before lowering the pipe into the trench, a heavy, tightly woven canvas bag of suitable size shall be placed over each end and left there until the connection is to be made to the adjacent pipe. Before final acceptance the CONTRACTOR shall remove from the pipe any foreign material which may have gotten into the line.

During laying operations, no debris, tools, clothing or other material shall be placed in the pipe. At times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other means approved by the ENGINEER.

Unless otherwise approved by the ENGINEER, the laying of pipe shall begin at the lowest point. For bell and spigot pipe, the pipe shall be installed so that the spigot ends point in the direction of flow.

For future stub-outs, the main shall either have a manhole or cleanout located at the end of the stub-out. Plans shall indicate which item to use or refer to the Standard Details.

Preparatory to making the joints, the pipe grade and alignment shall be checked and all dirt or other foreign matter shall be removed from the bell or coupling.

Sanitary Sewer mains shall be installed with a laser and under the full time supervision of the ENGINEER.

CONTRACTOR shall verify if each sanitary sewer service line is in use by flowing water down the line or otherwise testing the service line.

D. Rubber Gasketed Joints: Jointing of pipe made with a rubber gasket joint shall be made as recommended by the manufacturer. The rubber gasket and gasket seat inside the bell shall be wiped clean with a cloth. A thin film of lubricant, furnished with the pipe, shall be applied to the inside surface of the gasket. The plain end of the adjoining pipe shall be wiped clean and inserted into the bell a sufficient distance to make contact with the gasket. The plain end shall then be forced "home" by the use of a crow bar, fork tool or jack assembly.

E. Service Line Tap on a Lined Main: The area of the tap shall be prepared by breaking away the outer, deteriorated pipe by hand with a chisel, a diameter of 2 inches larger than the fitting diameter. Once exposed the pipe liner shall be cleaned, and the appropriate Inserta Tee hole saw shall be used to drill the hole for the fitting. The Inserta Tee Fatboy fitting shall be installed per the manufacturer's instructions supplied. The area of the tap shall then be restored by removing any loose pieces of the outer pipe and, when necessary to protect the pipe liner, encasing the cut-away area with concrete.

F. Sewer Testing:

1. General: The CONTRACTOR shall provide all equipment, materials, and do all work necessary to conduct tests to determine any leakage on the installed gravity sewer and also to determine and correct any structural problems with the installed sewer.

The tests to be required before acceptance shall include exfiltration and infiltration, lamp test, manhole acceptance, mandrel, and will include video inspection, and deflection. All tests shall be performed in the presence of the ENGINEER. The ENGINEER shall be notified at least 48 hours in advance of all testing.

When work consists of installation or replacement of sanitary sewer mains with multiple active service lines where exfiltration or air testing is not practical, the CONTRACTOR shall provide a video inspection of all service lines from the cleanout to the main (or point of connection to existing service line to the main, whichever distance is greater). The CONTRACTOR shall provide all labor, materials, equipment and bear the cost for the service line video inspections. The CONTRACTOR shall repair areas that do not comply with the Specifications and re-video these areas until all corrections are satisfactorily completed.

2. Exfiltration: Air testing will be considered for pipeline acceptance only, provided complete information describing the proposed test method is submitted to the ENGINEER for review and approval before testing is started.

If the leakage in any reach exceeds the allowable maximum it shall be re-tested after the leaks are repaired.

As an alternative method, the CONTRACTOR can conduct an exfiltration test on each reach of sewer between manholes to include all services and will be used for pipeline acceptance.

Exfiltration tests shall be conducted by blocking off all manhole openings except those connecting with the reach being tested, filling the line, and measuring the water required to maintain a constant level in the manholes. During the exfiltration test, the minimum water depth above the pipe invert shall be 2 feet.

The total exfiltration shall not exceed 100 gallons per inch of nominal diameter per mile of pipe per day for each reach tested. For purposes of determining maximum allowable leakage, manholes shall be considered sections of 48-inch pipe. The exfiltration tests shall be maintained on each reach for at least 2 hours or longer as necessary, in the opinion of the ENGINEER, to locate all leaks. In addition, any visible leaks or physical defects shall be repaired.

The CONTRACTOR shall provide, at his own expense, all necessary piping between the reach to be tested and the source of water supply, together with equipment and materials required for the tests. The methods used and the time of conducting exfiltration tests shall be acceptable to the ENGINEER.

3. Infiltration: If at any time prior to expiration of the one year correction period, there is any infiltration, the CONTRACTOR shall locate the leaks and make repairs as necessary to control the infiltration.
4. Alignment and grade: All sections of the sewer are to be within $\frac{3}{4}$ -inch of specified horizontal alignment and $\frac{1}{4}$ -inch of the specified vertical grade. A lamp test shall be performed to verify alignment between manholes.
5. Vacuum testing of manholes: The CONTRACTOR shall conduct a vacuum test on each manhole, or conduct a leakage test in conjunction with the test on the sewer. Test shall be conducted in accordance with ASTM C1244. It is recommended the vacuum test be completed prior to backfilling around the manhole.
 - a. All lift holes shall be plugged with non-shrink mortar.
 - b. All pipes entering the manhole shall be temporarily plugged, taking care to securely brace the pipes and plugs to prevent them from being drawn into the manhole.

- c. The test head shall be placed at the top of the manhole in accordance with the manufacturer's recommendations.
- d. A vacuum of 10 in. of mercury shall be drawn on the manhole, the valve on the vacuum line of the test head closed, and the vacuum pump shut off. The time shall be measured for the vacuum to drop to 9 in. of mercury.
- e. The manhole shall pass if the time for the vacuum reading to drop from 10 in. of mercury to 9 in. of mercury meets or exceeds the values indicated in Table 1.
- f. If the manhole fails the initial test, necessary repairs shall be made by an approved method. The manhole shall then be re-tested until a satisfactory test is obtained.

TABLE 1 Minimum Test Times for Various Manhole Diameters

Dep- th (ft)	Diameter, in.								
	30	33	36	42	48	54	60	66	72
	Time, sec								
8	11	12	14	17	20	23	26	29	33
10	14	15	18	21	25	29	33	36	41
12	17	18	21	25	30	35	39	43	49
14	20	21	25	30	35	41	46	51	57
16	22	24	39	34	40	46	52	58	67
18	25	27	32	38	45	52	59	65	73
20	28	30	35	42	50	53	65	72	81
22	31	33	39	46	55	64	72	79	89
24	33	36	42	51	59	64	78	87	97
26	36	39	46	55	64	75	85	94	105
28	39	42	49	59	69	81	91	101	113
30	42	45	53	63	74	87	98	108	121

- 6. Video Inspection: The sanitary sewer main shall be cleaned by the CONTRACTOR to the satisfaction of the ENGINEER if gravel, sediment or other material has entered the sanitary sewer. This shall be done prior to testing, final inspection and acceptance. It shall additionally be performed prior to street paving. The CONTRACTOR shall repair areas that do not comply with the Specifications.

The OWNER will perform a video inspection of the sewer main (8" or larger) before acceptance. Video inspections will be made after placement of backfill and crushed base surfacing over the sewer and AFTER the cleaning of the line and the lamp and mandrel testing have passed and approved by the ENGINEER. A smooth dry surface shall be prepared by the CONTRACTOR in order for the camera to make it to each manhole. Any low spots in the sewer pipe, which allow water to pond to a depth of ½-inch or greater, shall constitute a failure of the test. Failure of the camera to make it to each manhole due to obstructions, mud, low spots or other defects shall also constitute a failure of the test.

All low spots, which fail the video test, shall be brought to grade. Any spots showing infiltration, exfiltration, rolled gaskets, or other construction defects shall also be repaired. All repairs shall be made at no cost to the OWNER. Video inspection is to be repeated after the corrections are made.

Any time of the OWNER'S personnel associated with video inspection of the sanitary sewer, other than for the successful video inspection, will be invoiced to the CONTRACTOR by the OWNER. In addition, when the OWNER'S staff arrives at the scheduled time to perform the inspection, if the CONTRACTOR has not made the preparations to allow the inspection within 15 minutes of OWNER'S arrival, OWNER'S staff will leave and the inspection will be rescheduled through the ENGINEER, and a two-hour charge for OWNER'S personnel's time will be charged to the CONTRACTOR. All charges will use rates established by the City of Sheridan utility labor and equipment rates. The OWNER may also perform a videoing of the sewer near the end of the warranty period.

The video inspection shall be done in the presence of the ENGINEER. All tapes of the inspection shall become the property of the OWNER.

Where replacement sewer follows the alignment of the existing sanitary sewers, service lines will need to be reconnected as the new sewer is installed. This will prevent the use of a pressure test. The video inspection of the sewer mains may also be used in lieu of the pressure test to identify any infiltration or exfiltration, as approved by the ENGINEER.

All existing sanitary sewer mains may be videoed by the City of Sheridan prior to construction and after completion of construction. The CONTRACTOR will be responsible for repairs, to the satisfaction of the ENGINEER, and for any damage to existing sewer lines as a result of construction of the Project.

New service lines will also be videoed by the CONTRACTOR. The CONTRACTOR is responsible for correcting any problems found.

7. Deflection: A deflection test shall be conducted by pulling an approved solid pointed mandrel (Go-No Go device) through the installed sewer pipe prior to the City cameraing the sewer main. The diameter of the mandrel shall be 95 percent of the pipe diameter. Deflection testing shall be conducted on a manhole-to-manhole basis. Failure to pass the mandrel through a reach of sewer pipe shall constitute a failure of the test and will require the CONTRACTOR, at his expense, to locate and repair the portion of sewer pipe that has failed. Once repaired, that portion of pipe shall be deflection tested again.
8. Low Pressure Air Test: A low pressure air test may be used, if the CONTRACTOR's proposed procedures are approved by the ENGINEER. The test methods and evaluation of results shall comply fully with the latest edition of UNI-B-6, by Uni-Bell PVC Pipe Association of Dallas, TX. Equipment required includes: two air-tight plugs, braces for plugs,

compressor, air supply hose, throttling valve on air supply line, air bleed valve, high pressure shut-off valve on compressor, pressure gauge with isolation cock.

G. Separation with Water Mains: The sewer shall be laid at least 10-feet horizontally from any existing or proposed water main. This distance shall be measured from edge-of-pipe to edge-of-pipe. At crossings the sewer shall be installed to provide a minimum vertical separation of 18-inches between the outside of the water main and the outside of the sewer. This shall be the case when the sewer is either above or below the water main. At the crossing, sewer joints are to be arranged so that they are as far as possible from the water main.

At all crossings, pipe and backfill shall be properly installed to support the pipes. Flowable Fill, in accordance with Section 02228, is to be used at the crossing to fully support both pipes. The material is to be tamped and rodded to fill all voids adjacent to and below both pipes and to compact the fill material.

Where the 10-foot horizontal separation cannot be maintained, this separation may be reduced to 5 feet provided the bottom of the water main is at least 18 inches higher than the top of the sewer.

Where the requirements for the bottom of the water line to be at least 18 inches higher than the top of the sewer cannot be met, the installation is allowable under one of the following options:

- The proposed water line is lowered to at least 3 feet below the invert of the sewer pipe when measured from the top of the waterline pipe.
- The sewer may be encased in a minimum of 6 inches of Flowable Fill, in accordance with Section 02228, around the pipe, extended out a distance of 10 feet on both sides of the crossing. The pipe shall be placed on blocks to allow the lean concrete under the pipe. The pipe shall be fully supported, and stakes used to hold it from lateral movement, to assure it is not displaced during the placement of the Flowable Fill.
- The new section of sewer shall be pressure tested at 10 feet of head with allowable leakage determined by the equation in Subsection 3.01C of Section 02766. In addition to meeting this leakage limitation, there can be no visible leakage at joints in the sewer within 10 feet of the water main.

Place the sanitary sewer in a separate conduit (pipe) for a distance of 10 feet on either side of the crossing.

Sewer force mains must comply with Subsection 2.01H of this Section. No sewer services (taps on the sewer main) are allowed within 10' of a water main crossing.

Where unusual situations are encountered that makes it impossible to follow the requirements of this section a different approach might be required. That approach is to be designed on a case by case basis with the design for that particular separation approved by the Owner and the Wyoming Department of Environmental Quality. The Contractor shall be paid for this particular work as required as a changed site condition.

H. Separation of Water and Sewer Services: Water and sanitary sewer services shall be installed per Wyoming Department of Environmental Quality (WDEQ) regulations.

I. Prior to final acceptance of the sewers, the CONTRACTOR must thoroughly flush and clean lines of any construction debris. The CONTRACTOR is responsible for collecting any debris in these lines and preventing it from passing on downstream into the City sewer system. Any damages associated with the construction debris to any portion of the City's sewer system (including the wastewater treatment plant), shall be paid for in full by the CONTRACTOR.

J. Support of Sewer Crossings: Where a new pipeline crosses under an existing sanitary sewer main or sewer service, Flowable Fill, in accordance with Section 02228, will be placed between the two pipes to support the upper pipe. Flowable Fill must extend fully between the lower pipeline and the upper pipe.

PART 4 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.01 METHOD OF MEASUREMENT:

A. Standard Items:

1. 02712.0X – X" SANITARY SEWER MAIN

This item shall be measured on a lineal foot (LF) basis. Measurement shall be made along the centerline of pipe from centerline of manholes.

2. 02712.1X - X" PVC SANITARY SEWER SERVICE LINE

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of lineal feet (LF) of X" sanitary sewer service line furnished and installed as measured along the top centerline of the pipe through all cleanouts.

3. 02712.2X - X" SANITARY SEWER CLEANOUT

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of each (EA) X" sanitary sewer cleanouts furnished and installed.

4. 02712.3X – CONNECT TO EXISTING X" SANITARY SEWERLINE

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of each (EA) connection made to an existing X" sanitary sewerline.

5. 02712.4X - X" FORCE MAIN

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of lineal feet (LF) of X" force

main furnished and installed as measured along the top centerline of the pipe through all fittings and cleanouts.

4.02 BASIS OF PAYMENT:

A. Standard Items:

1. 02712.0X – X” SANITARY SEWER MAIN

Payment will be made at the Contract Unit Bid price per lineal feet (LF) of sanitary sewer main and will constitute full compensation for excavation, shoring, removal and disposal of any existing pipe being replaced, imported bedding material, backfill, compaction, construction staking, any bypass pumping required during installation, couplings to reconnect storm drains crossed by the sanitary sewer, warning tape, tracer wire (if required), haul, placing, furnishing and installing material for trench plugs when required, and dewatering. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

2. 02712.1X - X” PVC SANITARY SEWER SERVICE LINE

Payment will be made at the Contract Unit Bid price per lineal feet (LF) of X” sanitary sewer service line and will constitute full compensation for excavation, shoring, removal and disposal of any existing pipe being replaced, imported bedding material, connection to existing sanitary sewer services (including couplings and fittings), backfill, compaction, construction staking, tracer wire, haul, placing, crossing any underground utilities (both new and existing), televising after installation, and dewatering. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

3. 02712.2X - X” SANITARY SEWER CLEANOUT

Payment will be made at the Contract Unit Bid price for each (EA) cleanout furnished and installed, and will constitute full compensation for excavation, shoring, imported bedding material, backfill, compaction, construction staking from the control provided, tracer wire extensions, haul, placing, crossing any underground utilities (both new and existing), and dewatering. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

4. 02712.3X – CONNECT TO EXISTING X” SANITARY SEWERLINE

Payment will be made at the Contract Unit Bid price per each (EA) connection and will constitute full compensation for locating existing pipe, connecting to existing piping, connecting coupling, all trench excavation, shoring, backfill, compaction, any bypass pumping that may be required during connection, haul, placing, and dewatering. Price will also include

all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

Connections made to existing sewerlines at manholes shall be included in the bid item for the sanitary sewer eccentric manhole installation.

5. 02712.4X - X" FORCE MAIN

Payment will be made at the Contract Unit Bid price per lineal feet of force main and will constitute full compensation for trench excavation and backfill, furnishing and installing pipe, tracer wire and test station, warning tape, furnishing and placing bedding material, pressure and leakage testing. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

END OF SECTION 02712

PART 1 - GENERAL

1.01 WORK INCLUDED:

The work covered by this Section of the Specifications includes furnishing and installing all storm drain piping on the Project.

1.02 RELATED WORK:

- A. Section 02221 - Trenching, Backfilling and Compaction
- B. Section 02401 - Dewatering
- C. Section 02720 - Storm Drain Inlets
- D. Section 02722 - Manholes

1.03 RESPONSIBILITY FOR MATERIAL:

The CONTRACTOR shall be responsible for all such material furnished by him/her and shall replace, at his/her own expense, all such material found defective in manufacture or damaged in handling after delivery by the manufacturer. This shall include the furnishing of all materials and labor required for the replacement of installed material discovered defective prior to the final acceptance of the Work or during the one-year warranty period.

The CONTRACTOR shall be responsible for the safe storage of material furnished by him/her or to him/her and accepted by him/her and intended for the work. The interior of all pipe and other accessories shall be kept free from dirt and foreign matter at all times.

Pipe shall be carefully inspected for soundness before being installed in the trench. Rejected pipe and fittings shall be removed from the site immediately and permanently.

1.04 SUBMITTALS:

- A. Submittals will be required for all materials in accordance with this Section and Section 01300.
- B. Certification by Manufacturer:
 - 1. CONTRACTOR shall furnish certification by the manufacturer of the pipe to be furnished on the Project, certifying that the pipe complies with the applicable specifications. Required certification shall accompany each delivery of material.
 - 2. All pipe shall be clearly marked with type, class and or, thickness as applicable. Lettering shall be legible and permanent under normal conditions of handling and storage.
 - 3. Type of joint, class, thickness designation, casting, lining, marking, testing, etc., shall be specified.
- C. When boring and jacking storm drain pipe is required, before commencing installation, the CONTRACTOR shall present evidence to prove to the satisfaction of the ENGINEER that he has had previous experience in pipe installation of this nature. CONTRACTOR shall employ a superintendent able to furnish such

evidence and shall keep such supervisor continuously employed until the pipe installation is successfully completed.

PART 2 - PRODUCTS

2.01 PIPE:

A. Concrete Pipe. Pipe for storm drains shall be reinforced concrete pipe conforming to ASTM C76, C443 and C655. Joints for concrete pipe of 18" or larger shall be rubber gasket type conforming to ASTM C443, or as otherwise specified by ENGINEER. Pipe shall be a minimum B wall, Class III.

Elliptical pipe for storm drains shall be reinforced concrete pipe conforming to ASTM C507 and C655. Arch pipe may be substituted for elliptical pipe where shown in the Plans. Arch pipe for storm drains shall be reinforced concrete pipe conforming to ASTM C506 and C655. Joints for both elliptical and arch pipes shall be tongue and groove with a flexible mastic sealant conforming to ASTM C990. Elliptical and arch pipes shall be a minimum B wall, class III. Any increase in manhole size or other required modifications due to the use of arch pipe shall be at the CONTRACTOR's expense.

Any pipe jacked into place shall be Class V, with an R2 rubber and steel joint, and shall use a tongue-and-groove joint.

Cement for pipe shall be Type II or Type I-IISR.

B. PVC Pipe. PVC pipe shall meet the requirements of ASTM F794 and ASTM F949 for corrugated pipe. The pipe shall have a smooth interior and ribbed or corrugated exterior. The pipe stiffness shall be a minimum of 46 psi when tested at 5% deflection in accordance with ASTM D2412. Pipe shall be green in color. The pipe shall be ETI Ultra-Corr or ETI Ultra-Rib, or approved equal. Any wyes or connections shall be provided by the pipe manufacturer, and shall be fully compatible with the pipe ribs. Manhole connections shall include an entry piece provided by the pipe manufacturer. Installation of the PVC pipe shall follow manufacturer's recommendations.

2.02 REPLACEMENT PIPES:

If any water mains, sanitary sewer mains, or water or sanitary sewer service lines must be relocated or replaced due to the installation of the storm drain pipe, the appropriate section of these specifications must be followed.

2.03 TRASH GUARDS: Metal fabricated trash guards shall be provided when specified. Trash guards shall meet the requirements of Section 619 (and associated subsections and details) of the Wyoming Department of Transportation Standard Specifications for Road and Bridge Construction, 2010 Edition with the following exceptions:

1. Trash guards shall not be fabricated on site.
2. Shop Drawings are required to be submitted for review and approval prior to fabrication.
3. When required, the Owner will provide padlocks for the locking bar.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Excavation and Backfill: Excavation, backfill and compaction for pipe shall conform to the applicable portions of Section 02221, including thoroughly compacting the bedding under the pipe haunches. Bedding must be placed to a density of 95% as determined by ASTM D698. Bell holes shall be provided in the trench bottom for the pipe. If the CONTRACTOR over excavates he shall compact material back, according to the bedding specifications to provide uniform support to the pipe. Bedding shall also comply with the manufacturer's requirements, if more stringent than the above.

B. Handling of Pipe: All pipe furnished by the CONTRACTOR shall be delivered and distributed at the site by the CONTRACTOR. Pipe, fittings, and accessories shall be loaded and unloaded by lifting with hoists or skidding so as to avoid shock or damage. Under no circumstances shall such materials be dropped. Pipe handled on skidways shall not be skidded or rolled against pipe already on the ground.

In distributing the material at the site of the Work, each piece shall be unloaded opposite or near the place where it is to be installed. All material shall be stored in a neat and orderly manner.

C. Laying Pipe: All pipe shall be laid and maintained to the required lines and grades with fittings and tees installed at the required locations. Pipe runs shall be installed where indicated if the piping is dimensioned. Where piping is not dimensioned the CONTRACTOR shall install the pipe as close as possible to the locations indicated taking care to maintain orderly pipe runs.

Wherever obstructions not shown in the Plans are encountered during the progress of the Work and interfere to such an extent that an alteration in the plan is required, the ENGINEER shall have the authority to change the Plans and order a deviation from the line and grade or arrange for the removal, relocation or reconstruction of the obstructions. If the change in plan results in a change in the amount of Work by the CONTRACTOR, such altered Work shall be done on the basis of payment to the CONTRACTOR for extra work or credit to the OWNER for less work.

Proper implements, tools, and facilities satisfactory to the ENGINEER shall be provided and used by the CONTRACTOR for the safe and convenient execution of the Work. All pipe and fittings shall be carefully lowered into the trench piece by piece by means of a derrick, ropes or other suitable tools or equipment, in such a manner as to prevent damage to pipe. Under no circumstances shall materials be dropped or dumped into position.

Water shall not be allowed to accumulate in the trench during the laying of the pipe or the initial backfill operations. The trench shall be dewatered in accordance with Section 02401. The CONTRACTOR shall take all necessary precautions to prevent surface water from entering the storm drain trench. The cost of dewatering the trench shall be included in the CONTRACTOR's bid.

Pipe shall be protected from lateral displacement by means of bedding material installed as provided in Section 02221. Native (on-site) materials may be used for bedding RCP storm drains. The CONTRACTOR shall request in writing to use the native material in lieu of bedding material to the ENGINEER. The ENGINEER may approve or not approve, in writing, the use of native material as bedding material. Material shall meet the moisture and density requirements as defined in Subsection 3.05B of Section 02221. Under no circumstances shall pipe be laid in water and no pipe shall be laid under unsuitable weather or trench conditions.

Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the line. If the pipe laying crew cannot put the pipe into the trench and in place without getting earth into it, the ENGINEER may require that before lowering the pipe into the trench, a heavy, tightly woven canvas bag of suitable size shall be placed over each end and left there until the connection is to be made to the adjacent pipe. Before final acceptance the CONTRACTOR shall remove from the pipe any foreign material, including dirt or sand, which may have gotten into the line.

During laying operations, no debris, tools, clothing or other material shall be placed in the pipe. At times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other means approved by the ENGINEER.

At any time a RCP is saw cut, the steel reinforcement shall be cut flush with the end of the pipe.

Unless otherwise approved by the ENGINEER, the laying of pipe shall begin at the lowest point. For bell and spigot pipe the pipe shall be installed so that the spigot ends point in the direction of flow.

Preparatory to making the joints, the pipe grade and alignment shall be checked and all dirt or other foreign matter shall be removed from the bell or coupling. Trenching, backfilling, and compaction shall conform to Section 02221.

D. Pipe Deflection: Wherever it is necessary to deflect pipe from a straight line, either in the vertical or horizontal plane or avoid obstructions or plumb stems or where long-radius curves are permitted, the amount of deflection allowed shall not exceed that required for satisfactory jointing, requirements of the pipe manufacturer, and shall be approved by the ENGINEER.

E. Rubber Gasketed Joints: Jointing of pipe made with a rubber gasketed joint shall be made as recommended by the manufacturer. The rubber gasket and gasket seat inside the bell shall be wiped clean with a cloth. A thin film of lubricant, furnished with the pipe, shall be applied to the inside of the gasket. The plain end of the adjoining pipe shall be wiped clean and inserted into the bell a sufficient distance to make contact with the gasket. The plain end shall then be forced "home" by the use of a crow bar, fork tool or jack assembly.

The pipe joints shall fit together tightly and properly. Any displaced sealant shall be replaced. Any broken joints or portions of joints shall be replaced if directed by the

ENGINEER or grouted to the ENGINEER'S satisfaction. Any loss of sealant shall be replaced or grouted to the ENGINEER'S satisfaction.

F. Storm Drain Testing:

1. A leakage test of the storm drain will not be required, however, any concentrated leaks such as open joints, pinched joint material, cracked barrels or bells, noticeable infiltration and exfiltration, etc., shall be repaired to the satisfaction of the ENGINEER.
2. Alignment and grade: All sections of the storm drain are to be within 1 inch of specified horizontal alignment and ½-inch of the specified vertical grade. Water shall not pond in the storm drain more than ¾-inch deep.
3. The storm drain shall be cleaned by the CONTRACTOR to the satisfaction of the ENGINEER if gravel, sediment or other material has entered the storm drain. This shall be done prior to cameraing, final inspection and acceptance. It also shall be performed prior to street paving.
4. The storm drain shall be videoed by the OWNER prior to acceptance. The video will look for items covered in 1 and 2 above, as well as damaged pipe, debris or other conditions that do not comply with these Specifications. After the CONTRACTOR makes the needed corrections, the storm drain shall be re-videoed at a cost of the labor and equipment rates for the necessary equipment. This process shall be repeated as necessary.

G. Separation with Water Mains: The storm drain shall be laid at least 10-feet horizontally from any existing or proposed water main. This distance shall be measured from edge-of-pipe to edge-of-pipe. At crossings the storm drain shall be installed to provide a minimum vertical separation of 18-inches between the outside of the water main and the outside of the storm drain. This shall be the case when the storm drain is either above or below the water main. At the crossing, storm drain joints are to be arranged so that they are as far as possible from the water main.

At all crossings, pipe and backfill shall be properly installed to support the pipes. Flowable fill, in accordance with Section 02228, is to be used at the crossing to full support both pipes. The material is to be tamped and rodded to fill all voids adjacent to and below both pipes and to compact the fill material.

Where the 10-foot horizontal separation cannot be maintained, this separation may be reduced to 5 feet provided the bottom of the water main is at least 18 inches higher than the top of the storm drain.

Where the requirements for the bottom of the water line to be at least 18 inches higher than the top of the storm drain cannot be met, a different approach might be required. That approach is to be designed on a case-by-case basis with the design for that particular separation approved by the Owner and the Wyoming Department of Environmental Quality. The Contractor shall be paid for this particular work as required as a changed site condition.

- H. Manholes: RCP storm drain shall penetrate into the manholes no more than 1-inch as measured at the side of the pipe. The space between the manhole and the pipe shall be grouted watertight from both the inside and outside. Grouting on the inside shall result in a smooth surface between the pipe and the manhole wall, and the pipe and the manhole invert.
- I. Trash Guards: Trash guards shall be installed on pipe flared ends where specified. Trash guards are to comply with the requirements outlined in Subsection 2.03 of this Section.
- J. Connections: Make connections to existing storm drain piping and underground manholes.
1. **Branch Connections Using Wye Fitting:** Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; connect wye fitting onto existing piping and encase entire wye fitting, plus 6-inch overlap with concrete.
 2. **Branch Connection from Side (4" to 20"):** Remove section of existing pipe, install wye fitting into existing piping and encase entire wye with not less than 6 inches of concrete.
 3. **Branch Connection from Side (21" and larger):** Connection to pipe, manhole or other underground structure shall be made by cutting into the existing unit and creating an opening large enough to allow 3 inches of concrete to be packed around the entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. Outside of pipe, manhole or structure wall should be encased with 6 inches of concrete for a minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.

PART 4 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.01 METHOD OF MEASUREMENT:

A. Standard Items:

1. 02714.0X X" RCP STORM DRAIN PIPE

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of lineal feet (LF) of X" storm drain pipe furnished and installed as measured along the top centerline of the pipe through the inside edge of all manholes or pipes to which the pipe is connected. This item shall be paid for at the contract unit price bid, which price and payment shall constitute full payment for all trench excavation, imported pipe bedding material, backfill, compaction, shoring, dewatering, furnishing and installing material for trench plugs when required, furnishing and installing pipe and special transition fittings, capping/plugging future lines, connections to new manholes and new

inlets; testing and all other work necessary or incidental for completion of the item.

2. 02714.1XY X" x Y" ARCH RCP STORM DRAIN PIPE

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of lineal feet (LF) of X" x Y" storm drain pipe furnished and installed as measured along the top centerline of the pipe through the inside edge of all manholes or pipes to which the pipe is connected.

3. 02714.2XY X" x Y" ELLIPTICAL RCP STORM DRAIN PIPE

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of lineal feet (LF) of X" x Y" storm drain pipe furnished and installed as measured along the top centerline of the pipe through the inside edge of all manholes or pipes to which the pipe is connected.

4. 02714.3X X" PVC STORM DRAIN PIPE

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of lineal feet (LF) of X" storm drain pipe furnished and installed as measured along the top centerline of the pipe through the inside edge of all manholes or pipes to which the pipe is connected.

5. 02714.4X – CONNECT TO EXISTING X" STORM DRAIN LINE

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of each (EA) connection made to an existing X" storm drain line.

6. 02714.5X X" RCP FLARED END

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of each (EA) of X" RCP flared ends furnished and installed.

7. 02714.6XY X" x Y" ARCH RCP FLARED END

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of each (EA) of X" x Y" ARCH RCP flared ends furnished and installed.

8. 02714.7XY X" x Y" ELLIPTICAL RCP FLARED END

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of each (EA) of X" x Y" elliptical RCP flared ends furnished and installed.

9. 02714.8X TRASH GUARD

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of each (EA) of trash rack furnished and installed.

4.02 BASIS OF PAYMENT:

A. Standard Items:

1. 02714.0X X" RCP STORM DRAIN PIPE

This item shall be paid for at the contract unit price bid, which price and payment shall constitute full payment for all trench excavation, imported pipe bedding material, backfill, compaction, shoring, dewatering, furnishing and installing material for trench plugs when required, furnishing and installing pipe and special transition fittings, capping/plugging future lines, connections to new manholes and new inlets; testing and all other work necessary or incidental for completion of the item.

2. 02714.1XY X" x Y" ARCH RCP STORM DRAIN PIPE

This item shall be paid for at the contract unit price bid, which price and payment shall constitute full payment for all trench excavation, imported pipe bedding material, backfill, compaction, shoring, dewatering, furnishing and installing material for trench plugs when required, furnishing and installing pipe and special transition fittings, capping/plugging future lines, connections to new manholes and new inlets; testing and all other work necessary or incidental for completion of the item.

3. 02714.2XY X" x Y" ELLIPTICAL RCP STORM DRAIN PIPE

This item shall be paid for at the contract unit price bid, which price and payment shall constitute full payment for all trench excavation, imported pipe bedding material, backfill, compaction, shoring, dewatering, furnishing and installing material for trench plugs when required, furnishing and installing pipe and special transition fittings, capping/plugging future lines, connections to new manholes and new inlets; testing and all other work necessary or incidental for completion of the item.

4. 02714.3X X" PVC STORM DRAIN PIPE

This item shall be paid for at the contract unit price bid, which price and payment shall constitute full payment for all trench excavation, imported pipe bedding material, backfill, compaction, shoring, dewatering, furnishing and installing material for trench plugs when required, furnishing and installing pipe and special transition fittings, capping/plugging future lines, connections to new manholes and new

inlets; testing and all other work necessary or incidental for completion of the item.

5. 02714.4X – CONNECT TO EXISTING X” STORM DRAIN LINE

This item shall be paid for at the contract unit price bid, which price and payment shall constitute full payment for all trench excavation, imported pipe bedding material, backfill, compaction, shoring, dewatering, furnishing and installing material for trench plugs when required, furnishing and installing pipe and special transition fittings, capping/plugging future lines, connections to new manholes and new inlets; testing and all other work necessary or incidental for completion of the item.

6. 02714.5X X” RCP FLARED END

This item shall be paid for at the contract unit price bid, which price and payment shall constitute full payment for all trench excavation, shoring, imported pipe bedding material, backfill, compaction, gaskets, shoring, dewatering, furnishing and installing pipe and special transition fittings; and all other work necessary or incidental for completion of the item.

7. 02714.6XY X” x Y” ARCH RCP FLARED END

This item shall be paid for at the contract unit price bid, which price and payment shall constitute full payment for all trench excavation, shoring, imported pipe bedding material, backfill, compaction, gaskets, shoring, dewatering, furnishing and installing pipe and special transition fittings; and all other work necessary or incidental for completion of the item.

8. 02714.7XY X” x Y” ELLIPTICAL RCP FLARED END

This item shall be paid for at the contract unit price bid, which price and payment shall constitute full payment for all trench excavation, shoring, imported pipe bedding material, backfill, compaction, gaskets, shoring, dewatering, furnishing and installing pipe and special transition fittings; and all other work necessary or incidental for completion of the item.

9. 02714.8X TRASH GUARD

This item shall be paid for at the contract unit price bid, which price and payment shall constitute full payment for all installation, cutting, grinding, dewatering, furnishing and installing material for installation (if required), furnishing and installing connections and fittings, connections to flared ends; and all other work necessary or incidental for completion of the item.

END OF SECTION 02714

PART 1 - GENERAL

1.01 WORK INCLUDED:

The work covered by this Section of the Specifications consists of furnishing and installing all storm drain inlets and accessories at locations as specified herein and indicated in the Plans.

1.02 RELATED WORK:

- A. Section 02221 - Trenching, Backfilling and Compacting
- B. Section 02401 - Dewatering
- C. Section 02714 - Storm Drain Pipe and Fittings

1.03 RESPONSIBILITY FOR MATERIAL:

The CONTRACTOR shall be responsible for all such material furnished by him/her and shall replace, at his/her own expense, all such material found defective in manufacture or damaged in handling after delivery by the manufacturer. This shall include the furnishing of all materials and labor required for the replacement of installed material discovered defective prior to the final acceptance of the Work or during the one-year correction period.

The CONTRACTOR shall be responsible for the safe storage of material furnished by him/her or to him/her and accepted by him/her and intended for the work. The interior of all pipe and other accessories shall be kept free from dirt and foreign matter at all times.

1.04 SUBMITTALS:

Submittals will be required for all materials in accordance with this Section and Section 01300.

PART 2 - PRODUCTS

2.01 INLETS / CATCH BASINS:

Inlets / catch basins shall be constructed of precast reinforced concrete using Type II or I-IISR cement.

Reinforced concrete inlet / catch basin sections shall conform to the requirements of Standard Specifications for Precast Reinforced Concrete Box Sections, ASTM C850.

The inlet / catch basin shall be monolithic with the base and shall be cast with provisions to allow knockouts.

Precast adjusting grade rings, set in full cement mortar bed shall be used for adjustment of the frame and cover to finish grade. The maximum height limitation on grade rings shall be 8-inches. The grade rings shall meet the requirements of ASTM C478. Mortar used to grout concrete grade rings shall be (1) Portland Cement, ASTM C150, Type 1; (2) Hydrated Lime, ASTM C207, Type S; (3) Concrete sand (fine aggregate) which has been sieved through an 8-mesh screen; (4) Volumetric proportions, 1 part Portland cement, 1/2 part hydrated lime, 3 parts sand; (5) Cement, lime and sand shall be thoroughly mixed dry and only enough water added to form a mortar of the proper consistency.

All mortar shall be used within 40 minutes after mixing. Mortar, which has begun to take on initial set, shall be discarded and shall not be mixed with additional cement or new mortar.

Joints between precast inlet / catch basin wall sections shall be made with pre-molded plastic filler such as Rubber-Nek, as furnished by K.T. Snyder Company of Houston, Texas or an approved equal. Tylox SuperSeal rubber pipe gaskets as manufactured by Hamilton-Ken Mfg. Co., Kent, Ohio or O-ring gaskets which will meet the requirements of ASTM C443 will be accepted as equal to Rubber-Nek plastic joint filler. Jointing shall be in strict accordance with the plastic filler or gasket manufacturer's recommendations.

The inlet / catch basin shall be free of fractures and surface roughness. The planes of the ends of the inlet / catch basin shall be perpendicular to their longitudinal axis, within the limits as specified in ASTM C 478.

If necessary, inlet / catch basin sections may be repaired if in the opinion of the ENGINEER the repairs are sound and properly finished and cured and the repaired inlet / catch basin sections conform to the requirements of the Specifications.

2.02 INLET / CATCH BASIN FRAMES AND COVERS:

All cast iron inlet / catch basin frames shall be made of tough gray pig iron conforming to the requirements of ASTM C478 Class 35 and shall be free from cracks, swells, holes and cold shuts, and shall have a smooth finish. Castings shall conform in all dimensions to the Standard Details, or as provided in the Plans. Before leaving the foundry, all casting shall be thoroughly cleaned and subjected to a hammer test. The inlet / catch basin frame and grate shall be a Neenah R-3246-AL (adjustable to meet the curb height), or approved equal, with fish logo printed on curb box, for a Type A inlet; Deeter 1258 with Type B Grate (Deeter 1925), or approved equal, for a Type B inlet.

PART 3 - EXECUTION

3.01 INLET / CATCH BASIN INSTALLATION:

Inlets / catch basins shall be constructed to the general dimensions shown in the Plans. They shall be placed to the proper elevations and grades, and set to match the curb and gutter or valley, both horizontally and vertically.

The connection between the inlet / catch basin and the pipe shall be a smooth, watertight, grouted connection. This connection shall be grouted from both the inside and outside. Grouting the inside shall result in a smooth transition from the pipe to the inlet / catch basin. All pipes that connect to the inlet / catch basin shall not extend into the inside wall of the inlet more than 1 inch at any point.

Inlets / catch basins shall be constructed to the general dimensions shown in the Standard Details, or as provided in the Plans. Inlets / catch basins shall be set on a minimum of 6 inches of ¾-inch washed gravel that has been firmly placed on undisturbed natural material or natural backfill material that has been compacted to 95% of optimum density as determined by ASTM D698.

The inlet / catch basin frame and cover shall be set on the inlet / catch basin box level and aligned with the concrete curb and gutter. The curb box shall be set to match the height of the

existing curb. New concrete curb and gutter shall be formed and placed to direct flow into the new inlet / catch basin grate.

After installation, the inlet / catch basin box shall be thoroughly cleaned of debris.

PART 4 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.01 METHOD OF MEASUREMENT:

A. Standard Items:

1. 02720.00 TYPE A STORM DRAIN INLET / CATCH BASIN

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of each (EA) of Type A storm drain inlets furnished and installed.

2. 02720.10 TYPE B STORM DRAIN INLET / CATCH BASIN

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of each (EA) of Type B storm drain inlets furnished and installed.

3. 02720.20 TYPE C STORM DRAIN INLET / CATCH BASIN

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of each (EA) of Type C storm drain inlets furnished and installed.

4. 02720.30 TYPE D STORM DRAIN INLET / CATCH BASIN

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of each (EA) of Type D storm drain inlets furnished and installed.

5. 02720.40 TYPE E STORM DRAIN INLET / CATCH BASIN

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of each (EA) of Type E storm drain inlets furnished and installed.

6. 02720.50 SIDEWALK/CURB GRATE

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of linear feet (LF) of sidewalk grates furnished and installed. Measurement shall be made along the centerline of the grate from edge of sidewalk to edge of sidewalk, including the distance to face of curb if applicable.

4.02 BASIS OF PAYMENT:

A. Standard Items:

1. 02720.00 TYPE A STORM DRAIN INLET / CATCH BASIN

Payment will be made at the Contract Unit Bid price for each (EA) Type A inlet furnished and installed, and will constitute full compensation for excavation, shoring, ¾" washed gravel beneath the inlet, backfill, compaction, construction staking, grates, frames, adjustment needed, haul, placing, grout (if necessary) and dewatering. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

2. 02720.10 TYPE B STORM DRAIN INLET / CATCH BASIN

Payment will be made at the Contract Unit Bid price for each (EA) Type B inlet furnished and installed, and will constitute full compensation for excavation, shoring, ¾" washed gravel beneath the inlet, backfill, compaction, construction staking, grates, haul, placing, and dewatering. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

3. 02720.20 TYPE C STORM DRAIN INLET / CATCH BASIN

Payment will be made at the Contract Unit Bid price for each (EA) Type C inlet furnished and installed, and will constitute full compensation for excavation, shoring, ¾" washed gravel beneath the inlet, backfill, compaction, construction staking, grates, haul, placing, and dewatering. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

4. 02720.30 TYPE D STORM DRAIN INLET / CATCH BASIN

Payment will be made at the Contract Unit Bid price for each (EA) Type D inlet furnished and installed, and will constitute full compensation for excavation, shoring, ¾" washed gravel beneath the inlet, backfill, compaction, construction staking, grates, haul, placing, and dewatering. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

5. 02720.40 TYPE E STORM DRAIN INLET / CATCH BASIN

Payment will be made at the Contract Unit Bid price for each (EA) Type E inlet furnished and installed, and will constitute full compensation for excavation, shoring, ¾" washed gravel beneath the inlet, backfill, compaction, construction staking, grates, haul, placing, and dewatering. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

6. 02720.50 SIDEWALK / CURB GRATE

Payment will be made at the Contract Unit Bid price per linear feet (LF) Sidewalk / Curb Grate and frame furnished and installed, and will constitute full compensation for excavation, shoring, placement of Class "B" concrete beneath and 1' on each side of the trench frame, rebar, backfill, compaction, construction staking, grates, haul, placing, and dewatering. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

END OF SECTION 02720

PART 1 - GENERAL

1.01 WORK INCLUDED:

The work covered by this Section of the Specifications consists of furnishing and installing all manholes and accessories at locations as specified herein and indicated in the Plans.

1.02 RELATED WORK:

- A. Section 02221 - Trenching, Backfilling and Compacting
- B. Section 02401 - Dewatering
- C. Section 02641 - Valves and Valve boxes
- D. Section 02710 - Water Main
- E. Section 02712 - Sanitary Sewer
- F. Section 02714 - Storm Drain Pipe and Fittings
- G. Section 03010 - Concrete Work

1.03 RESPONSIBILITY FOR MATERIAL:

The CONTRACTOR shall be responsible for all such material furnished by him/her and shall replace, at his/her own expense, all such material found defective in manufacture or damaged in handling after delivery by the manufacturer. This shall include the furnishing of all materials and labor required for the replacement of installed material discovered defective prior to the final acceptance of the work or during the one-year correction period.

The CONTRACTOR shall be responsible for the safe storage of material furnished by him/her or to him/her and accepted by him/her and intended for the work. The interior of all pipe and other accessories shall be kept free from dirt and foreign matter at all times.

1.04 SUBMITTALS:

Submittals will be required for all materials in accordance with this Section and Section 01300.

PART 2 - PRODUCTS

2.01 MANHOLES:

Manholes shall be constructed of precast reinforced concrete using Type I-IIISR cement. Reinforced concrete manhole sections shall conform to the requirements of Standard Specifications for Precast Reinforced Concrete Manhole Sections, ASTM C478. All manholes should be capable of withstanding HS-20 loadings.

The bottom section of sanitary sewer and storm drain manholes shall be cast with circular openings or horseshoe-shaped blockouts, if allowed by the Plans, to accommodate the particular size or type of pipe or angle of turn in the line, as required. The bottom section of air release manholes shall be cast with horseshoe-shaped blockouts. The bottoms of sanitary sewer, storm drain, or other manholes that are intended to be watertight, are to be poured monolithic with the bottom wall section.

The upper section of the manhole shall be either a cone section or straight section, as indicated in the Plans. Cone sections shall be 2 feet tall.

Grade adjustment rings may be used for adjustment of the frame and cover to finish grade. Precast concrete grade adjustment rings shall not be used.

Grade adjustment rings that are manufactured from ARPRO® Expanded Polypropylene (EPP), black, 5000 series meeting ASTM D3575, or an approved equal, shall be used. The rings shall be manufactured using a high compression molding process to produce a finished density of 120 g/l ((7.5 pcf). Specifications for EPP adjustment rings shall be as follows:

- “Grade” adjustment rings may contain either an upper and lower keyway (tongue and groove) for vertical alignment and/or an adhesive trench on the underside with a flat top.
- “Finish” or “Flat” rings may either have a keyway (groove) on the underside for vertical alignment and/or an adhesive trench with a flat upper surface. These rings shall be available in heights (thicknesses) which will allow final adjustment of the frame and cover or grate to within ¼” (one quarter inch) to ½” (one half inch) of the specified final elevation.
- “Finish” rings may also have a keyway on the upper surface of the inner diameter to facilitate installation of an “Angle” ring.
- “Angle” rings may either have an upper and lower keyway (tongue and groove) for vertical alignment and/or an adhesive trench on the underside. When required, the “Angle” ring or rings shall allow final adjustment of the frame and cover or grate to within ½” of the specified final elevation.

Any adhesive or sealant used for watertight installation of the EPP grade adjustment rings shall be M-1 Structural Adhesive/Sealant or equal meeting the following specifications:

- ASTM C-920, Type S, Grade NS, Class 25, Uses NT, T, M, G, A and O,
- Federal Specification TT-S-00230-C Type II, Class A,
- Corps of Engineers CRD-C-541, Type II, Class A,
- Canadian Standards Board CAN 19, 13-M82, or
- AAMA 802.3-08 Type II, AAMA 803.3-08 Type I and AAMA 805.2-08 Group C.

Mortar used to further adjust EPP grade rings shall be a one-component, quick-set, high strength, non-shrink, polymer-modified cementitious patching mortar, which has been formulated for vertical or overhead use meeting the requirements of ASTM C-109 for Compressive Strength, C-348 for Flexural Strength and C-882 for Slant Shear Bond Strength. Repair mortar shall not contain any chlorides, gypsums, plasters, iron particles, aluminum powder or gas-forming agents nor shall it promote the corrosion of any steel that it may come in contact with. All mortar shall be used within 40 minutes after mixing. Mortar which has begun to take on initial set shall be discarded and shall not be mixed with additional cement or new mortar.

Cementitious grout shall be a premixed, non-metallic, high-strength, non-shrink grout which meets the requirements of ASTM C-191 and C-827 as well as CRD-C-588 and C-621. When mixed to a mortar or “plastic” consistency, it shall have minimum one day and 28-day compressive strength of 6,000 and 9,000 psi, respectively.

Joints between precast manhole wall sections shall be made with a premolded plastic filler such as Rubber-Nek, as furnished by K.T. Snyder Company of Houston, Texas or an approved equal. Tylox Type A rubber pipe gaskets as manufactured by Hamilton-Ken Mfg. Co., Kent, Ohio or O-ring gaskets which will meet the requirements of ASTM C443 will be accepted as equal to Rubber-Nek plastic joint filler. Jointing shall be in strict accordance with the plastic filler or gasket manufacturer's recommendations.

Floors in the manholes for air release valves shall consist of washed gravel bedding material 12 inches thick that extends at least one foot outside the manhole wall to support the manhole and to allow free drainage. The openings for the pipelines shall be precast knockouts. Vent pipe openings can be cast in place or can be drilled in the field. Electrical insulation/cushion shall be provided where the pipe extends through the precast manhole opening with the use of a rubber pad.

The manhole shall be substantially free of fractures and surface roughness. The planes of the ends of the manhole sections shall be perpendicular to their longitudinal axis, within the limits as specified in ASTM C478.

If necessary, manhole sections may be repaired if in the opinion of the ENGINEER the repairs are sound and properly finished and cured and the repaired manhole sections conform to the requirements of the Specifications.

Manhole inverts shall be PVC-lined through the entire manhole to allow a smooth flow of water through the manhole, and not allow an accumulation of solids. If a precast invert is used, it shall also be PVC-lined and must slope through the manhole and provide for a smooth transition of flow from the inlet pipe, through the manhole and back into the outlet pipe. When PVC pipe is cast into a cast-in-place base, the pipe shall remain intact until paving above the manhole is complete in order to keep debris out of the sewerline.

Sanitary sewer manholes and any manholes used on the water system that are intended to be water tight, shall have their exteriors (walls and base) coated with two coats (20 mils minimum total) of Koppers Bitumastic Super Service Black, Pure Asphalt #351-A or #75-CM, or approved equal.

Drop manholes shall be internal drops and provided when indicated in the Plans. Drop manholes shall conform to the Standard Details, or as required in the Plans. All drop manholes shall be Reliner internal drop manholes or approved equal.

2.02 MANHOLE STEPS:

Manhole steps are to be cast or drilled and mortared into the walls of the manhole, and designed to withstand a minimum concentrated live load of 300 lb. The live load shall be considered to be concentrated at such points as to cause the maximum stress in the structural member being considered. The steps shall have a minimum cross section of $\frac{3}{4}$ -inch. The steps shall be imbedded into the manhole wall a minimum of 3 inches. The materials used in the steps shall be $\frac{1}{2}$ -inch Grade 60 steel with a polypropylene plastic coating, complying with ASTM C478. The step shall be free of splinters, sharp edges, burrs, or projections which may be a hazard to persons using the steps for access into or out of the manhole. Minimum width of rungs shall be 12 inches. The rung shall also project a minimum of $5\frac{3}{4}$ inches from the wall, measured at the point of embedment. Steps in the manhole sections shall be aligned so as to form a continuous ladder with rungs equally spaced vertically in the assembled manhole at a maximum distance of 12 inches apart. The manhole steps shall comply with ANSI 14.3.

2.03 MANHOLE FRAMES AND COVERS:

All cast iron manhole frames and lids shall be made conforming to the requirements of ASTM A48 Class 35 and shall be free from cracks, swells, holes and cold shuts, and shall have a smooth finish. Castings shall conform in all dimensions to the Standard Details, or as required in the

Plans. Before leaving the foundry, all casting shall be thoroughly cleaned and subjected to a hammer test

A. Air Release Manholes (or other manholes used on the water system):

Frames and covers shall be frost-free design. Unless otherwise noted, the manhole frame shall be Neenah No. R-1755F2, with a Design C surface, or approved equal, with the word "WATER" cast on the lid.

B. Sanitary Sewers:

Frame and cover shall be Neenah R-1649, Deeter 1258, D&L Foundry A-1040, or approved equal, with the words "SEWER" cast on a non-venting, Type C lid. The cover shall be 24 inches with a 22-inch opening. It shall be rated for HS-20 loading. The cover shall have a vented opening such as a Denver opening or approved equal with one pick hole. Existing sanitary sewer manhole covers will not be allowed to be used as replacement lids in areas where existing manholes are to be removed unless allowed by the Plans.

C. Storm Drains:

Frame and cover shall be Neenah R-1649, Deeter 1258, D&L Foundry A-1040 or approved equal, with the words "STORM" cast on a vented, Type C lid. The cover shall have a vented opening such as a Denver opening or approved equal with one pick hole. Existing storm drain manhole covers will not be allowed to be used as replacement lids in areas where existing manholes are to be removed unless allowed by the Plans.

2.04 PIPE GASKET:

A flexible, watertight seal is to be used between the sanitary sewer pipe and the concrete manhole (or any manhole on the water system that is intended to be watertight), where the pipe passes through the manhole wall. This is to be a PSX Gasket with power sleeve and take-up clamp, or approved equal. Storm drain pipe to manhole transition shall be a grouted connection.

2.05 SPRAY-ON INSULATION:

Spray-on insulation shall be used on the outside of manholes and vaults when shown in the Plans.

Insulation applied to the exterior of manholes and vaults shall be a two-component polyurethane spray-on foam designed for this application. Once cured the foam shall produce a rigid surface. The foam shall have an in-place density of 2.0 lbs./cf (ASTM 01622), aged K-factor of 0.18 BTU/hr/ft²/°F/in (ASTM C518), compressive strength (parallel to foam rise) of 25 psi (ASTM C273), closed cell content of 90% (ASTM D2856), and water absorption of less than 0.05 lbs/ft³ (ASTM D2842). All above values are minimums. Insulation shall be as manufactured by Urethane Contractors Supply & Consulting of Roswell, New Mexico or approved equal.

Insulation shall be coated with a waterproof protective membrane. This coating shall be a two component polyuria elastomer that is sprayed on top of the cured insulation foam to form a flexible, tough, monolithic membrane. The coating material shall be 100% solids with no solvents

or VOCs. The dry coating shall have a minimum tensile strength of 2,200 psi. The service temperature range shall be -30°F to 120°F, minimum. The coating shall be Polysield SS-100, as manufactured by Urethane Contractors Supply and Consulting of Roswell, New Mexico, or approved equal.

PART 3 - EXECUTION

3.01 MANHOLE INSTALLATION:

Manholes shall be constructed to the general dimensions shown in the Plans. Base gravel is to be placed as shown in the Standard Details. Manhole inverts shall be within 0.04 feet of their design elevation.

At the horseshoe shaped blockouts where the water pipe protrudes through the manhole wall, Rubber-Nek, or approved equal, is to be placed around the pipe to prevent the manhole from resting on the pipe. The connection does need not be watertight on air release manholes.

The manhole frame shall be adjusted to finished grade through the use of ARPRO® Expanded Polypropylene (EPP), black. 5000 series adjusting rings, or approved equal using the procedure detailed in Section 3.02 below. If an equal adjusting ring is approved for use, it shall be installed according to all instructions of its manufacturer. The rings shall be sealed according to the ring manufacturer's recommendations—the process of simply setting the adjusting rings in place and setting the cast iron ring on top of the grade rings without using any bonding or setting agent will not be allowed. No concrete adjusting rings, and no wood material, or other material subject to deterioration, shall be used to adjust manhole frames to finished grade. No more than 8 inches of adjusting rings shall be permitted. If a greater adjustment is needed, the upper section shall be removed and the adjustment made through the use of intermediate manhole sections.

Invert channels of sanitary sewer manholes, which are precast, shall be very smooth, PVC-lined and semi-circular in shape conforming to the inside of the adjacent sewer sections. Where side branches or change in direction, grade, or diameter occur in the manhole, manufacturer's pipe fittings or carefully mitered sections of straight pipe may be used. Construction by laying the pipe through the manhole with glue-type fittings, and cutting top half of pipe out may be allowed by the ENGINEER. Only smooth sawcuts will be accepted, breaking pipe will not be allowed. After final finishing of the surface, the manhole floor shall be smooth and shall slope uniformly toward the invert channel at not less than 1 inch per foot nor more than 2 inches per foot. The channel shall be approved by the ENGINEER to ensure the camera and maintenance equipment can be utilized in the manhole. If the camera or maintenance equipment cannot get into the newly installed channel, the CONTRACTOR shall remove and replace the invert to the satisfaction of the OWNER at no additional cost to the OWNER.

At the circular opening through the manhole wall, the PSX Gasket, or approved equal, is to be installed for a watertight connection on sanitary sewers, or elsewhere if required. All sanitary sewer connections between manhole sections are to be watertight. Storm drain connections between manhole and pipe shall be a grouted smooth and watertight from both the inside and outside.

3.02 MANHOLE ADJUSTMENT:

Existing Manhole frames and covers shall be adjusted through the use of grade rings or the removal and replacement of the riser sections as determined by the ENGINEER. If the total

adjustment, including the existing rings, is in excess of eight inches, an existing manhole section shall be replaced with a new section having the correct dimensions, or an additional section added. CONTRACTOR shall verify the size and quantity of rings that will be required at each manhole to facilitate the adjustment.

For installation of the ARPRO® Expanded Polypropylene (EPP), black, 5000 series adjusting rings, the following procedure shall be used:

- Installation surface preparation shall be in accordance with the manufacturer's instructions.
- The joint between the first grade ring and top of the manhole shall be sealed using an adhesive/sealant meeting the requirements of Section 2.01 above.
- If the top of the manhole is not level or is irregular, then a non-shrink repair mortar, or a non-shrink cementitious grout, meeting the requirements of Section 2.01 above shall be used. A bed of the specified mortar or grout shall be placed on the top surface of the manhole and then the first grade ring shall be embedded and leveled into the bed of material.
- The remaining joints between all manhole adjustment rings and the frame and cover shall be sealed using an adhesive/sealant meeting the requirements of Section 2.01 above.
- No other materials shall be used in the construction of the grade adjustment area beyond those specified above. Prohibited materials include, but are not limited to, wood or wood shims of any kind, concrete, brick, block, stones, etc.
- The use of any heat-shrinkable chimney seals shall not be permitted.

3.03 EXISTING MANHOLE REMOVAL:

The CONTRACTOR shall excavate and remove all existing manholes as specified in the Plans. The manhole, frame and cover shall be removed and disposed of by the CONTRACTOR. The backfill of the existing manhole shall be with 3-inch minus pit run material. Filling of the manhole and removal of only the cone section and ring and cover will not be acceptable.

3.04 TIE TO EXISTING MANHOLES:

The CONTRACTOR shall make all required ties to existing manholes as neat as possible. The tie shall be made by saw cutting or chiseling out a hole in the location of the new sanitary sewer or storm drain pipe. Large equipment such as track or rubber tire hoes shall not be used to knock a hole in the manhole. The manhole/new pipe connection shall be encased with concrete on the outside of the connection, and grouted on the inside. This connection shall be watertight.

The CONTRACTOR shall provide a new very smooth flowline inside the existing manhole to direct flow in the designated direction. All existing formed flowlines that are to be abandoned and any abandoned invert(s) shall be grouted watertight.

3.05 CONFINED SPACE ENTRY:

The CONTRACTOR shall satisfy confined space entry requirements for the ENGINEER and OWNER to enter manholes and vaults. The requirements shall include furnishing and operating air quality testing equipment, furnishing and operating air movement equipment, furnishing communications equipment, and furnishing and operating other equipment and manpower to satisfy confined space entry requirements.

3.06 SPRAY-ON INSULATION:

Spray-on polyurethane shall be applied to clean, dry, cured damp-proofing material. The foam shall be stored, mixed, applied and protected according to manufacturer requirements, including those for weather conditions and safety. At least two layers shall be used to obtain the depth required. Each layer shall be applied continuously. The second layer is to be applied as soon as the first layer is cured. Total dry thickness of the foam is to be 2 inches. Foam shall be firmly attached to the manhole. Any foam that was improperly mixed or applied shall be promptly removed and replaced with properly mixed and applied material at the CONTRACTOR's expense.

The waterproofing coating shall be applied to the foam as soon as it is fully cured. The surface shall be clean and dry. The coating shall be stored, mixed and applied according to manufacturer's requirements, including those for weather conditions and safety. The coating shall be applied in a continuous multi-directional spraying operation. The DFT shall be a minimum of 30 mils. The completed surface shall be hard and waterproof, free from pinholes, thin areas, areas of loose coating or other imperfections.

3.07 DURING CONSTRUCTION:

Following installation of the manhole, a plywood sheet or similar material shall be laid across the bottom of the manhole (above the flow line through the manhole) to prevent dirt and gravel from entering the sanitary sewer or storm drain. This shall be removed with the manhole invert and adjoining sewer thoroughly cleaned, prior to final acceptance. When paving, a metal plate shall be placed over the top of the manhole opening to prevent material from falling into the manhole. CONTRACTOR shall remove any dirt, gravel or other construction debris from the manhole and adjacent sanitary sewer or storm drain.

CONTRACTOR shall use whackers or similar equipment to assure compaction around the manholes meets requirements outlined in Section 02221.

3.08 CONCRETE "DIAMOND" COLLARS:

Concrete collars, or "diamonds" as shown in standard details 02570-3.01b and 02722-3.02 shall NOT be installed if the new or adjusted manhole is being placed in a paved area. If settlement of the manhole at grade exceeds one quarter-inch ($\frac{1}{4}$ ") after one year, however, the CONTRACTOR will be required to adjust the manhole to grade and install a concrete collar at no cost to the OWNER.

Concrete collars shall be installed on all new or adjusted manholes in non-paved roadways (e.g. alleyways) unless otherwise approved by OWNER.

PART 4 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.01 METHOD OF MEASUREMENT:

A. Standard Items:

1. 02722.0X X" SANITARY SEWER MANHOLE

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of each (EA) of X" Sanitary Sewer Manhole furnished and installed.

2. 02722.1X X" SANITARY SEWER DROP MANHOLE

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of each (EA) of X" Sanitary Sewer Drop Manhole furnished and installed.

3. 02722.2X X" STORM DRAIN MANHOLE

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of each (EA) of X" Storm Drain Manhole furnished and installed.

4. 02722.3X CONNECT TO EXISTING SANITARY SEWER MANHOLE

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of each (EA) Connection to Existing Sanitary Sewer Manhole.

5. 02722.4X CONNECT TO EXISTING STORM DRAIN MANHOLE

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of each (EA) Connection to Existing Storm Drain Manhole.

6. 02570.40 CONCRETE COLLAR, 4' X 4', FOR MANHOLES

This item shall be measured for payment by each number (EA) of 4' x 4' concrete collars installed around manholes in unpaved roadways, complete and in place.

4.02 BASIS OF PAYMENT:

A. Standard Items:

1. 02722.0X X" SANITARY SEWER MANHOLE

Payment will be made at the Contract Unit Bid price for each (EA) X" Sanitary Sewer Manhole furnished and installed, and will constitute full compensation for excavation, shoring, aggregate material beneath manhole base, manhole base, backfill, manhole sections, compaction, construction staking, cast iron ring and cover, any adjustment needed, haul, placing, grout (if necessary) and dewatering. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

2. 02722.1X X" SANITARY SEWER DROP MANHOLE

Payment will be made at the Contract Unit Bid price for each (EA) X" Sanitary Sewer Drop Manhole furnished and installed, and will constitute full compensation for excavation, shoring, aggregate material beneath manhole base, manhole base, internal drop piping and materials, backfill,

manhole sections, compaction, construction staking, cast iron ring and cover, any adjustment needed, haul, placing, grout (if necessary) and dewatering. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

3. 02722.2X X" STORM DRAIN MANHOLE

Payment will be made at the Contract Unit Bid price for each (EA) X" Storm Drain Manhole furnished and installed, and will constitute full compensation for excavation, shoring, aggregate material beneath manhole base, manhole base, backfill, manhole sections, compaction, construction staking, cast iron ring and cover, any adjustment needed, haul, placing, grout (if necessary) and dewatering. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

4. 02722.3X CONNECT TO EXISTING SANITARY SEWER MANHOLE

Payment will be made at the Contract Unit Bid price for each (EA) Connection to the Existing Sanitary Sewer Manhole, and will constitute full compensation for excavation, shoring, creating an opening in the existing manhole, concrete collars if necessary, backfill, compaction, construction staking, reconstruction of manhole inverts if necessary, special sleeves or couplings if necessary, any adjustment needed of ring and cover, placing, grout (if necessary) and dewatering. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

5. 02722.4X CONNECT TO EXISTING STORM DRAIN MANHOLE

Payment will be made at the Contract Unit Bid price for each (EA) Connection to the Existing Storm Drain Manhole, and will constitute full compensation for excavation, shoring, creating an opening in the existing manhole, concrete collars if necessary, backfill, compaction, construction staking, reconstruction of manhole inverts if necessary, special sleeves or couplings if necessary, any adjustment needed of ring and cover, placing, grout (if necessary) and dewatering. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

6. 02570.40 CONCRETE COLLAR, 4' X 4', FOR MANHOLES

Payment shall be made at the contract unit price bid for each (EA) concrete collar for manholes in unpaved roadways and shall constitute full compensation of all materials (including concrete and rebar), compaction, cleaning, labor, tools and incidentals necessary to complete each item. No payment shall be made for concrete collars placed as a corrective measure.

END OF SECTION 02722

PART 1 - GENERAL1.01 WORK INCLUDED:

The work covered by this Section of the Specifications includes providing a steel pipe sleeve, herein after also referred to as the casing, through which water mains, sanitary sewers, or other pipe hereinafter also referred to as the carrier pipe, will be placed. Also included is installing this casing by a boring and jacking operation, and installing the water main or sanitary sewer through the casing.

1.02 RELATED WORK:

- A. Section 01300 - Submittals
- B. Section 02060 - Temporary Traffic Control
- C. Section 02221 - Trenching, Backfilling and Compacting
- D. Section 02401 - Dewatering
- E. Section 02710 - Water Main
- F. Section 02712 - Sanitary Sewer
- G. Section 02714 - Storm Drain Pipe and Fittings

1.03 SUBMITTALS:

Submittals will be required for all materials in accordance with this Section and Section 01300.

Before commencing work on the boring and jacking operation, the CONTRACTOR shall present evidence to prove to the satisfaction of the ENGINEER that he or she (or his or her subcontractor) has had previous experience in pipe installation of this nature. This requirement shall include the superintendent for this work. The CONTRACTOR shall employ a superintendent able to furnish satisfactory evidence and shall keep this superintendent continuously employed until the casing pipe installation is completed.

PART 2 - PRODUCTS2.01 STEEL CASINGS:

- A. Steel Pipe Sleeve. Shall meet ASTM A139 or A570, Grade B, with a minimum yield stress of 35,000 psi. Wall thickness shall be sufficient to withstand jacking forces without deformation, with a minimum wall thickness of 0.375-inch. Pipe need not be new if it is in good, sound condition and approved by the ENGINEER.

The casing pipe shall have an inside diameter approximately 3 inches greater than the pipe bells, or larger if necessary to accommodate pipe skids and installation.

- B. Joints. All joints shall be welded. All field welded joints shall comply with AWS Code for procedures of manual shielded metal arc welding for appearance, quality of welds made, and methods used in correcting welding work.

2.02 SKIDS:

Pipe skids shall be positioned on the pipe as shown in the Plans. The spacing between the skids shall not exceed 7 feet. Provide 3 skids per 20-foot joint, or 2 per 13-foot joint. A closer spacing shall be used if recommended by the manufacturer. Skids are to be at least 8 inches wide. The skids shall be firmly attached to the pipes so they do not slide when the pipe is installed.

Skids for PVC pipe shall be made of HDPE material manufactured by injection molding. The skids shall include projections of sufficient height to keep the bells from touching the casing, while not leaving a gap of more than 1½ inches to the top of the steel casing. The projections shall be centered around the spacer so the pipe is fully supported in all positions (even if the pipe twists from how it is originally inserted into the casing). The spacer and projections shall be designed to adequately carry the pipe totally filled with water. Casing spacers shall be "RACI" type as marketed by Public Works Marketing Inc., Dallas, Texas, 214-340-4226, or approved equal.

See Section 13900 if the carrier pipe is metallic.

2.03 END SEALS:

Casing end seals shall be 1/8-inch thick synthetic rubber with stainless steel bands and clamps, for a watertight seal. The end seal shall be Model C by Pipeline Seal and Insulator, or Model AC by Advance Products, or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. General: No construction in the property of the controlling agency (railroad, State DOT, County road right-of-way, or other), shall be started until construction coordination has been finalized. Permits required by the appropriate agency shall be followed. Shoring, sheeting or other approved construction shall be required for the excavation of jacking or boring pits. Such shoring construction shall be designed for a live load plus earth pressure. Where shoring construction is required within the R-O-W, sufficient drawings and specifications on shoring construction shall be submitted by the CONTRACTOR to the Agency as applicable for their approval before any excavation is commenced. Boring and casing operations are to comply with details on the construction drawings.

- B. Boring and Jacking: Boring and jacking of casing pipe shall be accomplished in such a manner that there will be no damage to the roadway section, and in accordance with the permit and Section 02060. Boring is to be a mechanical augering or drilling of the soil. The casing is to be jacked close enough behind the boring operation so there is no caving of soil from above. Any indication that the material above or adjoining the hole being bored is caving into the opening and being removed, shall be sufficient reason to stop the work and require a different method of installation be used. Acceptable repairs must be made if soil is removed outside of the casing. Removal of the material from the bored hole by washing or sluicing will not be permitted. All excess excavated material shall be disposed of in a manner approved by the ENGINEER.

Pipe sleeve shall be jacked into place for that length of casing as shown in the Plans.

The end of the pipe opposite the jacking pit shall not deviate from: (a) the horizontal alignment shown on the plan sheet by more than 1 foot in either direction; (b) the vertical alignment shall not deviate from the indicated elevation and slope by more than 2 inches from that specified. In addition, no high points shall be created in or adjacent to the pipe casing that are not shown in the Plans. Also the grade for a gravity line shall be such that it does not impact the design of the line or adjacent manholes.

The CONTRACTOR shall coordinate his work so traffic will not be closed during the construction of the casing crossing. The CONTRACTOR shall also furnish and maintain the necessary safety precautions as set forth in Section 02221.

C. Excavation. Trench excavation and backfilling operations shall conform in all respects to applicable portions of Section 02221. Laying and jointing of the casing pipe shall conform to the recommendations of the manufacturer of the pipe used.

The casing pipe shall be installed as shown in the Plans with care being taken to disturb as little of the shoulder embankment as possible. Backfill shall be compacted to no less than 95% of maximum density at $\pm 2\%$ of optimum moisture as determined by ASTM D698. The CONTRACTOR's installation and backfilling operations shall be completed in a manner acceptable to the ENGINEER and owner of the road being crossed.

D. Carrier Pipe Installation: Carrier pipe shall be installed in the casing on skids to facilitate installation and to provide support for pipe between joints as shown in the Plans. The carrier pipe shall be installed on a smooth operation without jerking. Skids shall remain in the place on the pipe they are installed. After installation of the pipe in the casing, the ends of the casing shall be closed with rubber end seal as indicated in the Plans.

The carrier pipe does not need to be restrained joint pipe, unless indicated in the Plans.

The carrier pipe inside the casing shall be considered subsidiary to bid item Boring and Jacking bid item. No extra compensation will be made for the carrier pipe inside the casing.

PART 4 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.01 METHOD OF MEASUREMENT:

A. Standard Items:

1. 02740.0X UNDERGROUND BORE CASING – X”

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of lineal feet (LF) of Underground Bore Casing – X” installed. Measurement shall be made along the centerline of the bore casing from end to end. Payment will not be made for additional casing length beyond that identified in the Plans unless additional length is approved by the Engineer.

4.02 BASIS OF PAYMENT:

A. Standard Items:

1. 02740.0X UNDERGROUND BORE CASING – X”

Payment will be made at the Contract Unit Bid price per linear foot (LF) of Underground Bore Casing – X” furnished and installed, and will constitute full compensation for excavation and backfilling of bore pits, shoring (if necessary), boring and jacking operations associated with the casing pipe installation, for installation of cathodic protection anodes, compaction, construction staking and dewatering. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

END OF SECTION 02740

PART 1 - GENERAL1.01 SCOPE:

The work covered by this Section of the Specifications consists of the testing, cleaning, and disinfection of all portions of the water system, including valves and stops, service lines to the curb stops, fire hydrants, etc.

1.02 PLAN:

The CONTRACTOR shall submit a waterline system testing, cleaning and disinfection plan 7 days prior to performing any work associated with testing the waterline to the ENGINEER for approval. The flushing and testing plan submitted shall have a schedule on when the work will be completed and describe how the waterlines will be tested, disinfected, flushed and how turbidity will be checked in the area prior to final flushing.

1.03 COORDINATION:

The CONTRACTOR shall request the presence of the ENGINEER for waterline flushing, testing, cleaning and sterilizing, providing 48-hour advance notice. The ENGINEER shall contact the OWNER'S Engineering Project Manager, who will schedule the necessary staff to be present. If OWNER'S staff arrives and the testing is cancelled or delayed by more than 15 minutes, a minimum 2-hour charge for the staff's time shall be paid to the OWNER by the CONTRACTOR. Rates shall be in accordance with the City of Sheridan's utility labor and equipment rates.

PART 3 - EXECUTION3.01 FLUSHING AND TESTING:

- A. General: After the pipe has been laid with all joint restraint and/or solid thrust blocking in place and partially or fully backfilled, all newly laid pipe or any valved section thereof shall be subjected to a combination hydrostatic pressure and leakage test. CONTRACTOR shall notify the ENGINEER at least forty-eight hours prior to testing. ENGINEER will be present at all tests. The CONTRACTOR shall provide test equipment including test pumps, gauges, instruments, taps, piping, valves and other equipment required. This includes a temporary flushing set-up approved by the ENGINEER, if a fire hydrant is not available. Pressure gauges used shall be graduated in increments not greater than 5 psi and shall have a range of 50% more than the test pressure. Use only recently calibrated gauges and instruments. Prior to testing, remove from systems all equipment which would be damaged by test pressure. Replace removed equipment after testing. Any section of pipe provided with thrust blocks shall not be tested until 7 days after the concrete has been placed, or the concrete has reached 80% its design strength.

Water required for testing, cleaning, and sterilizing waterline systems shall be from the City of Sheridan Water System. CONTRACTOR shall use potable water for all testing, cleaning, and sterilizing. Water shall be available at no cost; however, coordination and scheduling is required. The CONTRACTOR shall contact the ENGINEER to coordinate times of availability, such as during times

of high demand.

Where thrust restraint is required, but not part of this project, temporary thrust restraint is to be provided by the CONTRACTOR.

Pressure tests shall be conducted against all valves and curb stops.

Prior to disinfection and testing, an initial flush at a minimum velocity of 2.5 feet per second shall be made to clean the line, with the duration of this flush sufficient to displace at least twice the pipe volume of the length of line being flushed. The CONTRACTOR shall coordinate so that the ENGINEER is present for this flushing.

In the event that no valves are shown in the drawings that would allow for the CONTRACTOR to test against them, the CONTRACTOR should make provisions to perform testing without the use of the valves, such as by installing temporary plugs and thrust restraints. Any additional valves installed by the CONTRACTOR for testing purposes shall be paid for by the CONTRACTOR.

B. Procedure: The pipe shall be slowly filled with water, and the specified test pressure, corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the ENGINEER. The pump, pipe connection, and all necessary apparatus shall be furnished by the CONTRACTOR. Before applying the specified test pressure, all air shall be expelled from the pipe. The CONTRACTOR shall make any necessary taps at points of highest elevation before the test is made and insert the plugs after the test has been completed.

The length of time for a combination pressure and leakage test shall be a minimum of two hours. The test pressure to be used shall be one and one-half times the working pressure, with a minimum of 125 psi for all lines except as otherwise noted in the Plans. Final test pressures shall be approved by the ENGINEER.

C. Allowable Leakages: The allowable leakage during the duration of the test shall not exceed the amount as determined from the following formula as appropriate:

$$\text{Ductile Iron Pipe and PVC Pipe: } L = \frac{S \times D \times P^{0.5}}{140,000}$$

L = leakage in gallons per hour
S = length of pipe tested, in feet
D = the nominal diameter of the pipe in inches
P = the average test pressure during the test in pounds per square inch

Leakage is defined as the quantity of water to be supplied into the pipe, or any valved section thereof, necessary to maintain the specified test pressure after the pipe has been filled with water and air expelled.

D. Test Results: Any cracked or defective pipes or fittings discovered in consequence of the pressure test shall be replaced with sound material. Should any test of pipe laid disclose leakage greater than that specified above, the CONTRACTOR shall locate and repair the defective joints, until the leakage is within the specified allowance. The CONTRACTOR may, with ENGINEER's approval, fully backfill the

pipe trench prior to hydrostatic test if the trench is interfering with traffic flow, job site access or normal operations. However, it shall be understood to be the CONTRACTOR's risk if the pipe will not reach the test results specified herein. If this occurs he must find the leaks and do the required excavation and pipe repair even though a fully backfilled trench will make this more involved and difficult.

If warranted, one additional test may be requested by the ENGINEER on any section of waterline being tested at no additional cost to the OWNER.

Any section of pipe which fails the leakage test shall be repaired at the CONTRACTOR's expense. This section shall be retested after repairs are made.

3.02 STERILIZING WATER MAINS:

A. General: Disinfection of water mains shall be done in accordance with "AWWA Standard for Disinfecting Water Mains", AWWA C651-99. The interior of all pipes, fittings and other accessories shall be kept free from dirt and foreign matter at all times. Prior to disinfection, all lines shall be flushed to remove anything that may have entered the pipe during construction, unless approved by the ENGINEER to utilize only a final flush.

B. Chlorination:

1. Form of Chlorine and Means of Application: Before being placed in service, all new water distribution systems and repaired portions of, or extensions to, existing systems shall be chlorinated. If the available water is more alkaline than pH 8, the holding time in the main shall be increased at the discretion of the ENGINEER.
2. Form of Applied Chlorine: Any of the following methods of procedure shall be followed, subject to the approval of the ENGINEER.
 - a. Liquid Chlorine: A chlorine gas-water mixture shall be applied by means of a solution-feed chlorinating device, or, if approved by the ENGINEER, the dry gas may be fed directly through proper devices for regulating the rate of flow and providing effective diffusion of the gas into the water within the pipe being treated. Chlorination devices for feeding solutions of the chlorine gas or the gas itself must provide means for preventing the backflow of water into the chlorine cylinder.
 - b. Chlorine Bearing Compound in Water: On approval of the ENGINEER, a mixture of water and a chlorine-bearing compound of known chlorine content may be substituted as an alternative for liquid chlorine. An acceptable chlorine-bearing compound is calcium hypochlorite.

The calcium hypochlorite should first be made into a paste and then thinned to a slurry with clean water, to a one percent chlorine solution (10,000 PPM), then injected or pumped into the newly laid pipe after preliminary flushing. Special attention should be given to

the chlorine content of the product used, when determining the mixture to obtain the one- percent chlorine solution.

The preferred point of application of the chlorinating agent shall be at the supply end of the pipeline extension or any valved section of it, and through a corporation stop inserted in the top of the newly laid pipe. The water injector for delivering the chlorine-bearing water into the pipe should be supplied from a tap on the pressure side of the gate valve controlling the flow into the pipeline extension.

3. Rate of Application: Water from the source of supply shall be controlled so as to flow slowly into the newly laid pipeline. The chlorine mixture shall be in such proportion to the amount of water required to fill the pipe that the chlorine dose applied shall be at least 10 ppm after a retention period of twenty-four hours. The initial concentration shall be at least 25 ppm of chlorine in the water, although more may be required, but shall not exceed 150 ppm (to calculate, see page 6 of this section). If an initial concentration is greater than 150 ppm, the CONTRACTOR shall flush the section that is being tested immediately and reschedule the testing of that section of waterline for another day. The method of determining the rate of flow of water into the new line from the source of supply shall be acceptable to and approved by the ENGINEER.
4. Preventing Reverse Flow: Valves shall be manipulated, hydrants opened and pressure verified so that the strong chlorine solution in the line being treated will not flow back into the line supplying the water.
5. Retention Period: Treated water shall be retained in the pipe long enough to destroy all non-sporeforming bacteria. This period should be at least twenty-four hours and preferably longer, as may be directed by the ENGINEER, but shall not exceed 72 hours without approval from the City. All chlorinated water shall be flushed within 72 hours. After the chlorine treated water has been retained for the required time, the chlorine residual at the pipe extremities and at other representative points should be at least 10 ppm.
6. Chlorinating Valves and Hydrants: In the process of chlorinating newly laid pipe, all valves or other appurtenances shall be operated while the pipeline is filled with the chlorinating agent.

C. Final Flushing and Test:

Following chlorination, all chlorinated water shall be thoroughly flushed from the newly laid pipeline at its extremities until the replacement water throughout its length shall, upon test, be proved acceptable to the public health authority having jurisdiction. Such testing shall include a standard total coliform analysis used on drinking water supplies, turbidity and chlorine residual. Tests shall not detect any coliform bacteria. If non-coliform bacteria are detected, another sample shall be taken. The turbidity level of the samples collected cannot increase by more than one NTU above the background level of the water entering the main being flushed. The chlorine residual shall be less than 2 mg/L when the sample is collected. Samples should not be taken from an unsterilized hose or from a fire hydrant

because such samples seldom meet current bacteriological standards. Tests shall be taken from every new stretch of water mains being disinfected and flushed, prior to placing them into service. One test shall be taken for every three blocks (or less) of new water main. The CONTRACTOR is responsible for all work and costs associated with testing.

Service lines shall also be chlorinated and flushed.

Chlorinated water flushed from the system shall be disposed of in manner not to pollute any surface water or damage property. Contractor shall be responsible for routing of flushing water. Chlorinated water shall either be allowed to percolate into the ground, or be dechlorinated using sodium thiosulfate before it reaches a surface water body or another method satisfactory to the ENGINEER and the Wyoming Department of Environmental Quality. The CONTRACTOR is responsible for obtaining any permits associated with flushing this water.

Flushing water may possibly be disposed into the sanitary sewer as long as this effort is coordinated with and approved by the City of Sheridan. Not all sewers may be capable of receiving the flushing flow.

D. Repetition of Procedure: Should the initial treatment fail to result in the conditions specified above, the chlorination procedure shall be repeated until such results are obtained.

E. Connection to existing Water Lines: Where fittings and valves are to be installed in existing lines which must be put back into service as soon as the installation is complete, the interior of the fittings and valves shall be swabbed with a 5 percent chlorine solution immediately prior to assembly. After assembly, thoroughly flush the line.

PART 4 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.01 METHOD OF MEASUREMENT:

A. Standard Items:

All testing, cleaning and sterilizing of water lines shall be incidental to the bid price of bid items in Section 02710 of these Specifications.

4.02 BASIS OF PAYMENT:

A. Standard Items:

All testing, cleaning and sterilizing of water lines shall be incidental to the bid price of bid items in Section 02710 of these Specifications.

CALCULATING QUANTITIES OF CHLORINE FOR DISINFECTING WATER MAINS

The amount or weight of chlorine required to disinfect a particular segment of water line is directly related to the volume of water contained in that particular segment of water main.

A. Volume of Water in Pipe

$$\begin{aligned} \text{Volume of Water (Gallons)} &= \text{Area of Pipe (Ft}^2\text{)} \times \text{Length (ft)} \times 7.48 \\ &= \pi \times R^2 \times L \times 7.48 \\ \text{Where } \pi &= 3.1416 \\ R &= \text{Inside Radius of Pipe in Feet} \\ L &= \text{Length of Pipe to be Disinfected, in Feet} \\ 7.48 &= \text{Gallons per Cubic Foot} \end{aligned}$$

B. Formula to Determine Lbs. of Chlorine Required

$$\begin{aligned} \text{Lbs. of Chlorine} &= \text{ppm} \times \text{MG} \times 8.34 \\ \text{Where: Lbs. of Chlorine} &= 100\% \text{ Effective Chlorine} \\ \text{ppm} &= \text{Chlorine Dosage in Parts per Million} \\ \text{MG} &= \text{Million Gallons of Water (100,000 gallons = 0.1 MG)} \\ &= 8.34 \text{ Lbs. of Water per Gallon} \end{aligned}$$

C. Sample Calculations

Example: 4,500 lineal feet of 8" water main to be disinfected at a chlorine concentration of 75 ppm.

$$\begin{aligned} \text{Volume of Water} &= \pi R^2 L \times 7.48 \\ R &= 4" = 4/12 \text{ Ft} = 0.333 \text{ Ft} \\ L &= 4,500 \text{ Ft} \\ \text{Volume of Water} &= 3.1416 \times (.333)^2 \times 4,500 \times 7.48 \\ &= 11,750 \text{ Gallons} \\ &= 0.011750 \text{ MG} \\ \text{Lbs. of Chlorine} &= \text{ppm} \times \text{MG} \times 8.34 \\ \text{ppm} &= 75 \\ \text{Lbs. of Chlorine} &= 75 \times 0.011750 \times 8.34 \\ &= 7.34 \text{ Lbs. of 100\% Effective Chlorine} \end{aligned}$$

D. Using Chlorine Compounds or Solutions Less Than 100% Effective Chlorine

Most chlorine compounds or chlorine solutions on the market do not contain 100% effective chlorine. Normally the containers of the compound or solution will state the amount of effective chlorine as a percentage.

Example: Determine how much Sodium Hypochlorite solution is required to provide 7.34 lbs. of 100% effective chlorine. Sodium Hypochlorite container is labeled at 5.25% effective chlorine.

$$\begin{aligned} \text{Effective Chlorine Per Gallon} &= 0.0525 \times 8.34 \text{ Lbs./Gal} = 0.44 \text{ Lbs./Gal} \\ \text{Gallons of Clorox Required} &= 7.34 \text{ Lbs.} / 0.44 \text{ Lbs./Gal} = 16.7 \text{ Gallons} \end{aligned}$$

16.7 Gallons of Clorox Required.

END OF SECTION 02766

PART I - GENERAL

1.01 Work Included:

The work covered by this Section of the Specifications includes the furnishing and installation of pipe culvert, connecting bands, and appurtenances that are required to replace damaged sections or install new culvert sections as shown in the Plans.

1.02 Related Work.

- A. Section 02060 - Temporary Traffic Control
- B. Section 02221 - Trenching, Backfilling and Compaction
- C. Section 02401 - Dewatering
- D. Section 02450 - Grading
- E. Section 02480 - Reclamation

1.03 RESPONSIBILITY FOR MATERIAL:

The CONTRACTOR shall be responsible for all such material furnished by him/her and shall replace, at his/her own expense, all such material found defective in manufacture or damaged in handling after delivery by the manufacturer. This shall include the furnishing of all materials and labor required for the replacement of installed material discovered defective prior to the final acceptance of the Work or during the one-year correction period.

The CONTRACTOR shall be responsible for the safe storage of material furnished by him/her or to him/her and accepted by him/her and intended for the Work. The interior of all pipe and other accessories shall be kept free from dirt and foreign matter at all times.

1.04 SUBMITTALS:

Submittals will be required for all materials in accordance with this Section and Section 01300.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Corrugated Metal Pipe:

This pipe shall conform to the requirements of the following specifications: AASHTO M365 and M2185. The pipe shall be galvanized and have a minimum gauge of 12 and shall be polymer coated..

B. Flared Ends and Connecting Bands

Flared ends to be used on the corrugated metal pipe shall be fabricated from galvanized sheet steel meeting the applicable requirements of AASHTO M36. Connecting bands to be used on the corrugated metal pipe shall be fabricated from galvanized sheet steel meeting the applicable requirements of AASHTO M36.

PART 3 - EXECUTION

3.01 INSTALLATION

In locations shown in the Plans or as directed by the ENGINEER, CONTRACTOR shall remove the existing culvert, connecting bands, headwalls, cutoff walls, flared ends and all appurtenances to the limits required. In some cases this will require sawcutting the existing culvert at the edge of the excavation and upon completion of pipeline installation, backfill and reconnect with new materials to replace the damaged culvert. New or proposed culverts shall be constructed with new pipe materials to the lines and grades shown in the Plans.

Culverts shall not be placed under a roadway section.

The completed channel bottom shall be firm for its full length and width and where required, the channel shall have a longitudinal camber. The amount of camber shall be varied to suit height of fill and supporting soil, but in no case shall the camber create a reversal of the pipe gradient.

Where conduits are placed in embankment fill, the excavation shall be made after the embankment has been completed to the specified height above the designed grade for those conduits specified in the Plans.

Excavated material shall be stockpiled for use as backfill, incorporated into other portions of Work, or wasted as directed by the ENGINEER. Material to be used in the backfill of the pipe shall be stockpiled a minimum of two feet from the edge of the trench.

Backfill material placed under, adjacent to, and over the pipe shall be fine, readily-compactable, job-excavated soil or granular fill material. Backfill material shall not contain frozen lumps, organics, highly plastic clay or large stones.

Backfill shall be placed in compactable layers of approximately eight inches loose measurement, and each layer compacted to 95% of optimum dry unit weight in accordance with ASTM D698 and within 3% of the moisture content.

Backfill adjacent to or over pipe culverts shall be brought up simultaneously on both sides of the pipe to avoid lateral displacement. Backfill under the haunches of the pipe shall be tamped or rammed into place between the pipe and the channel bottom.

Care shall be exercised during backfilling, operations to prevent damage to the pipe, either through unequal pressure exerted on the sides or by backfill being dropped directly onto the pipe.

Pipe shall be inspected before any backfill is placed. Any pipe found to be out of alignment, unduly settled or damaged shall be taken up and re-laid or replaced.

Flexible pipes shall be firmly jointed by coupling bands. The pipe installation shall begin at the downstream end of the line. The lower half of the pipe shall be in contact with the shaped trench bottom throughout its entire length.

The outside circumferential laps of flexible pipe shall be placed facing upstream. The pipe shall be placed with longitudinal laps or seams at the sides.

PART 4 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.01 METHOD OF MEASUREMENT:

A. Standard Items:

1. 02800.0X – X” CULVERT

This item shall be measured on a lineal foot (LF) basis. Measurement of culverts shall be made along the centerline of pipe.

2. 02800.1X – X” CULVERT FLARED END

This item shall be measured on a per each (EA) basis. Measurement for this item will be made in the field with the quantity for payment determined by the actual number of each flared end furnished and installed.

4.02 BASIS OF PAYMENT:

A. Standard Items:

1. 02800.0X – X” CULVERT

This item shall be paid for at the contract unit price bid, which price and payment shall constitute full payment for all trench excavation, imported pipe bedding material, backfill, compaction, shoring (if necessary), construction staking, dewatering, and all other work necessary or incidental for completion of the item.

2. 02800.1X – X” CULVERT FLARED END

Payment will be made at the Contract Unit Bid price per each flared end and will constitute full compensation for all trench excavation, shoring, backfill, compaction, construction staking, and dewatering. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

END OF SECTION 02800

PART 1 – GENERAL

1.01 SUMMARY:

This Section of the Specifications covers materials and work associated with providing geosynthetic engineering fabric for stabilization. The fabrics covered in this section shall be a woven fabric consisting only of long chain polymeric filaments or yarns, such as polyethylene, polyester, polyamide, or polyvinylidene-chloride, formed into a stable network so that the filaments or yarns retain their relative positions to each other.

1.02 SUBMITTALS:

Submit for approval name of fabric, its specifications and installation procedures per Section 01300.

1.03 QUALITY ASSURANCE

Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions. All test methods shall be in accordance with latest ASTM procedures.

PART 2 – PRODUCTS

2.01 MATERIALS

Engineering fabric installed beneath aggregate base courses shall meet the minimum performance and strength requirements listed for Separation and Stabilization as shown in the attached Table 2 during its service life. Engineering fabric beneath crushed aggregate base course shall be Mirafi HP270 or approved equal.

PART 3 – EXECUTION

3.01 PACKAGING AND ON-SITE STORAGE

Engineering fabric shall be uniformly rolled onto a cardboard core, and shall be wrapped in plastic to protect the material from moisture and damage during shipment. Protective wrapping shall be left on the fabric until installation. The product must not be allowed to get wet prior to installation to prevent weakening of the cardboard core. Rolls shall be externally tagged for easy field identification. External tagging shall include the following: 1) name of manufacturer; 2) product type; 3) product grade; 4) lot number; and, 5) physical dimensions.

3.02 INSTALLATION

Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction. Coordinate with work of other sections.

GEOTEXTILE (FABRIC) AND IMPERMEABLE PLASTIC MEMBRANE SPECIFICATIONS
Fabric and Membrane Requirements (Minimum Roll Averages)

Fabric and Membrane Property	Test Method	Drainage & Filtration	Erosion Control	Silt Fence	Separation & Stabilization		Embankment & Retaining Wall Reinforcement	Impermeable Plastic Membrane
					Woven	Non-Woven		
PERFORMANCE CRITERIA DURING SERVICE LIFE								
Equivalent or Apparent Opening Size, US Standard Sieve μm [a]	ASTM D 4751-93	40-100 (425-150)	40-140 (425-106)	20-50 (850-300)	30-50 (600-300)	40-100 (425-150)	40-100 (425-150)	—
Thickness, Mils (μm)	ASTM D 5199-91	—	—	—	—	—	—	12 (305)
Permittivity, Sec.^{-1} [a]	ASTM D 4491-92	0.2	0.1	.01	.25	0.1	.005	$<10^{-7}$ $\text{cm/sec}^{[f]}$
Retention Efficiency, %	ASTM D 5141-91	—	—	75	—	—	—	—
STRENGTH REQUIREMENTS								
Wide Width Strip Tensile Strength, lbf./in. (kN/m)	ASTM D 4595-86 ^[b] ASTM D 4885-88 ^[g]	40 (7)	65 (11)	65 (11)	200 (34)	65 (11)	200 (35)	80 ^[g] (14)
Elongation at Failure, %	ASTM D 4595-86 ^[b]	40 min.	40 min.	20 min.	10 min.	20 min.	35 max.	20 min.
Burst Strength, psi (kPa)	ASTM D 3786-87 (Diaphragm Method)	130 (900)	210 (1450)	250 (1725)	290 (2000)	210 (1450)	430 (2960)	—
Trapezoid Tear Strength, lbf. (N)	ASTM D 4533-91 (any direction)	25 (110)	40 (180)	50 (220)	110 (500)	40 (180)	75 (330)	50 (220)
Puncture Strength, lbf. (N)	ASTM D 4833-88 ^[c]	25 (110)	50 (220)	50 (220)	120 (530)	50 (220)	110 (490)	60 (265)
Seam Strength, (Seam Efficiency) %	ASTM D 4884-90	100	100	100	90	100	100	—
ENVIRONMENTAL REQUIREMENTS								
Mildew/Rot Resistance, %	AATCC 30 1988 ^[e]	100	100	100	100	100	100	100
Insect/Rodent Resistance, %	AATCC 24 1985 ^[e]	100	100	100	100	100	100	100
Ultraviolet Resistance, % Strength Retention	ASTM D 4355-92	^[d]	90	70	^[d]	^[d]	^[d]	^[d]

- [a] Apparent Opening Size (AOS) and Permittivity property specifications will be determined on a site specific basis for critical conditions and listed separately in a special provision when needed.
- [b] 8" (200 mm) wide x 4" (100 mm) length specimen tested at a strain rate of 10% (10 mm) per minute {0.4 in.} (10 mm) per minute.
- [c] Using 5/16" (8 mm \pm .01 mm) diameter flat tipped steel cylinder centered with ring clamp.
- [d] Non-stabilized or low susceptible geotextiles should not be exposed to ultraviolet radiation for more than 5 days.
- [e] American Association of Textile Chemists and Colorists test procedures.
- [f] Permeability Coefficient (ASTM D 4491-92)
- [g] Wide Strip Tensile Method for Geomembranes

Note: Values are omitted where the requirement does not apply to the end use application or is sufficiently addressed by a related property.

PART 4 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.01 METHOD OF MEASUREMENT:

A. Standard Items:

1. 02895.01 – ENGINEERING FABRIC

This item shall be measured by the number of square yards (SY) of engineering fabric placed upon the neat lines defined in the plans.

4.02 BASIS OF PAYMENT:

A. Standard Items:

1. 02895.01 – ENGINEERING FABRIC

Payment shall constitute full compensation for all haul, installation and placing. Price will also include all costs to cover labor, equipment, tools and incidentals to complete the work in accordance with the contract documents.

END OF SECTION 02895

DIVISION 3
CONCRETE

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK:

The extent of concrete work, as shown in the Plans.

1.02 RELATED WORK:

- A. Section 02221 - Trenching, Backfilling and Compaction
- B. Section 02450 - Grading
- C. Section 02519 - Crushed Aggregate Base Course
- D. Section 03020 - Concrete Curb and Gutter
- E. Section 03030 - Concrete Sidewalks, Approaches, Fillets and Double Gutters
- F. Section 03040 - Portland Cement Concrete Pavement

1.03 QUALITY ASSURANCE:

- A. Codes and Standards: Comply with provisions of following codes, specifications and standards, except where more stringent requirements are shown or specified:

ACI 301 "Specifications for Structural Concrete for Buildings".
ACI 318 "Building Code Requirements for Reinforced Concrete".
ACI 347 "Formwork"
ACI 350 "Environmental Concrete Structures"
Concrete Reinforcing Steel Institute, "Manual of Standard Practice".

- B. Concrete Mix Designs: Concrete mix designs shall be prepared for each type of concrete by an independent testing laboratory acceptable to the ENGINEER at the CONTRACTOR's expense. The mix designs shall be prepared in strict conformance with either the laboratory trial batch or field experience methods as defined by ACI 301. Subject to approval by ENGINEER this provision may be waived if the CONTRACTOR can show by previous testing and experience that the concrete will meet these Specifications. The concrete mix design submittal shall contain at a minimum the information as identified in Subsection 1.04 of this Section. No concrete is to be placed until the mix design is approved by the ENGINEER.

- C. Concrete Testing: The CONTRACTOR shall employ at his or her 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 CONTRACTOR will perform all acceptance testing during the on-site placement of the concrete as identified in Subsection 3.15 of this Section. 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.

1.04 SUBMITTALS:

- A. Product Data: Submit manufacturer's product data with application and installation instructions for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds,

waterstops, joint systems, curing compounds, and others as requested by ENGINEER.

B. Shop Drawings; Reinforcement: Submit Shop Drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, diagrams of bent bars, arrangement of concrete reinforcement. Include special reinforcement required and openings through concrete structures. Work to be done by a well-qualified detailer.

C. Concrete Mix Design: Submit complete information qualifying that the proposed mix is in complete compliance with the concrete specified herein. The submittal shall contain but not be limited to the following:

1. A table showing weights of all aggregate, cement, water and admixtures to be used for a yard of concrete.
2. The water-cement ratio, calculated from the weights of water and cementitious materials in the mix design.
3. Certification of aggregate compliance with these Specifications and source of supply and location. Certification to include gradation tests, wear and soundness tests.
4. Admixture literature to certify compliance with these Specifications.
5. Cement Mill Test Certification.
6. Test reports indicating recent strength, air and slump performance for the proposed mix.

D. Samples: Submit samples of materials as specified and as otherwise requested by ENGINEER, including names, sources and descriptions.

PART 2 - PRODUCTS

2.01 FORM MATERIALS:

A. The CONTRACTOR shall be solely responsible for the adequacy of all forming, shoring and bracing design and construction. Any formwork installed by the CONTRACTOR shall be solely at CONTRACTOR's risk. The ENGINEER's review and/or approval will not lessen or diminish the CONTRACTOR's liability.

B. Forms for Exposed Finish Concrete: Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Plastic forms shall not be used. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown in the Plans. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection. Aluminum will not be permitted.

C. Forms for Unexposed Finish Concrete: Form concrete surfaces which will be unexposed in finished structure with plywood, lumber, metal or other acceptable material. Plastic forms shall not be used. Provide lumber dressed on at least 2 edges and one side for tight fit. Aluminum will not be permitted.

2.02 REINFORCING MATERIALS:

A. Reinforcing Bars (Rebar): ANSI/ASTM A615, Grade 60, deformed.

B. Steel Wire: ANSI/ASTM A82, plain, cold drawn, steel. The wire for epoxy coated reinforcing shall be nylon, epoxy or plastic coated.

C. Welded Wire Fabric (WWF): ANSI/ASTM A 185, welded steel wire fabric.

D. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Bar supports shall conform to ACI 315 for stainless steel chairs, plastic spacers or plastic shim plates.

Brick, broken concrete masonry units, spalls, rocks or similar materials shall not be used for support of reinforcing steel.

For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.

For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).

E. Fiber Reinforcing: The fiber shall be synthetic fibrous concrete reinforcement composed of 100% virgin polypropylene MD graded fibers containing no reprocessed olefin materials and shall be FIBERMESH or an approved equal. All fiber reinforcing shall be fibrilated and not less than 1" in size.

2.03 CONCRETE MATERIALS:

A. Portland Cement: ANSI/ASTM C150, Type I, II, or III. For below-ground concrete water system structures, other than thrust blocks, use Type II modified or V.

Use one brand of cement throughout the project, unless otherwise acceptable to ENGINEER. Certified mill certificates shall be furnished by the cement company and sent to the ENGINEER with every shipment.

B. Normal Weight Concrete Aggregates: ANSI/ASTM C 33, and as herein specified. Provide aggregates from a single source for exposed concrete.

Local aggregates not complying with ANSI/ASTM C 33 but which have shown by special test or actual service to produce concrete of adequate strength and durability may be used when acceptable to the ENGINEER.

C. Fly Ash: Fly ash shall be Class F conforming to ASTM C618. Fly ash shall contain less than 1 percent by weight carbon and less than 3 percent by weight sulfur trioxide. Fly ash supplied during the life of the project shall have been formed at the same single source. Fly ash color shall not substantially alter the resulting concrete from the normal gray color and appearance. 15% by weight of cement SHALL be replaced by Class F fly ash for all mix proportions listed in Subsection 2.05 of this Section. Fly ash shall replace cement at a ratio of the specific gravity of cement to the specific gravity of fly ash. The CONTRACTOR shall provide the ENGINEER with the chemical and physical analyses of the fly ash.

D. Water: Potable.

E. Admixtures:

1. All admixtures to be used in concrete shall be subjected to prior approval by the ENGINEER.
2. All admixtures used in any mix design shall be manufactured and supplied by the same manufacturer or shall be submitted with proof of compatibility.
3. Air-Entraining Admixture: ANSI/ASTM C 260.
4. Water-Reducing Admixture: ANSI/ASTM C 494, Type A, and contain not more than 1% chloride ions.

Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

"Eucon WR-75"; Euclid Chemical Co.
"Pozzolith 322N"; Master Builders.
"Plastocrete 160"; Sika Chemical Corp.
"Chemtard"; Chem-Masters Corp.

5. Calcium chloride is not permitted.

F. Color Pigment: ASTM C 979/C 979M, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, nonfading, and resistant to lime and other alkalis.

Color: As selected by the ENGINEER and OWNER.

2.04 RELATED MATERIALS:

A. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.

B. Moisture-Retaining Cover: One of the following, complying with ANSI/ASTM C171:

Waterproof paper.
Polyethylene film.
Polyethylene-coated burlap.

C. Liquid Membrane-Forming Curing Compound: Liquid type membrane forming curing compound complying with ANSI/ASTM C 309, pigmented or colored at time of application, non-toxic to potable water, and has a water retention of .01/Gr./Sq. CM as determined per ASTM C-156 Standards.

D. Bonding Compounds: 100% solids, non-sag two component material suitable for use on dry or damp surfaces.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
 - a. Epoxy resin bonding compounds shall be used for wet areas and shall be Adhesive Engineering, Concesive Nos. 1001, 1001-LPL or 1180 as applicable; Sika Chemical Corporation, Sikadur 35, Hi-Mod LV, Sikadur 32, Hi-Mod, or Sikadur 31, Hi-Mod Gel as applicable; Burke Company 881 LPL Epoxy; or equal.
 - b. Non-epoxy bonding compounds shall be used for dry areas and shall be Burke Company, Acrylic Bondcrete; Imperial Chemical Industrial, Inc., Thoro System Products, Acryl 60; Thorobond; or equal. Bonding compounds shall be applied in accordance with the manufacturer's instructions.

E. Joint Sealers

1. Joints, when so indicated in the Plans, shall be sealed with a mastic joint sealer material of uniform, stiff consistency that does not contain solvents.
2. The mastic shall tenaciously adhere to primed concrete surfaces, shall remain permanently mastic and shall not contaminate potable water.
3. The material shall be of a type that will effectively and permanently seal joints subject to movements in concrete.
4. Joint sealing materials shall meet the requirements of Dow Corning 888 or 890 Silicone Joint Sealant or approved equal.
5. Joint sealing shall be completed on all concrete paving projects and shall be incidental to the concrete work. No separate pay item will be made for joint sealing.

2.05 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 ENGINEER for preparing and reporting proposed mix designs.

Submit written reports to ENGINEER of each proposed mix for each class of concrete at least 15 days prior to start of work in accordance with Subsection 1.04C of this Section. Do not begin concrete production until mixes have been reviewed by ENGINEER.

Design mixes to provide normal weight concrete with the following properties:

	CLASS A	CLASS B	FLOWABLE FILL
Maximum Flexural Strength (28 Day)	600 psi	--	--
Minimum Compressive Strength (28 Day)	4800 psi	4000 psi	100 psi
Max. Water Content (Gallons per 94 lb. sack of cement)	5 Gal.	5.5 Gal.	50 Gal.
Minimum Cement Content (94 lb. Sack of Cement per CY Concrete)	7 sacks	6 sacks	1 sack

Class A: Portland Cement Concrete Pavement

Class B: All other uses except as noted

Flowable Fill: Trench backfill/sewer line encasement

B. Adjustment to Concrete Mixes: Mix design adjustments may be requested by CONTRACTOR when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to OWNER and as accepted by ENGINEER. Laboratory test data for revised mix design and strength results must be submitted to and accepted by ENGINEER before using in work.

C. Admixtures: Use air-entraining admixture in all concrete. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having air content within following limits:

4% to 7% for maximum 1½" aggregate.

4½% to 7½% for maximum ¾" aggregate.

Use admixtures for water-reducing and set-control in strict compliance with manufacturer's directions. The use of water reducing additives shall not permit a reduction in specified cement content.

D. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:

Not less than 1" and not more than 4".

Concrete containing HRWR admixture (super plasticizer): 3" before and not more than 8" after HRWR addition.

PART 3 - EXECUTION

3.01 FORMWORK

- A. Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position.

The design and layout of the formwork as well as its construction is the responsibility of the CONTRACTOR. Formwork and finished concrete shall conform to the tolerances specified by ACI 347.

Design formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials

Construct forms to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chambers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent leakage of cement paste.

Fabricate forms for each removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.

Provide temporary openings, where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.

Chamfer exposed corners and edges $\frac{3}{4}$ -inch, using wood, metal, PVC or rubber triangular fillets or chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

All forms shall be removed before backfilling against the concrete.

- B. Form Ties: Factory-fabricated, adjustable-length, removable or snapoff metal forms ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal.

Unless otherwise indicated, provide ties so portion remaining within concrete after removal is at least $1\frac{1}{2}$ -inch inside concrete.

Unless otherwise shown, provide form ties which will not leave holes larger than 1-inch diameter in concrete surface.

- C. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed. Retighten forms and bracing after concrete placement is required to eliminate mortar leaks and maintain proper alignment. Before concrete is deposited within the forms, all inside surfaces of steel and plywood form surfaces shall be thoroughly, but not excessively, coated with an approved non-staining bond releasing form oil.

3.02 REINFORCEMENT:

- A. Steel Reinforcing shall be cut and bent in accordance with ACI 318 and CRSI "Manual of Standard Practice". Reinforcement shall be accurately formed to the dimensions indicated in the Plans and on the bending schedule. All bars shall be bent cold.

- B. Bar Spacing: The clear distance between parallel bars shall not be less than one bar diameter and, unless specifically authorized, shall in no case be less than one inch, nor less than the maximum size of coarse aggregate specified.

- C. Concrete Cover: Unless otherwise shown in the Standard Details or in the Plans all reinforcing shall have the minimum nominal cover as follows:

Unformed Surfaces (crushed base, soil, etc...)	3"
Formed Surfaces in Contact with Earth or Water	
Conventionally reinforced #5 bars and smaller	1½"
Conventionally reinforced #6 through #18 bars	2"
Unformed surfaces in contact with water or weather	2"

- D. No "Bury" or "Carrier" bars will be allowed unless specifically approved by the ENGINEER. "Chairs" shall be used to raise rebar. All "chairs" shall be approved by the ENGINEER.

- E. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.

- F. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.

- G. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.

- H. Splicing:

Except as shown or specified in the Plans, reinforcing steel shall not be spliced at any location without specific approval by the ENGINEER. Splices in adjacent bars shall be staggered.

Where permitted or required, splices in reinforcing steel shall have sufficient lap to transfer full strength of the bar by bond and shear. Unless specified or shown otherwise in the Plans, the bars at a lap splice shall be in contact with each other.

Unless specified or shown otherwise in the Plans, bars shall be lap spliced in accordance with ACI 318 and shall be fastened together with steel tie wire.

Unless shown otherwise in the Plans, where bars are to be lap spliced at joints in the concrete, all bars shall project from the concrete first placed, a minimum length equal to the lap splice length indicated in the Plans. All concrete or other deleterious coating shall be removed from dowels and other projecting bars by wire brushing or sandblasting before the bars are embedded in a subsequent concrete placement.

I. Supports:

All reinforcement shall be retained in place, true to indicated lines and grades, by the use of approved bar supports.

The supports shall be of sufficient quantity, strength and stability to maintain the reinforcement in place throughout the concreting operations.

Supports must be completely concealed in the concrete and shall not discolor or otherwise mar the surface of the concrete.

The CONTRACTOR shall be held responsible for providing the appropriate quantity and type of bar supports.

J. Bar Tying:

Bars shall be tied sufficiently often to prevent shifting. There shall be at least three ties in each bar length (this shall not apply to dowel laps or to bars shorter than 4 feet, unless necessary for rigidity). Slab bars shall be tied at every intersection around the periphery of the slab. Wall bars and slab bar intersections shall be tied at not less than every fourth intersection, but at not greater than the following maximum spacings:

	Slab Bars (inches)	Wall Bars (inches)
Bars No. 5 and smaller	60	48
Bars No. 6 through No. 9	96	60

3.03 JOINTS:

A. Construction Joints: Locate and install construction joints so as not to impair strength and appearance of the structure, as acceptable to ENGINEER.

Provide keyways at least 1½" deep in construction joints in walls, slabs and between walls and footings; accepted bulkheads designed for this purpose may be used for slabs.

Place construction joints perpendicular to the main reinforcement. Continue reinforcement across construction joints.

3.04 INSTALLATION OF EMBEDDED ITEMS:

A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto.

B. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure screed strip units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting type screeds.

3.05 PREPARATION OF FORM SURFACES:

Coat contact surfaces of forms with a form-coating compound before reinforcement is placed.

Thin form-coating compounds only with thinning agent of type, and in amount, and under conditions of form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come into contact with reinforcing steel or concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.

3.06 CONCRETE PLACEMENT:

A. Preplacement Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Moisten wood forms immediately before placing concrete where form coatings are not used.

B. General: Comply with ACI 304, and as herein specified. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation. On sloped surfaces begin placement of concrete at bottom of slope and place upward.

C. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24" and in a manner to avoid inclined construction joints. Where

placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI 301 or 304 recommended practices.

Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6" into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.

D. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.

Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

Bring slab surfaces to correct level and strikeoff with straightedge. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.

Maintain reinforcing in proper position during concrete placement operations.

3.07 COLD WEATHER CONCRETING PROCEDURES:

A. Definition: Cold weather is defined as a period when for more than 3 successive days the mean daily temperature falls below 40°F or any day when the low temperature is expected to fall or falls below freezing (32°F).

B. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.

C. Materials: Water and aggregates may be preheated for cold weather placement; however, their temperature shall not exceed 150°F. All methods and equipment for heating of water and aggregate shall conform to the requirements of ACI 306. Concrete mixture at the point of placement shall have a temperature of not less than 50°F and not more than 90°F. Temperature tests at the job site shall confirm this requirement.

D. Construction: No concrete shall contain frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or subgrade containing frozen materials. Placement shall be delayed until the ground has fully thawed out. When temperatures are expected to fall below 32°F the night before the concrete is placed, then all reinforcing steel, forms and the ground shall be preheated for a minimum of 12 hours at a minimum temperature of 50°F.

- E. Curing: When temperatures are expected to be below 32°F any time before the concrete has reached a strength of 1000 psi, the concrete must be adequately protected against frost damage by heating blankets, straw or insulation materials for a minimum of 7 days. The concrete temperature shall at no time fall below 40°F based on recording temperature monitors placed at a maximum of 50 feet on centers, each way, and around the circumference of the floor, wall, roof slab and wall footing. CONTRACTOR shall provide heat and recording thermometers as required to keep the concrete temperature as specified throughout the entire curing period of 7 days.

When combustion type heaters are used to maintain concrete temperatures within an enclosure, the exhaust gases shall be vented from the heater to the outside atmosphere so that the concrete is not exposed to the products of combustion.

3.08 HOT WEATHER PLACING:

- A. Definition: Hot weather is defined as any combination of high air temperature, low relative humidity and wind tending to impair the quality of fresh or hardened concrete or otherwise resulting in abnormal concrete properties. During hot weather, any or all the methods specified in ACI 305 shall be used to maintain the concrete temperature below the specified limits.
- B. Materials: Cool ingredients before mixing to maintain concrete temperature at time of placement below 90°F. Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated into total amount of mixing water. Ice when introduced into the mixer shall be in such form that it will be completely melted and dispersed throughout the mix at the completion of the mixing time.
- C. Concrete Temperature: The temperature of concrete, as delivered at the time and location of placement, shall not exceed 100°F under any conditions. The temperature of concrete as delivered at the time and location of placement, except for concrete deposited in wall or column forms, shall not exceed the following temperatures under the following ambient conditions:

RELATIVE HUMIDITY LESS THAN %	AMBIENT TEMPERATURE GREATER THAN °F	MAXIMUM CONCRETE TEMPERATURE °F
80	90	100
70	90	95
60	90	90
50	90	85
40	90	80
30	80	75
20	75	70

- D. Preparation for Placing: Forms and reinforcing steel shall be cooled by fog spraying evaporation or covering with water-soaked burlap immediately prior to placing concrete. Forms shall be free of standing water when concrete is placed.
- E. Placement: Concrete shall be placed in shallower layers than under normal conditions if necessary to assure coverage of the previous layer while it will respond readily to vibration.
- F. Protection and Curing: Fog spray shall be used after finishing and before the specified curing is commenced to avoid surface plastic-shrinkage cracking. Forms shall be kept covered and continuously moist. Once forms are loosened and during form removal, concrete surfaces shall be protected from drying and shall be kept continuously wet by fog spraying or other approved means until the specified curing is commenced.

3.09 SURFACE FINISHES:

- A. Rough Form Finish: For formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise indicated. This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4" in height rubbed down or chipped off.
- B. Smooth Form Finish: For formed concrete surfaces exposed-to-view, or that are to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, or other similar system. This is as-cast concrete surface obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed.

- C. Wood-Float Finish: This requires an integral finish by wood-float after screeding, to compact the surface evenly. Any excess surface water shall be removed before floating and no mortar shall be used for leveling.
- D. Steel Trowel Finish: This shall be an integral finish obtained by troweling with a steel trowel after the surface has been floated and allowed to stand until all water-sheen has disappeared. Final troweling shall be done after the concrete has hardened sufficiently to prevent drawing moisture and fine materials to the surface and when the concrete is sufficiently hard that no mortar accumulates on the trowel. Cement or mixture of cement and sand, shall not be spread on surfaces to absorb excess water or to stiffen the concrete. Troweling shall produce a dense, smooth, impervious surface free from defects and blemishes.
- E. Unformed Surfaces: Unformed surfaces which will not be exposed in the completed work shall be brought to required finished elevations and left true and regular.
- F. Broom Finish: Immediately after trowel finishing, slightly roughen concrete surface by brooming with a fiber bristle broom to leave a fine uniformly scratched concrete surface.
- G. Tinning: Refer to Section 03040

3.10 FINISH SCHEDULE:

- A. Unless otherwise indicated in the Plans, concrete finishes shall be used as follows:
1. Formed surfaces not exposed to view: Rough Form Finish
 2. Formed surfaces exposed to view: Smooth Form Finish
 3. Sidewalk, approaches, fillets, curb and gutter, and double gutter: Broomed Surface Finish
 4. Portland Cement Concrete Pavement: See Section 03040
 5. Water carrying structures: Steel Trowel Finish

3.11 CONCRETE CURING AND PROTECTION:

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing.
- B. Curing Methods: Perform curing of concrete by moist curing, by moisture-retaining cover curing, by curing compound, and by combinations thereof, as herein specified.
1. All horizontal, screeded and floated surfaces, exposed to drying winds and sunlight, shall be sprayed with a curing compound in accordance with

these Specifications at an application rate of 200 sf per gallon or until the entire concrete surface is covered.

2. All formed concrete surfaces shall be sprayed with a concrete curing compound in accordance with these Specifications at an application rate of 200 sf per gallon or until the entire concrete surface is covered.

3.12 REMOVAL OF FORMS:

Formwork not supporting weight of concrete, such as sides of curbs and gutter, sidewalks and similar parts of the work, may be removed after cumulatively curing at not less than 50°F (10°C) for 12 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

Formwork supporting weight of concrete, such as beam soffits, joints, slabs and other structural elements, may not be removed in less than 14 days and until concrete has attained design minimum 28 day compressive strength. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location or members.

Form facing material may be removed 4 days after placement, only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.

3.13 MISCELLANEOUS CONCRETE ITEMS:

- A. Filling-In: Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.

3.14 CONCRETE SURFACE REPAIRS:

- A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms.

Cut out honeycomb, rock pockets, voids over 1/4" in any dimension, and holes left by tie rods and bolts, down to solid concrete but, in no case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water and brush-coat the area to be patched with specified epoxy bonding agent. Damp-pack with a mix of one part of cement to 2 parts of sand and fine gravel, epoxy and sand mix or combination of materials as approved by ENGINEER.

The water content of the damp-pack material shall be such that a ball of the mix may be squeezed in the hand without bringing free water to the surface. Damp-pack material shall be tamped into place and finished to match adjacent concrete surfaces. Particular care shall be taken that no sagging of the material will occur. The bond between any two layers of damp-pack shall be improved through the use of an approved epoxy bonding agent. Surfaces which have been damp-packed shall be kept continuously damp during, and for a period of not less than seven days after completing the damp-pack operation, by the curing procedure

described in this Section. Under no circumstances shall CONTRACTOR apply a plaster coat over the honeycomb areas to conceal the existence of the honeycombing in the concrete.

- B. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of ENGINEER. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins and other projections on surface; and stains and other discolorations that cannot be removed by cleaning.

Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.

Repair material shall be HD50, or approved equal.

- C. Form Tie Holes: Tie holes shall be thoroughly sandblasted or roughened. The tie holes shall then be coated with a water insensitive epoxy or an acceptable bonding agent and properly filled through damp-packing with a mortar of dry consistency and a mix of one part of cement to one part of plaster sand. The amount of water to be added to the cement-sand mix shall be such that the mortar can be driven into the voids and will compact properly. The outside of the tie hole shall be drypacked no sooner than 7 days after the inside has been drypacked.

3.15 QUALITY CONTROL TESTING DURING CONSTRUCTION:

The CONTRACTOR shall perform the following tests and submit test reports to ENGINEER.

Sampling and testing for quality control during placement of concrete will include the following, at a minimum but may include additional testing as determined by ENGINEER.

- A. Water-Cement Ratio: The **actual** water-cement ratio of the concrete, based on moisture content of aggregates and adjusted batch weights of water and cementitious materials, shall be determined and printed on the ticket of each load delivered to the jobsite.
- B. Sampling Fresh Concrete: ASTM C172, except modified for slump to comply with ASTM C94.
- C. Slump: ASTM C143; one test per every 25 CY of concrete delivered at point of discharge; and one test for each set of compressive strength test specimens.
- D. Air Content: ASTM C231 for normal weight concrete; one for each set of compressive strength test specimens.
- E. Concrete Temperature: 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 made.
- F. Compression and Flexural Test Specimens: ASTM C31; ASTM C78 one set of 4 standard cylinders for each compressive strength test, unless otherwise directed.

Mold and store cylinders or beams for laboratory cured test specimens except when field-cure test specimens are required.

G. Compressive Strength Tests: ASTM C39; one set for each 50 CY or any fraction thereof, placed in any one day; 1 specimen tested at 7 days, and 2 at 28 days with one held in reserve. Additional specimens may be required for field cure when conditions warrant.

Strength level of concrete will be considered satisfactory if averages of sets of lab cured cylinders of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 10%.

Test results shall be reported in writing to ENGINEER and CONTRACTOR as soon as possible. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for the 7-day, and 28-day tests.

H. Additional Tests: The OWNER may have an independent testing service to make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42, or by other methods as directed. CONTRACTOR shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.

I. Concrete Strength Deficiency:

1. Sliding scale pay factor for strength acceptance:

The sliding scale pay factors shown in the following tables shall be applied to each day's concrete placements for which test results indicate deficient concrete strengths.

CLASS A CONCRETE (4800 psi)

Average Compressive Strength (psi)	Percent of contract Unit Price for Concrete in Each Day's Pour Where Strength is Deficient
4800 or greater	100
4500 – 4799	90
4000 – 4499	75
Less than 4000	Reject *

*The OWNER may elect to leave the reject material in place in which case the pay factor will be 25%. Payment will not be made for material ordered removed from the project.

CLASS B CONCRETE (4000 psi)

Average Compressive Strength (psi)	Percent of contract Unit Price for Concrete in Each Day's Pour Where Strength is Deficient
4000 or greater	100
3700 – 3999	90
3500 – 3699	75
Less than 3500	Reject *

*The OWNER may elect to leave the reject material in place in which case the pay factor will be 25%. Payment will not be made for material ordered removed from the project.

END OF SECTION 03010

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK:

- A. Concrete curb and gutter shall consist of air-entrained Class B Portland Cement Concrete constructed in accordance with Section 03010. This work shall be in conformity with the lines and grades, thicknesses, and typical cross sections shown in the Plans or established by the ENGINEER.
- B. It is the intent of this Section to allow machine-laid or hand formed curb and gutter.

1.02 RELATED WORK:

- A. Section 02221 - Trenching, Backfilling and Compaction
- B. Section 02450 - Grading
- C. Section 02519 - Crushed Aggregate Base Course
- D. Section 03010 - Concrete Work
- E. Section 03030 - Concrete Sidewalks, Approaches, Fillets and Double Gutters
- F. Section 03040 - Portland Cement Concrete Pavement

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Portland Cement Concrete: Air-entrained Class B Portland Cement Concrete shall conform to the requirements of Section 03010.
- B. Preformed Expansion Joint Material: Joint material shall comply with the requirements of AASHTO M213, ASTM D994, ASTM D1751, or ASTM D1752.

PART 3 - EXECUTION

3.01 FOUNDATION PREPARATION:

- A. Foundation Preparation: Excavation for the construction shall be to a depth of 6 inches below the bottom of the concrete. The base course upon which the concrete is to be placed shall have a firm and even surface and shall be compacted.

Excavation shall be as required to permit placing of curb, gutter and/or combined curb and gutter to the lines as shown in the Plans.

A minimum depth of 6 inches of crushed aggregate base course material shall be placed and compacted to 95% of maximum dry density in accordance with ASTM D698 at +/-3% moisture. A firm, even surface shall be established under all curb and gutter. This requirement is waived if curb and gutter is installed on a portion of street where the base course material is 6 inches or more in thickness.

All soft, yielding and otherwise unsuitable material shall be removed and replaced with suitable material. Filled sections shall be compacted and extended a minimum of one foot outside the form lines.

3.02 FORMS:

- A. Forms: Forms, unless otherwise approved by the ENGINEER, shall be of metal and of a depth equal to the face of the item being constructed as shown in the Plans and/or the Standard Details. No plastic forms shall be allowed. Forms in place shall be approved by the ENGINEER prior to the placement of concrete.

Forms shall be designed to produce hardened concrete having the shape, lines and dimensions shown in the Plans and/or the Standard Details. Forms shall be substantial and sufficiently tight to prevent leakage of mortar and shall be maintained in proper position and accurate alignment. Forms shall be thoroughly cleaned and oiled with an approved form oil before concrete is placed and shall not be removed until the concrete has hardened sufficiently to support all loads without damage.

Where the curb and gutter is to abut an existing sidewalk, the CONTRACTOR shall use an approved face-to-gutter form secured in such a way so as to maintain an established gutter grade. The curb height may vary so that the top of the curb shall match as nearly as possible the standard curb and gutter cross section. Hand forming may be allowed by permission of the ENGINEER for lengths not exceeding 10 feet.

Radii shall be formed using flexible or curved metal forms properly set to fit the required curvature. Wood forms may be used subject to the approval of the ENGINEER. Radii may be formed by using segments of straight forms, provided the length of the straight segment does not exceed one-tenth of the length of the radius.

3.03 REINFORCEMENT:

- A. Reinforcement: Reinforcement shall be placed in conformance with the Plans and shall be placed and held in position prior to concrete placement.

3.04 PLACING AND FINISHING CONCRETE:

- A. Placing Concrete: The subgrade shall be properly compacted and brought to specified grade before placing concrete. The base course shall be thoroughly dampened immediately prior to the placement of the concrete. Concrete shall be spaded and tamped thoroughly into the forms to provide a dense, compacted concrete free of rock pockets. The exposed surfaces shall be floated, finished and broomed.

The rate of concrete placement shall not exceed the rate at which the various placing and finishing operations can be performed in accordance with these Specifications.

Machines or equipment that build curb and gutter by the extrusion process may be used when approved, provided this method will produce a finished product

comparable in all respects to that obtained by the set-form method. Slipform machines shall be automatically controlled for longitudinal grade and alignment and transverse slope by sensing devices operating from string lines set from construction stakes placed by the CONTRACTOR.

Water shall be used to check the grades on gutters and radii for drainage to confirm there is no ponding of water, prior to the concrete setting up. Ponding water shall not exceed ¼" inch in depth.

The letters "W" and "S" shall be stamped by the CONTRACTOR on the top back of curb to identify the location of all water (W) and sanitary sewer (S) service locations. The letters shall be a minimum of 3" tall. The OWNER shall supply the stamps.

B. Stripping Forms and Finishing:

1. Forms: Forms may be removed on the day following pour if the concrete is sufficiently set that removal will be without danger of chipping or spalling. When forms are removed before the expiration of the curing period, the edges of the concrete shall be protected with moist earth or sprayed with curing compound. All forms shall be cleaned, oiled and examined for defects before they are used again.
2. Broomed Finish: The surface of concrete curbs and gutters shall be finished true to the lines and grades shown in the Plans. Concrete shall be worked until the coarse aggregate is forced down into the body of the concrete and no coarse aggregate is exposed. Honeycomb or other detrimental blemished in formed surfaces shall be filled with grout and satisfactorily finished. All edges shall be tooled to a ¼-inch radius. The surface shall then be floated with a wooden float to a smooth and uniform surface. When the concrete in the curb and gutter has hardened sufficiently, the surface shall be given a broom finish. The broom shall be an approved type. Strokes shall be made without tearing the concrete. The broomed finish shall produce regular corrugations not over 1/8-inch in depth.

3.05 PROTECTION:

- A. The CONTRACTOR shall always have materials available to protect the surface of the concrete against rain. These materials shall consist of waterproof paper or plastic sheeting.
- B. When concrete is being placed in cold weather, cold weather procedures shall be in accordance with Subsection 3.07 of Section 03010. Any concrete damaged by freezing shall be removed and replaced at the CONTRACTOR's expense.

3.06 CURING:

- A. Curing shall be in accordance with Section 03010.

3.07 JOINTS:

A. Joints: Curb and gutter shall be monolithically poured with no construction joints permitted, except at the location of a planned expansion joint.

Expansion joints shall be placed at radius points, construction joints, junctions with existing concrete as directed by ENGINEER, opposite to or at expansion joints in adjacent concrete, and at not more than 150' intervals in a continuous run of the item being constructed. Expansion joints shall be made using ½-inch thick, preformed expansion joint filler complying with AASHTO M148.

Contraction joints shall be formed to cut 1/8-inch wide to ¼ of the depth of the item being placed. The joints shall be placed to coincide with the joints in adjacent concrete or else in uniform sections 10 feet in length. Where necessary in making a closure, sections less than 10 feet in length will be permitted, except the minimum length shall be 4 feet. When contraction joints are made by suitable forming or grooving before the concrete has set, the edges shall be tooled to acceptable radius.

3.08 BACKFILL:

A. Curb Backfill: The curb backfill to a level of 5 inches below the top of curb shall be completed before final grading of the subgrade and placement of base courses.

Backfill shall be impervious dirt up to a level 5 inches below top of curb. Sand or gravel backfill in this area will not be permitted.

In areas where lawns exist, the top 5 inches of backfill shall be black loam or good topsoil which is suitable for the growth of lawns. It shall be placed out from the curb a sufficient distance and in an amount to replace turf or lawn removed during installation. The backfill shall be placed to a point level with the top of the curb, immediately adjacent to the curb, and shall be graded and blended to match the existing undisturbed lawn area.

Where lawns do not exist, the top 5 inches of backfill shall be clayey-type soil and shall be placed to conform to the typical sections shown in the Plans.

Backfill shall be compacted to prevent settlement and the surface shall be leveled off to a neat appearing and free draining surface.

3.09 PRIME AND SEAL COAT PREPARATION:

The edge of the gutter adjacent to the asphalt surfacing shall be **uniformly** painted with an asphalt prime coat before the pavement surface course is placed. When an asphalt seal coat is specified, the application of oil and cover aggregate shall lap 3 inches over on the gutter to provide a good seal on the joint between the concrete and pavement.

3.10 TOLERANCES

The Work shall be performed in a manner which results in a curb and gutter constructed to specified line and grade, uniform in appearance and structurally sound. Curb and gutter found with unsightly bulges, ridges, low spots in the gutter or other defects shall be removed and replaced at the CONTRACTOR's expense if the ENGINEER considers them to be irreparable.

Grade shall not deviate more than ¼-inch, and alignment shall not vary more than ¼-inch from Plan elevation, grade or alignment. Tolerances may be checked by use of survey instruments, straight edges, or water ponding. Ponding water shall not exceed ¼-inch in depth.

Any chips to the top or edge of the curb or cracks in the curb shall be repaired to the satisfaction of the ENGINEER or replaced.

PART 4 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.01 METHOD OF MEASUREMENT:

A. Standard Items:

1. 03020.10 – CURB AND GUTTER TYPE A

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of lineal feet (LF) of Type A curb and gutter installed as measured along the flow line of gutter, including the length through the inlet / catch basin.

2. 03020.20 – CURB AND GUTTER TYPE B

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of lineal feet (LF) of Type B curb and gutter installed as measured along the flow line of gutter, including the length through the inlet / catch basin.

3. 03020.30 – TEMPORARY CURB AND GUTTER TYPE A

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of lineal feet (LF) of Temporary Type A curb and gutter installed as measured along the flow line of gutter, including the length through the inlet / catch basin.

4. 03020.40 – TEMPORARY CURB AND GUTTER TYPE B

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of lineal feet (LF) of Temporary Type B curb and gutter installed as measured along the flow line of gutter, including the length through the inlet / catch basin.

4.02 BASIS OF PAYMENT:

A. Standard Items:

1. 03020.10 – CURB AND GUTTER TYPE A

Payment will be made at the Contract Unit Bid price per lineal feet (LF) of curb and gutter and will constitute full compensation for all materials, construction staking, all sawcuts required to install this item, curing of concrete, for all premolded mastic material for expansion joints,

contraction joints, steel dowels and sleeves, joint sealer, concrete extensions into the street around inlets, for placing and compacting crushed aggregate base course under this item as shown in the Plans, all required protection from the weather for curing and curing agent needed to cover the concrete uniformly. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents. Where curb and gutter will be replaced, the length will be from existing joint to existing joint, or as directed by the ENGINEER.

2. 03020.20 – CURB AND GUTTER TYPE B

Payment will be made at the Contract Unit Bid price per lineal feet (LF) of curb and gutter and will constitute full compensation for all materials, construction staking, all sawcuts required to install this item, curing of concrete, for all premolded mastic material for expansion joints, contraction joints, joint sealer, steel dowels and sleeves, concrete extensions into the street around inlets, and for placing and compacting crushed aggregate base under this item as shown in the Plans. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents. Where curb and gutter will be replaced, the length will be from existing joint to existing joint, or as directed by the ENGINEER.

3. 03020.30 – TEMPORARY CURB AND GUTTER TYPE A

Payment will be made at the Contract Unit Bid price per lineal feet (LF) of temporary curb and gutter and will constitute full compensation for all materials, construction staking, and for placing and compacting crushed aggregate base under this item as shown in the Plans. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

4. 03020.40 – TEMPORARY CURB AND GUTTER TYPE B

Payment will be made at the Contract Unit Bid price per lineal feet (LF) of temporary curb and gutter and will constitute full compensation for all materials, construction staking, and for placing and compacting crushed aggregate base under this item as shown in the Plans. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

END OF SECTION 03020

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK:

- A. Concrete sidewalk, driveway approaches, fillets, and double gutters, shall consist of air-entrained Class B Portland Cement Concrete constructed in accordance with Section 03010. This work shall be in conformity with the lines and grades, thicknesses, and typical cross sections shown in the Plans or established by the ENGINEER.

- B. The quantity of driveway approaches and concrete sidewalk replacement shown in the Plans is an estimate and may be increased or decreased without an adjustment in contract prices.

1.02 RELATED WORK:

- A. Section 02221 - Trenching, Backfilling and Compaction
- B. Section 02450 - Grading
- C. Section 02519 - Crushed Aggregate Base Course
- D. Section 03010 - Concrete Work
- E. Section 03020 - Concrete Curb and Gutter
- F. Section 03040 - Portland Cement Concrete Pavement

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Portland Cement Concrete: Air-entrained Portland Cement Concrete Class B shall conform to the requirements of Section 03010.

- B. Reinforcing Steel: Reinforcing steel shall conform to the requirements of Section 03010.

- C. Preformed Expansion Joint Material: Joint material shall comply with the requirements of AASHTO M213, ASTM D994, ASTM D1751, or ASTM D1752.

- D. Detectable Warning Plate: The detectable warning plate installed at ADA ramp locations shall be cast iron and meet all current ADA standards.

PART 3 - EXECUTION

3.01 GENERAL:

- A. Sidewalks and driveway approaches, either new or replacement, double gutters, ADA ramps and fillets shall be constructed at the locations shown in the Plans and where directed by the ENGINEER, and shall be in accordance with these Specifications.

3.02 SUBGRADE AND BASE COURSE PREPARATION:

- A. The subgrade shall be excavated or filled with suitable material to the required grades and lines.
- B. All soft, yielding and otherwise unsuitable material shall be removed and replaced with suitable material. Filled sections shall be compacted to 95% of maximum dry density in accordance with ASTM D698 at +/-3% moisture and extend a minimum of one foot outside the form lines unless special circumstances as approved by ENGINEER, prohibit the excavation.
- C. Refer to Sections 02450 and 02519.

3.03 ERECTING FORMS:

- A. Forms, wood or steel, shall be staked securely in place, true to line and grade. No plastic forms shall be used.
- B. Sufficient support shall be given to the form to prevent movement in any direction, resulting from the weight of the concrete or the concrete placement.
- C. Forms shall be clean and well-oiled prior to setting in place.
- D. The form shall be set so that the completed installation does not depart from grade more than one-quarter inch (1/4") when checked with a 10-foot straightedge. The alignment shall not vary more than one-half inch (1/2") in 10 feet. The alignment and grade elevation of the forms shall be checked and corrections shall be made by the CONTRACTOR immediately before the concrete is placed. When any form has been disturbed or any grade has become unstable, the form shall be reset and rechecked
- E. Immediately prior to placing the concrete, forms shall be carefully inspected for proper grading, alignment and rigid construction. Adjustments and repairs as needed shall be completed before placing concrete. The alignment and grade elevation of the forms shall be checked and corrections shall be made by the CONTRACTOR immediately before the concrete is placed. When any form has been disturbed or any grade has become unstable, the form shall be reset and rechecked

3.04 PLACING AND FINISHING CONCRETE:

- A. Placing Concrete: The subgrade shall be properly compacted and brought to specified grade before placing concrete. The base course shall be thoroughly dampened immediately prior to the placement of the concrete. Concrete shall be spaded and tamped thoroughly into the forms to provide a dense, compacted concrete free of rock pockets. The exposed surfaces shall be floated, finished and broomed.

The rate of concrete placement shall not exceed the rate at which the various placing and finishing operations can be performed in accordance with these Specifications.

Water shall be used to check the grades on gutters and radii for drainage to confirm there is no ponding of water, prior to the concrete setting up. Ponding water shall not exceed ¼" inch in depth.

1. The surface of concrete shall be finished true to the lines and grades shown in the Plans.
2. The cross slope of any concrete sidewalk shall not exceed 1.5% as measured with 4' level that is capable of calculating slope with a digital readout. All concrete sidewalk must meet all current ADA Standards
3. Concrete shall be worked until the coarse aggregate is forced down into the body of the concrete and no coarse aggregate is exposed. The surface shall then be floated with a wooden float to a smooth and uniform surface.
4. When the concrete has hardened sufficiently, the surface shall be given a broom finish. The broom shall be of an approved type. The strokes shall be square across the concrete from edge to edge with adjacent strokes overlapped. Strokes shall be made without tearing the concrete. The broomed finish shall produce regular corrugations not over one-eighth inch (1/8") in depth.
5. Concrete that is adjacent to forms and formed joints shall be edged with a suitable edging tool to the dimensions shown in the Plans.

B. Stripping Forms and Finishing:

1. Forms: Forms may be removed on the day following pour if the concrete is sufficiently set that removal will be without danger of chipping or spalling. When forms are removed before the expiration of the curing period, the edges of the concrete shall be protected with moist earth or sprayed with curing compound. All forms shall be cleaned, oiled and examined for defects before they are used again.
2. Broomed Finish: The surface of concrete curbs and gutters shall be finished true to the lines and grades shown in the Plans. Concrete shall be worked until the coarse aggregate is forced down into the body of the concrete and no coarse aggregate is exposed. Honeycomb or other detrimental blemished in formed surfaces shall be filled with grout and satisfactorily finished. All edges shall be tooled to a ¼-inch radius. The surface shall then be floated with a wooden float to a smooth and uniform surface. When the concrete in the curb and gutter has hardened sufficiently, the surface shall be given a broom finish. The broom shall be an approved type. Strokes shall be made without tearing the concrete. The broomed finish shall produce regular corrugations not over 1/8-inch in depth.

3.05 PROTECTION:

- A. The CONTRACTOR shall always have materials available to protect the surface of the plastic concrete against rain. These materials shall consist of waterproof paper or plastic sheeting.
- B. When concrete is being placed in cold weather, cold weather procedures shall be in accordance with Subsection 3.07 of Section 03010. Any concrete damaged by freezing shall be removed and replaced at the CONTRACTOR's expense.

3.06 CURING:

- A. Curing shall be in accordance with Section 03010.

3.07 JOINTS:

- A. Preformed Expansion Joints shall be installed at the locations shown in the Standard Details.
- B. Contraction joints shall be provided between expansion joints at the intervals noted in the Standard Details. Joints in new construction shall match joints in adjacent existing concrete.

3.08 BACKFILL:

- A. In areas where lawns exist or as shown in the Plans or as directed by the ENGINEER, the top 5 inches of backfill bringing its level up to the top of the sidewalk or driveway shall be black loam or good topsoil which is suitable for the growth of lawns.
 - 1. It shall be placed out from the sidewalk or driveway a sufficient distance and in amount to replace turf or lawn removed during installation.
 - 2. Backfill shall be completed by grading to match the existing lawn.
 - 3. Seeding shall be per Section 02480.
- B. Where lawns are not required, the top 5 inches of backfill shall be crushed aggregate base course, unless another material is requested by the ENGINEER.

3.09 TOLERANCES:

- A. The work shall be performed in a manner which results in the item being constructed true to line and grade, uniform in appearance and structurally sound. If the slab is of insufficient thickness or has excessive pockets or surface damage as determined by the ENGINEER, it shall be replaced at no cost to the OWNER. Any repairs allowed by the ENGINEER shall be accomplished to the satisfaction of the ENGINEER.

- B. Items found with unsightly bulges, ridges, low spots or other defects shall be removed and replaced at the CONTRACTOR's expense if the ENGINEER considers them to be irreparable.
- C. When checked with a 10-foot straightedge, grade shall not deviate longitudinally by more than one-quarter inch (1/4") and alignment shall not vary by more than one-half (1/2").
- D. Final elevation shall not depart from plan elevation by more than 1/4-inch. The transition over a joint shall be no more than 1/8-inch.
- E. Cross Slope shall be checked by the ENGINEER with a level (or SMART level) and shall not be over 1.5%. All concrete must meet all current ADA Standards.

PART 4 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.01 METHOD OF MEASUREMENT:

A. Standard Items:

1. 03030.0X – CONCRETE SIDEWALK – X"
Measurement for this item will be made in the field with the quantity for payment determined by the actual number of square yards (SY) of X" thick sidewalk installed.
2. 03030.01X COLORED CONCRETE SIDEWALK – X"
Measurement for this item will be made in the field with the quantity for payment determined by the actual number of square yards (SY) of X" thick colored concrete sidewalk installed.
3. 03030.10 – ADA DETECTABLE WARNING PLATE
This item shall be measured on a per each (EA) basis for the quantity of 2'x2' detectable warning plate at each ADA ramp location to provide the required overall width of detectable plate matching the full width of the ramp. For example, a 4' wide ramp would require the installation of two (2) each detectable warning surfaces.
4. 03030.20 – CONCRETE FILLET AND CURB
Measurement for this item will be made in the field with the quantity for payment determined by the actual number of square yards (SY) of fillet and curb installed.
5. 03030.30 – CONCRETE DOUBLE GUTTER
Measurement for this item will be made in the field with the quantity for payment determined by the actual number of square yards (SY) of double gutter installed.

6. 03030.40 – CONCRETE RESIDENTIAL APPROACH

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of square yards (SY) of concrete driveways and alley approaches installed. Also included in this item will be any miscellaneous concrete to be installed that is 6” thick.

7. 03030.50 – CONCRETE COMMERCIAL AND ALLEY APPROACH

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of square yards (SY) of concrete driveways and alley approaches installed.

8. 03030.60 – CONCRETE PATHWAY– X”

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of square yards (SY) of X” thick concrete pathway installed.

4.02 BASIS OF PAYMENT:

A. Standard Items:

1. 03030.0X – CONCRETE SIDEWALK – X”

This item shall be paid for at the contract unit price bid, which price and payment shall constitute full compensation for all materials, placing and curing of concrete, any pre-molded expansion joint material, contraction joints, joint sealant, and for the furnishing, placement, and compaction of crushed aggregate base course under the sidewalk, and for all equipment, tools and labor and all other work necessary or incidental for completion of the item.

2. 03030.01X COLORED CONCRETE SIDEWALK – X”

Payment will be made at the Contract Unit Bid price per square yard (SY) of concrete sidewalk and will constitute full compensation for all materials, curing of concrete, for all dyes or stains used, for all premolded mastic material for expansion joints, contraction joints, joint sealant, sealing of joints, all sawcuts required to install expansion joints, for removing existing soils beneath existing concrete sidewalk or areas of new concrete sidewalk to provide for crushed base and concrete placement, and for placing and compacting crushed base under the sidewalk. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

3. 03030.10 – ADA DETECTABLE WARNING PLATE

Payment for this item shall be paid for at the contract unit price bid, which price and payment shall constitute full compensation for placement of detectable surface panels at locations shown in the Plans, including all materials and other work necessary or incidental for completion of the item.

4. 03030.20 – CONCRETE FILLET AND CURB

Payment will be made at the Contract Unit Bid price and will constitute full compensation for all materials, rebar (if called for in the Plans), curing of concrete, for all premolded mastic material for expansion joints, joint sealant, contraction joints, detectable warning surfaces, all materials needed for protection from the weather, all sawcuts required to install expansion joints, and for placing and compacting crushed base under this item. Price will also include all costs to cover labor, equipment, tools, quality control testing, and incidentals to complete the work in accordance with the Contract Documents.

5. 03030.30 – CONCRETE DOUBLE GUTTER

Payment will be made at the Contract Unit Bid price per square yard of double gutter and will constitute full compensation for all materials, rebar (if called for in the Plans), curing of concrete, for all premolded mastic material for expansion joints, contraction joints, joint sealant, all sawcuts required to install expansion joints, and for placing and compacting crushed base under this item. Price will also include all costs to cover labor, equipment, tools, quality control testing, and incidentals to complete the work in accordance with the Contract Documents.

6. 03030.40 – CONCRETE RESIDENTIAL APPROACH

Payment will be made at the Contract Unit Bid price per square yard of driveway, alley approach and sidewalk - 6" and will constitute full compensation for all materials, rebar (if called for in the Plans), construction staking, curing of concrete, for all premolded mastic material for expansion joints, contraction joints, joint sealant, all sawcuts required to install expansion joints, and for placing and compacting crushed aggregate base course base under this item. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

7. 03030.50 – CONCRETE COMMERCIAL AND ALLEY APPROACH

Payment will be made at the Contract Unit Bid price per square yard of driveway, alley approach and sidewalk - 6" and will constitute full compensation for all materials, rebar (if called for in the Plans), construction staking, joint sealant, curing of concrete, for all premolded mastic material for expansion joints, contraction joints, all sawcuts required to install expansion joints, and for placing and compacting

crushed aggregate base course under this item. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

8. 03030.6X – CONCRETE PATHWAY– X”

Payment will be made at the Contract Unit Bid price per square yard of concrete pathway and will constitute full compensation for all materials, curing of concrete, all premolded mastic material for expansion joints, contraction joints, joint sealant, and all sawcuts required to install expansion joints. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

END OF SECTION 03030

PART 1 - GENERAL

1.01 SUMMARY:

- A. This work shall consist of constructing a pavement composed of air-entrained Class A Portland Cement Concrete constructed on a prepared subgrade or base course in accordance with Section 03010 and in reasonably close conformity with the lines, grades, thicknesses, and typical cross sections shown in the Plans or established by the ENGINEER.

1.02 RELATED WORK:

- A. Section 02450 - Demolition of Existing Surfacing
B. Section 02519 - Crushed Aggregate Base Course
C. Section 03010 - Concrete Work
D. Section 03020 - Concrete Curb and Gutter
E. Section 03030 - Concrete Sidewalks, Approaches, Fillets, and Double Gutter

1.03 QUALITY ASSURANCE:

- A. Codes and Standards: Comply with provisions of following codes, specifications and standards, except where more stringent requirements are shown or specified:

ACI 301 "Specifications for Structural Concrete for Buildings".
ACI 318 "Building Code Requirements for Reinforced Concrete".
Concrete Reinforcing Steel Institute, "Manual of Standard Practice".

- B. Concrete Mix Designs: Concrete mix designs shall be prepared for each type of concrete by an independent testing laboratory acceptable to the ENGINEER. The mix designs shall be prepared in strict conformance with either the laboratory trial batch or field experience methods as defined by ACI 301. Subject to approval by ENGINEER this provision may be waived if the CONTRACTOR can show by previous testing and experience that the concrete will meet these Specifications. The concrete mix design submittal shall contain at a minimum the information as identified in Subsection 1.04 of this Section. No concrete is to be placed until mix design is approved by the ENGINEER.

- C. 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 CONTRACTOR will perform all acceptance testing during the on-site placement of the concrete as identified in Subsection 3.15 of Section 03010. 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.

1.04 SUBMITTALS:

- A. Product Data: Submit manufacturer's product data with application and installation instructions for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds,

waterstops, joint systems, curing compounds, and others as requested by ENGINEER.

B. Shop Drawings; Reinforcement: Submit Shop Drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, diagrams of bent bars, arrangement of concrete reinforcement. Include special reinforcement required and openings through concrete structures. Work to be done by a well-qualified detailer.

C. Concrete Mix Design: Submit complete information qualifying that the proposed mix is in complete compliance with the concrete specified herein. The submittal shall contain but not be limited to the following:

1. A table showing weights of all aggregate, cement, water and admixtures to be used for a yard of concrete.
2. The water-cement ratio, calculated from the weights of water and cementitious materials in the mix design.
3. Certification of aggregate compliance with these Specifications and source of supply and location. Certification to include gradation tests, wear and soundness tests.
4. Admixture literature to certify compliance with these Specifications.
5. Cement Mill Test Certification.
6. Test reports indicating recent compressive and flexural strengths, air and slump performance for the proposed mix.

D. Samples: Submit samples of materials as specified and as otherwise requested by ENGINEER, including names, sources and descriptions.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Portland Cement Concrete – Air entrained Class A Portland Cement Concrete shall conform to the requirements of Section 03010.

B. Joint Fillers:

1. The filler for each joint shall be furnished in a single piece for the full depth required for the joint unless otherwise authorized by the ENGINEER. When the use of more than one piece is authorized for a joint, the abutting ends shall be fastened securely, and held accurately to shape by stapling or other positive fastening satisfactory to the ENGINEER.

2. Prefomed joint filler shall conform to the requirements of AASHTO M213, ASTM D944, ASTM D1751 or ASTM D1752 unless otherwise shown in the Plans, and shall be punched to admit the dowels where called for in the Plans.

C. Joint Sealers:

1. Hot poured sealer for joints shall conform to the requirements of ASTM D3405-75T unless otherwise shown in the Plans.
2. Elastic joint sealer, where called for in the Standard Details or in the Plans, shall be two component polyurethane sealant meeting ASTM C920-79, Type M, Grade P, Class 25, Use TMO. Sealant for horizontal joints may be either Class A (self-leveling) or Class B (nonsag). Sealant for sloped or vertical joints shall be Class B.
3. Prefomed compression joints shall be manufactured to the size and shape shown in the Standard Details or in the Plans, from materials conforming to the requirements of ASTM D2628. The CONTRACTOR shall furnish a certification for each shipment indicating that the material has been sampled, tested, and inspected in accordance with the provisions of ASTM D2628. Each certification so furnished shall be signed by an authorized agent of the manufacturer or independent testing agency. If recommended by the manufacturer, an approved lubricant-adhesive may be used to provide lubrication and bond for the joint. The lubricant shall be manufactured of material that is compatible with the sealer.
4. Silicone Rubber Base joint sealant shall conform to Federal Spec TT-S-001543A Sealing Compound.

D. Curing Materials

1. Burlap Cloth made from Jute or Kenaf AASHTO M182 (Class 3)
2. Waterproof Paper for Curing Concrete ASTM C171
3. Liquid Membrane-Forming Compounds for Curing Concrete ASTM C309, Type 2, white pigmented.

PART 3 - EXECUTION

3.01 PROPORTIONING CONCRETE MIX:

A. The concrete shall meet the following requirements:

1. Slump between one (1) and four (4) inches.
2. Design flexural strength of at least 600 psi.
3. Design compressive strength of at least 4,800 psi.

4. The cement content shall not be less than 7.0 sacks per cubic yard with a maximum water-cement ratio of 0.45.
5. Flyash may be substituted for Portland cement up to a maximum of 20 percent based on replacing 75 pounds of Portland cement with 100 pounds of flyash.
6. The percentage of air entrained in the mix shall be 4-7 percent.

B. The mix proportions will be based upon trial mixes conducted by an Independent Testing Laboratory in accordance with ACI 301. The proportions will be stated in terms of aggregates in a saturated, surface-dry condition, and the batch weights will have to be adjusted periodically to take into account the actual moisture content of the aggregates at time of use.

C. The designated proportions shall govern during the progress of the work, except as provided below in paragraphs (1) through (3), inclusive.

1. If it is found impossible to obtain concrete of the desired plasticity and workability with the proportions originally approved by the ENGINEER, he may approve changes in aggregate weights, provided that in no case shall the cement content originally designated be changed except as provided below.
2. If it is found impossible to produce concrete having the required consistency without exceeding the maximum allowable water-cement ratio specified, the cement content shall be increased or admixtures added as approved by the ENGINEER so that the maximum water-cement ratio will not be exceeded.
3. No change in the sources or character of the materials shall be made without due notice to the ENGINEER, and no new materials shall be used until approved by the ENGINEER and he has approved new proportions based upon Independent Laboratory tests and trial mixes.

3.02 EQUIPMENT:

A. The batching plant shall include bins, weighing hoppers, and scales for the fine aggregate and for each size of coarse aggregate. If cement is used in bulk, a bin, hopper, and separate scale for cement shall be included. The weighing hopper shall be properly sealed and vented to preclude dusting operation.

1. Bins and Hoppers - Bins with adequate separate compartments for fine aggregate and for each size of coarse aggregate shall be provided in the batching plant.
2. Scales - The scales for weighing aggregates and cement shall be of either the beam type or the springless-dial type. They shall be accurate within 0.5 percent throughout the range of use. When beam-type scales are used, provisions, such as a "telltale" dial, shall be made for indicating to the operator that the required load in the weighing hopper is being approached. A device on weighing beams shall indicate critical position clearly. Poises shall be designed to be secured in any position and to

prevent inadvertent change. The weigh beam and "telltale" device shall be in full view of the operator while the hopper is charged, and he shall have convenient access to all controls. Weighing may be accomplished using electronic load cells and computer controls.

Scales shall be tested as often as the ENGINEER may deem necessary to assure their continued accuracy. The CONTRACTOR shall have on hand not less than ten 50-pound weights for frequent testing of all scales.

B. Concrete may be mixed at the site of construction or at a central point, or wholly or in part in truck mixers. Each mixer shall have attached in a prominent place a manufacturer's plate showing the capacity of the drum in terms of volume of mixed concrete and the speed of rotation of the mixing drum or blades.

1. Central plant mixers shall be capable of combining the aggregates, cement, and water into a thoroughly mixed and uniform mass within the specified mixing period, and of discharging and distributing the mixture without segregation on the prepared grade. The mixer shall be equipped with an approved timing device which will automatically lock the discharge lever when the drum has been charged and release it at the end of the mixing period.

The mixers shall be cleaned at suitable intervals. The pickup and throw-over blades in the drum or drums shall be repaired or replaced when they are worn down 1-inch or more. The CONTRACTOR shall: (1) have available at the job site a copy of the manufacturer's design, showing dimensions and arrangement of blades in reference to original height and depth; or (2) provide permanent marks on blade to show points of 1-inch wear from new condition. Drilled holes of ¼-inch diameter near each end and at the midpoint of each blade are recommended.

2. Truck Mixers and Truck Agitators - Truck mixers used for mixing and hauling concrete, and truck agitators used for hauling central mixed concrete shall conform to the requirements of ASTM C94.
3. Non-agitator Trucks - Bodies of nonagitating hauling equipment for concrete shall be smooth, mortar-tight, metal containers and shall be capable of discharging the concrete at a satisfactory controlled rate without segregation. The concrete shall be discharged from the bottom of the container. If discharge of concrete is accomplished by tilting the body, the surface of the load shall be retarded by a suitable baffle. Covers shall be provided when needed for protection.

C. The finishing machine shall be of an approved type. The finishing machine shall be of ample weight and power for proper finishing of the concrete. The finishing machine shall be designed and operated to strike off, screed and consolidate the concrete. Screed and float adjustments of these machines shall be checked at the start of each day's paving. Machines that cause displacement of side forms or frequent delays due to mechanical failure shall be replaced. When the finishing machines ride the edge of previously constructed slabs, provisions shall be made to protect the surface of these slabs.

D. Vibrators, for full width vibration of concrete paving slabs, may be either the surface pay type or the internal type with either immersed tube or multiple spuds.

1. Vibrators may be attached to the spreader or the finishing machine, or may be mounted on a separate carriage.
2. Vibrators shall not come in contact with the joint, load transfer devices, subgrade, or side forms.
3. The frequency of the surface vibrators shall not be less than 3,500 impulses per minute, and the frequency of the internal type shall not be less than 5,000 impulses per minute for tube vibrators and not less than 7,000 impulses per minute for spud vibrators. When spud-type internal vibrators, either hand-operated or attached to spreaders or finishing machines, are used adjacent to forms, they shall have a frequency of not less than 3,500 impulses per minute.

E. The CONTRACTOR shall provide sawing equipment adequate in number of units and power to complete the sawing with a water-cooled diamond edge saw blade or an abrasive wheel at the required rate. The CONTRACTOR shall provide adequate artificial lighting facilities for night sawing. All of this equipment shall be on the job both before and continuously during concrete placement. A backup saw will be available.

F. Straight side forms shall be made of a metal having a thickness of not less than 7/32-inch and shall be furnished in sections not less than ten feet (10') in length.

1. Forms shall have a depth at least equal to the prescribed edge thickness of the concrete, without horizontal joint, and a base width equal to not less than the depth of the forms.
2. Flexible or curved forms of proper radius shall be used for curves of 100-foot radius or less. Flexible or curved forms shall be of a design acceptable of the ENGINEER.
3. Forms shall be provided with adequate devices for secure setting so that when in place they will withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment.
4. Flange braces shall extend outward on the base not less than 2/3 the height of the form.
5. Forms with battered top surfaces, and bent, twisted, or broken forms shall be removed from the work. Repaired forms shall not be used until inspected and approved.
6. Builtup forms shall not be used except where the total area of pavement of any specified thickness on the Project is less than 2,000 square yards.
7. The top face of the form shall not vary from a true plane more than 1/8 inch in ten feet, and the upstanding leg shall not vary more than 1/4-inch.

8. The forms shall contain provisions for locking the ends of abutting form sections together tightly, and secure setting.

3.03 PREPARATION OF GRADE:

After the subgrade and/or base course has been graded and compacted, in accordance with the provisions for the material specified, the grade shall be trimmed to an acceptable elevation.

3.04 SETTING FORMS:

- A. The foundations under the forms shall be hard and true to grade so that the form, when set, will be firmly in contact of its whole length and at the specified grade. Any grade which at the form line is found below established grade shall be filled to grade and thoroughly compacted. Imperfections or variations above grade shall be corrected by tamping or by cutting, as necessary.
- B. Forms shall be set sufficiently in advance of the point where concrete is being placed.
 1. After the forms have been set to correct grade, the grade shall be thoroughly tamped, mechanically or by hand, at both the inside and outside edges of the base of the forms.
 2. Forms shall be staked into place with not less than three pins for each ten-foot section. A pin shall be placed at each side of every joint.
 3. Form sections shall be tightly locked, free from play or movement in any direction. No excessive settlement or springing of forms under the finishing machine will be tolerated.
 4. Forms shall be cleaned and oiled prior to the placing of the concrete.
- C. The forms shall not deviate from true line by more than ¼-inch at any point. The alignment and grade elevation of the forms shall be checked and corrections shall be made by the CONTRACTOR immediately before the concrete is placed. When any form has been disturbed or any grade has become unstable, the form shall be reset and rechecked.
- D. In lieu of setting forms the edge of a previously placed concrete curb and gutter section may be used as a form.

3.05 CONDITIONING OF SUBGRADE OR BASE COURSE:

- A. When side forms have been securely set to grade, the subgrade or base course shall be brought to proper cross section. Low areas may be filled with subgrade or base course material and compacted to the specified density, or filled with concrete integral with the pavement. The finished grade shall be maintained in a smooth and compacted condition until the pavement is placed.
- B. The subgrade or base course shall be uniformly moist when the concrete is placed. If it subsequently becomes too dry, the subgrade or base course shall be

sprinkled, but the method of sprinkling shall not be such as to form mud or pools of water.

C. No concrete shall be placed on frozen ground.

3.06 HANDLING, MEASURING, AND BATCHING MATERIALS:

A. The batch plant site, layout, equipment, and provisions for transporting material shall be such as to assure a continuous supply of material to the work. Aggregates from different sources and of different gradings shall not be stockpiled together.

B. Aggregates shall be handled from stockpiles or other sources to the batching plant in such manner as to secure a uniform grading of the material. Aggregates that have become segregated or mixed with earth or foreign material shall not be used.

1. All aggregates produced or handled by hydraulic methods, and washed aggregates, shall be stockpiled or binned for draining at least 12 hours before being batched. In case the aggregates contain high or non-uniform moisture content, storage or stockpile periods in excess of 12 hours may be required by the ENGINEER.

2. Rail shipment requiring more than 12 hours will be accepted as adequate binning only if the car bodies permit free drainage.

3. The fine aggregate and each size of coarse aggregate shall be weighed into separated hoppers in the respective amounts set by the job mix.

C. Cement shall be measured by the sack or by weight. Separate scales and hoppers shall be used for weighing the cement, with a device to indicate positively the complete discharge of the batch of cement into the mixer. Ninety-four pounds of bulk cement shall be considered one sack. Batches involving fractional sacks shall not be allowed, except when bulk cement is used.

D. Flyash shall be stored in a separate silo. If both cement and flyash are used, they may be batched cumulatively provided Portland Cement is batched first.

E. Methods and equipment for adding air-entraining agent or other admixtures into the batch, when required, shall be approved by the ENGINEER. All admixtures shall be measured into the mixer with an accuracy of ± 3 percent.

3.07 MIXING CONCRETE:

A. The concrete may be mixed at the work site, in a central-mix plant, or in truck mixers. The mixer shall be of an approved type and capacity.

B. Ready-mix concrete shall be mixed and delivered in accordance with requirements of ASTM C685.

C. When concrete is mixed in a central mixing plant, mixing time shall not be less than recommended by the manufacturer unless tests can show the mix can be thoroughly mixed in less time. Mixing time shall be measured from the time all materials, except water, are in the drum. Transfer time in multiple drum mixers is included in mixing time.

1. The contents of an individual mixer drum shall be completely removed before a succeeding batch is emptied therein.
2. The mixer shall be operated at a drum speed as shown on the manufacturer's name plate on the approved mixer.
3. The batch shall be so charged into the drum that a portion of the mixing water shall enter in advance of the cement and aggregates. The flow of water shall be uniform, and all water shall be in the drum by the end of the first 15 seconds of the mixing period. The throat of the drum shall be kept free of such accumulations as may restrict the free flow of materials into the drum.

D. Any concrete mixed less than the specified time shall be discarded and disposed of by the CONTRACTOR at his expense.

E. The volume of concrete mixed per batch shall not exceed the mixer's nominal capacity in cubic feet, as shown on the manufacturer's standard rating plate on the mixer, except that an overload up to ten percent above the mixer's nominal capacity may be permitted provided concrete test data for strength, segregation, and uniform consistency are satisfactory, and no spillage of concrete takes place.

F. The time elapsing from the time water is added to the mix until the concrete is deposited in place at the site of the work shall not exceed:

1. 45 minutes when the concrete is hauled in non-agitating trucks.
2. 90 minutes when hauled in truck mixers or truck agitators.

G. Retempering concrete by adding water or by other means will not be permitted, except that when concrete is delivered in transit mixers or agitators, and when approved by the ENGINEER. When additional water is added to the batch materials and additional mixing performed to increase the slump to meet the specified requirements, the following conditions must be met:

1. Water must be measured through a water meter.
2. Maximum allowable water-cement ratio is not exceeded.
3. Maximum allowable slump is not exceeded.
4. Maximum allowable mixing and agitating time (on drum revolutions) are not exceeded.
5. Concrete is remixed for at least half the minimum required mixing time or number of revolutions.

6. Concrete that does not meet the above provisions shall be rejected.

H. No concrete shall be mixed, placed, or finished when the natural light is insufficient, unless an adequate and approved artificial lighting system is operated.

I. Unless otherwise authorized, the temperature of the mixed concreting operations shall be discontinued when a descending air temperature in the shade and away from artificial heat reaches 40° F and not resumed until an ascending air temperature in the shade away from artificial heat reaches 35°F.

J. The temperature of the mixed concrete shall be not less than 50°F and not more than 90°F at the time of placing it in the forms.

1. The mixing water may be heated to no more than 150°F.

2. Aggregate may be heated by either steam or dry heat prior to being placed in the mixer. The apparatus used shall heat the mass uniformly and shall be so arranged as to preclude the possible occurrence of overheated areas which might injure the materials.

3.08 PLACING CONCRETE:

A. The concrete shall be deposited on the grade in such manner as to require as little rehandling as possible. Unless truck mixers, truck agitators, or non-agitating hauling equipment are equipped with means for discharge of concrete without segregation of the materials, the concrete shall be unloaded into an approved spreading device and mechanically spread on the grade in such manner as to prevent segregation of the materials. Placing shall be continuous between transverse joints without the use of intermediate bulkheads. Necessary hand spreading shall be done with shovels, not rakes. Workmen shall not be allowed to walk in the freshly-mixed concrete with boots or shoes coated with earth or foreign substances.

B. Where concrete is to be placed adjoining a previously constructed lane of pavement and mechanical equipment will be operated upon the existing lane of pavement, that lane shall have attained 80% of design strength. If only finishing equipment is carried on the existing lane, paving in adjoining lanes may be permitted after three days.

C. Concrete shall be thoroughly consolidated against and along the faces of all forms and along the full length and on both sides of all joint assemblies, by means of vibrators inserted in the concrete. Vibrators shall not be permitted to come in contact with a joint assembly, the grade, or side form. In no case shall the vibrator be operated longer than 15 seconds in any one location.

D. Concrete shall be deposited as near to expansion and contraction joints as possible without disturbing them, but shall not be dumped from the discharge bucket or hopper onto a joint assembly unless the hopper is well centered on the joint assembly.

3.09 TESTING:

A. The CONTRACTOR will perform all acceptance testing during the on-site placement of the concrete as identified in Section 03010, including actual water-cement ratio, based on moisture content of aggregates and adjusted batch weights of water and cementitious materials, which shall be determined and printed on the ticket of each load delivered to the jobsite..

B. The concrete shall be sampled, specimens made, and compliance determined in accordance with the following:

- | | | |
|----|---|----------------------|
| 1. | Slump | ASTM C143 |
| 2. | Air Content | ASTM C231 |
| 3. | Unit Weight | ASTM C138 |
| 4. | Strength (compressive)
(flexural, third point) | ASTM C39
ASTM C78 |
| 5. | Making and Curing Test
Specimens in the Field | ASTM C31 |

C. Slump, Air Content, and four cylinders shall be performed on each days pour and each additional 50 CY thereafter. Compressive Strength Cylinders shall be tested one at 7 days, two at 28 days and one held in reserve.

D. All testing will be performed by an ACI certified technician.

3.10 STRIKEOFF OF CONCRETE AND PLACEMENT OF REINFORCEMENT:

A. Following the placing of the concrete, it shall be struck off to conform to the cross section shown in the Plans and to an elevation such that when the concrete is properly consolidated and finished, the surface of the pavement will be at the elevation shown in the Plans or established by the ENGINEER.

B. When reinforced concrete pavement is placed in two layers, the entire width of the bottom layer shall be struck off to such length and depth that the sheet of fabric or bar mat may be laid full length on the concrete in its final position without further manipulation. The reinforcement shall then be placed directly upon the concrete, after which the top layer of the concrete shall be placed, struck off, and screeded. Any portion of the bottom layer of concrete which has been placed more than 30 minutes without being covered with the top layer shall be removed and replaced with freshly mixed concrete at the CONTRACTOR's expense.

C. When reinforced concrete is placed in one layer, the reinforcement may be positioned in advance of concrete placement or it may be placed by mechanical or vibratory means in plastic concrete, after the concrete is spread.

D. Reinforcing steel shall be free from dirt, oil, paint, grease, mill scale, and loose or thick rust which would impair bond of the steel with the concrete.

3.11 JOINTS

- A. Joints shall be constructed of the type and dimensions, and at the locations required by the Standard Details, Plans or Special Provisions.
- B. Bars shall be placed by approved mechanical equipment or rigidly secured by chairs and other approved supports to prevent displacement.
- C. Tie bars shall not be painted or coated with asphalt or other material, or enclosed in tubes or sleeves.
- D. Dowels, when used as load transfer devices, shall be held in position parallel to the surface and centerline of the slab by a metal device that is left in the pavement.
1. One half of each dowel shall be painted with one coat of lead or tar paint, to prevent the concrete from binding to that portion of the dowel.
 2. An approved metal dowel cap or sleeve shall be furnished for each dowel bar used with the expansion joints. The caps or sleeves shall fit the dowel bar tightly.
 3. In lieu of using dowel assemblies at contraction joints, dowel bars may be placed in the full thickness of pavement by a mechanical device approved by the ENGINEER.
- E. Sawed joints shall be cut by means of concrete saws with diamond blades or other approved equipment to the depth, width, and line shown in the Standard Details or in the Plans.
1. Sawing of the joints shall commence as soon as the concrete has hardened sufficiently to permit sawing without raveling, usually 4 to 24 hours. All joints shall be sawed before uncontrolled shrinkage cracking takes place. If necessary, the sawing operations shall be carried on both during the day and night, regardless of weather conditions. The sawing of any joint shall be omitted if a crack occurs at or near the joint location prior to the time of sawing, and sawing shall be discontinued when a crack develops ahead of the saw. In general, all joints should be sawed in sequence. Where the saw cut was discontinued because of interference of the form the saw cut must be completed when the form is stripped.
 2. Suitable guide lines or devices shall be used to assure cutting the joint as shown in the Standard Details or in the Plans.
 3. The saw cut shall not vary by more than ¼-inch in 10 feet.
 4. When necessary, a second shallower cut must be made to provide adequate space for joint sealer. This sawing may commence as soon as the concrete has hardened sufficiently to permit cutting without chipping, spalling or tearing.

F. When approved by the ENGINEER joints may be cut into the fresh concrete with a finishing tool. This tool must be capable of cutting to the depth specified.

1. Suitable guide lines or devices shall be used to assure cutting the joint as shown in the Standard Details or in the Plans.
2. The cut shall not vary by more than ¼-inch in 10 feet.

G. LONGITUDINAL JOINTS. Deformed steel tie bars of specified length, size, spacing, and material shall be placed perpendicular to the longitudinal joints as shown in the Standard Details or in the Plans.

1. When adjacent lanes of pavement are constructed separately, steel side forms shall be used which will form a keyway along the construction joint or dowels shall be installed at the spacing and size shown in the Plans. Tie bars or load transfer bars shall be installed through the holes in the forms or approved two-piece connectors may be used.
2. Longitudinal contraction joints shall consist of planes of weakness created by cutting grooves in the surface of the pavement and, when shown in the Standard Details or in the Plans, shall include load transfer assemblies.

H. TRANSVERSE EXPANSION JOINTS - The expansion joint filler shall be continuous from form to form, shaped to the subgrade. Damaged or repaired joint filler shall not be used unless approved by the ENGINEER.

1. The expansion joint filler shall be held in vertical position. An approved installing bar, or other device, shall be used if required to secure preformed expansion joint filler at the proper grade and alignment during placing and finishing of the concrete.
2. Finished joints shall not deviate more than ¼-inch in the horizontal alignment from a straight line.
3. If joint fillers are assembled in section, there shall be no offsets between adjacent units.
4. No plugs of concrete shall be permitted anywhere within the expansion space.

I. TRANSVERSE CONTRACTION JOINTS - Transverse contraction joints shall consist of planes of weakness created by cutting grooves in the surface of the pavement and, when shown in the Standard Details or in the Plans, shall include load transfer assemblies.

J. When directed by the ENGINEER, random cracks shall be routed or sawed and filled with joint sealer. Care shall be taken so that the depth of cut is uniform.

K. Transverse formed contraction joints. These joints shall comply with the requirements of Subsection 3.11G for the longitudinal formed joint.

L. Transverse construction joint. Transverse construction joints shall be constructed when there is an interruption of more than 30 minutes in the concreting operations. No transverse joint shall be constructed within five feet of an expansion joint, contraction joint, or plane of weakness. If sufficient concrete has not been mixed at the time of interruption to form a slab at least five feet long, the excess concrete back to the last preceding joint shall be removed and disposed of as directed.

3.12 FINAL STRIKEOFF, CONSOLIDATION, AND FINISHING

A. The sequence of operations shall be the strikeoff and consolidation, floating and removal of laitance, straight edging, and final surface finish.

B. First, the concrete shall be consolidated and struck off.

1. Unless otherwise permitted for small areas or for short periods of time due to equipment failure, all pavement concrete shall be consolidated using vibrators for full width of paving slabs.
2. Concrete adjacent to joints shall be mechanically vibrated adjacent to the joints as required, the finishing machine shall be brought forward, operating in a manner to avoid damage to or misalignment of joint devices.
3. After the concrete has been placed and vibrated adjacent to the joints as required, the finishing machine shall be brought forward, operating in a manner to avoid damage to or misalignment of joint devices.

C. After the concrete has been struck off and consolidated, it shall be further smoothed, trued, and consolidated, by means of a longitudinal float, by the use of one of the following methods as specified or permitted:

1. Hand Method: The hand-operated longitudinal float shall be not less than 12 feet in length and six inches in width, properly stiffened to prevent flexibility and warping. The longitudinal float, operated from foot bridges resting on the side forms and spanning but not touching the concrete, shall be worked with a sawing motion, while held in a floating position parallel to the road centerline, and shall be passed gradually from one side of the pavement to the other. Movement ahead along the centerline of the pavement shall be in successive advances of not more than one-half the length of the float. Any excess water or soupy material shall be wasted over the side forms on each pass.
2. Mechanical Method: The mechanical longitudinal float shall be of a design approved by the ENGINEER and shall be in good working condition. The tracks from which the float operates shall be securely adjusted to the required crown. The float shall be accurately adjusted and coordinated with the adjustments of the transverse finishing machine so that a small amount of mortar is carried ahead of the float at all times. The forward speed shall be adjusted so that the float will lap the distance specified by the ENGINEER on each transverse trip. The float shall pass over each area of pavement at least two times, but excessive operation

over a given area will not be permitted. Any excess water or soupy material shall be wasted over the side forms on each pass.

3. Alternative Mechanical Method: As an alternative to Item (2) above, the CONTRACTOR may use a machine composed of a cutting and smoothing float, or floats, suspended from and guided by a rigid frame. This frame shall be carried by four or more visible wheels riding on, and constantly in contact with, the side forms.
4. If necessary, following one of the preceding methods of floating, long handled floats having blades not less than five feet in length and six inches in width may be used to smooth and fill in open-textured areas in the pavement. Long handled floats shall not be used to float the entire surface of the pavement in lieu of, or supplementing, one of the preceding methods of floating. When strikeoff and consolidation are done by the hand method and the crown of the pavement will not permit the use of the longitudinal float, the surface shall be floated transversely by means of the long handled float. Care shall be taken not to work the crown out of the pavement during the operation. After floating, any excess water and laitance shall be removed from the surface of the pavement by a straightedge ten feet or more in length. Successive drags shall be lapped one-half of the length of the blade.

D. After the floating has been completed and the excess water removed, but while the concrete is still plastic, the surface of the concrete shall be tested for trueness with a ten-foot straightedge. For this purpose the CONTRACTOR shall furnish and use an accurate ten-foot straightedge swung from handles three feet longer than $\frac{1}{2}$ the width of the slab. the straightedge shall be held in contact with the surface in successive positions parallel to the road centerline and the whole area gone over from one side of the slab to the other, as necessary. Advance along the road shall be in successive stages of not more than $\frac{1}{2}$ the length of the straightedge. Any depressions found shall be immediately filled with freshly mixed concrete, struck off, consolidated, and refinished. High areas shall be cut down and refinished. Special attention shall be given to assure that the surface across joints meets the requirements for smoothness. Straightedge testing and surface corrections shall continue until the entire surface is found to be free from observable departures from the straightedge and the slab conforms to the required grade and cross section.

E. The final finish will be specified in the Plans as to the type of surface texture. The following types of surface textures may be specified:

1. Type I - Transverse Tinning: The mainline finish shall be produced by mechanical equipment described as follows: The transverse grooving machine shall be either a vibrating roller or a comb equipped with steel tines. The machine shall be self-propelled and shall automatically lift the roller or tine comb at the end of the pavement. Hand grooving methods will be permitted in a manner approved by the ENGINEER in those areas where the mechanical equipment cannot be used.

This equipment shall have rectangular or circular shaped spring steel tines which are randomly spaced at $\frac{1}{2}$ to 1 inch intervals from center to

center. The grooves shall be made perpendicular to the center line of the pavement and the resulting transverse grooves shall be 0.090 to 0.125 inches wide and shall be 0.125 to 0.1875 inch deep.

Acceleration lanes, deceleration lanes, and irregular sections may be finished by methods other than mechanical provided they produce a similar type of transverse groove.

2. Type II - Longitudinal Tinning: The mainline finished shall be produced by mechanical equipment described as follows: The longitudinal grooving machine shall be either a vibrating roller or a comb equipped with steel tines. The machine shall be self-propelled and shall automatically lift the roller or tine comb at the end of the pavement. Hand grooving methods will be permitted in a manner approved by the ENGINEER in those areas where the mechanical equipment cannot be used.

This equipment shall have rectangular or circular shaped spring steel tines which are randomly spaced at ½ to 1-inch intervals from center to center. The grooves shall be made parallel to the center line of the pavement and the resulting longitudinal grooves shall be 0.090 to 0.125 inches wide and shall be 0.125 to 0.1875 inches deep. The mechanical equipment shall be operated from a bridge when the pavement is 16 feet or more in width.

Acceleration lanes, deceleration lanes, and irregular sections may be finished by methods other than mechanical provided they produce a similar type of transverse groove.

3. Type III - Artificial Grass Drag: The pavement finish shall be produced by a nylon or artificial grass drag as approved by the ENGINEER. A uniform surface of gritty texture shall be produced by pulling the drag longitudinally. For a pavement width of 16 feet or more in width, the drag shall be mounted on a bridge which travels on the forms. The drag shall be at least three feet wide and in full contact with the full width of the pavement. Drags shall be maintained clean and free from encrusted mortar. Drags that cannot be cleaned shall be discarded and new ones substituted.
4. Type IV - Bristle Broom: The surface texture produced by a broom shall be applied when the water sheen has practically disappeared. The broom shall be drawn from the center to the edge of the pavement with adjacent strokes slightly overlapping. The brooming operation shall be so executed that the corrugations produced in the surface shall be uniform in appearance and shall have a minimum depth of approximately 1/16 inch and a maximum depth of approximately 1/8-inch. Brooming shall be completed before the concrete is in such condition that the surface will be torn or unduly roughened by the operation. The finished surface shall be free from rough and porous areas, irregularities and depressions resulting from improper handling of the broom. Mechanical brooming, in lieu of the manual brooming, will be permitted if satisfactory results can be obtained.

5. Type V - Belt Finish (paving with Rigid Forms): When straight edging is complete and the water sheen has practically disappeared and just before the concrete becomes nonplastic, the surface shall be belted with a two-ply canvas belt not less than eight inches wide and at least three feet longer than the pavement width. Hand belts shall have suitable handles to permit controlled, uniform manipulation. The belt shall be operated with short strokes transverse to the road centerline and with a rapid advance parallel to the centerline.
6. Type VI - Burlap Drag: The drag shall be a seamless strip of damp burlap or cotton fabric which shall produce a uniform surface of a gritty nature after dragging it longitudinally along the full width of pavement. For pavement 16 feet or more in width, the drag shall be mounted on a bridge with travels on the forms. The dimensions of the drag shall be such that a strip of burlap or fabric, at least three feet wide, is in contact with the full width of pavement surface while the drag is used. Drags shall be maintained clean and free from encrusted mortar. Drags that cannot be cleaned shall be discarded and new drags shall be substituted.

F. After the final finish, but before the concrete has taken its initial set, the edges of the pavement along each side of each slab, and on each side of transverse expansion joints, formed joints, transverse construction joints, and emergency construction joints shall be worked with an approved tool and rounded to a radius of ¼-inch.

1. A well-defined and continuous radius shall be produced, and a smooth, dense mortar finish shall be obtained. The surface of the slab shall not be unduly disturbed by tilting of the tool during use.
2. At all joints, any tool marks appearing on the slab adjacent to the joints shall be eliminated by texturing the surface. The rounding of all the corner of the slab shall not be disturbed when the surface is textured. All concrete on top of the joint filler shall be completely removed.
3. All joints shall be tested with a straightedge before the concrete has set, and correction shall be made if one side of the joint is higher than the other or if an edge is higher or lower than the adjacent slabs.

G. If the application of water to the surface is permitted, it shall be applied as a fog spray by means of approved spray equipment.

H. Unless otherwise specified, hand finishing methods will not be permitted except under the following conditions:

1. In the event of breakdown of the mechanical equipment, hand methods may be used to finish the concrete already deposited on the grade when the breakdown occurs.
2. Narrow widths or areas of irregular dimensions where operations of the mechanical equipment is impractical may be finished by hand methods.

3. Concrete, as soon as placed, shall be struck off and screeded. An approved portable screed shall be used. In operation the screed shall be moved forward on the forms with a combined longitudinal and transverse shearing motion, moving always in the direction in which the work is progressing and so manipulated that neither end is raised from the side forms during the striking off process. If necessary, this shall be repeated until the surface is of uniform texture, true to grade and cross section, and free from porous areas.
4. The screed for the surface shall be at least two feet longer than the maximum width of the slab to be struck off. It shall be of approved design, sufficiently rigid to retain its shape, and shall be constructed either of metal or other suitable material shod with metal.
5. Consolidation shall be attained by the use of a suitable vibrator or other approved equipment.

3.13 SURFACE TEST

A. As soon as the concrete has hardened sufficiently, the pavement surface shall be tested with a ten-foot straightedge or other specified devices.

1. Areas showing high spots of more than ¼-inch, but not exceeding ½-inch in ten feet, shall be marked and immediately ground down with and approve grinding tool to an elevation where the area or spot will not show surface deviations in excess of ¼-inch when tested with a ten-foot straightedge. Grinders shall be of the stacked head, vertical blade type that will not polish or smooth the surface but will provide a coefficient of friction approximately equal to that of the unground pavement. Grinding grooves shall be kept parallel with the direction of travel.
2. Where the departure from correct cross section exceeds ½-inch, the pavement shall be removed and replaced by and at the expense of the CONTRACTOR. Any area or section so removed shall be not less than five feet in length nor less than the full width of the lane involved. When it is necessary to remove and replace a section of pavement, any remaining portion of the slab adjacent to the joints that is less than five feet in length shall also be removed and replaced.

3.14 CURING

A. Immediately after the finishing operations have been completed and as soon as marring of the concrete will not occur, the entire surface of the newly placed concrete shall be covered and cured in accordance with one of the following methods.

1. Cotton or Burlap Mats: The surface of the pavement shall be entirely covered with mates. The mats used shall be of such length (or width) that as laid they will extend at least twice the thickness of the pavement beyond the edges of the slab. The mat shall be placed so that the entire surface and both edges of the slab are completely covered. Prior to being placed, the mats shall be saturated thoroughly with water. The

mats shall be so placed and weighed down as to cause them to remain in intimate contact with the surface covered, and the covering shall be maintained fully wetted and in position for 72 hours after the concrete has been placed, unless otherwise specified.

2. **Waterproofed Paper:** The top surface and sides of the pavement shall be entirely covered with waterproofed paper. The units shall be lapped at least 18 inches. The paper shall be so placed and weighted down as to cause it to remain in intimate contact with the surface covered. The paper shall be of such dimensions that each unit as laid will extend beyond the edges of the slab at twice the thickness of the pavement or shall be of pavement width and two-foot strips of paper provided for the edges. If laid longitudinally, paper not manufactured in sizes which will provide this width shall be securely sewed or cemented together, the joints being securely sealed in such a manner that they do not open up or separate during the curing period. Unless otherwise specified, the covering shall be maintained in place for 72 hours after the concrete has been placed. The surface of the pavement shall be thoroughly wetted prior to the placing of the paper.
3. **White Pigmented Impervious Membrane:** The entire surface of the pavement shall be sprayed uniformly with white pigmented curing compound immediately after the finishing of the surface and before the set of the concrete has taken place, or if the pavement is cured initially with burlap or cotton mates, the curing compound may be applied upon removal of the mats.
 - a. The curing compound shall not be applied during rainfall.
 - b. Curing compound shall be applied under pressure at a rate of approximately one gallon to 150 square feet by mechanical sprayers. The spraying equipment shall be of the fully atomizing type equipped with a tank agitator. At the time of use, the compound shall be in a thoroughly mixed condition with the pigment uniformly dispersed throughout the vehicle. During the application the compound shall be stirred continuously by effective mechanical means. Hand spraying of off widths or shapes and on concrete surfaces exposed by the removal of forms will be permitted. Curing compound shall be applied to the inside faces of joints to be sealed.
 - c. Should the film become damaged from any cause within the required curing period, the damaged portions shall be repaired immediately with additional compound.
 - d. Upon removal of side forms, the sides of the slabs exposed shall be protected immediately to provide a curing treatment equal to that provided for the surface.
4. **White Polyethylene Sheeting:** The top surface and sides of the pavement shall be entirely covered with polyethylene sheeting. The units used shall be lapped at least 18 inches. The sheeting shall be so placed and

weighted down as to cause it to remain in intimate contact with the surface covered. The sheeting as prepared for use shall have such dimension that each unit as laid will extend beyond the edges of the slab at least twice the thickness of the pavement. Unless otherwise specified, the covering shall be maintained in place for 72 hours after the concrete has been placed.

- B. Failure to provide sufficient cover material of whatever kind the CONTRACTOR may elect to use, or lack of water to adequately take care of both curing and other requirements, shall be cause for immediate suspension of concreting operations. The concrete shall not be left exposed for more than ½ hour between stages of curing or during the curing period.
- C. When concrete is being placed and the average daily temperature is below 40°F or the air temperature may be expected to drop below 35°F, a sufficient supply of straw, hay, grass, or other suitable blanketing material shall be spread over the pavement to a sufficient depth to prevent freezing of the concrete. The period of time such protection shall be maintained shall be not less than ten days or until the concrete has reached full strength. The CONTRACTOR shall be responsible for the quality and strength of the concrete placed during cold weather, and any concrete injured by frost action shall be removed and replaced at the CONTRACTOR's expense.

3.15 REMOVING FORMS

- A. Forms shall not be removed from freshly placed concrete until it has set for at least 12 hours, except auxiliary forms used temporarily in widened areas.
- B. Forms shall be removed carefully so as to avoid damage to the pavement. After the forms have been removed, the sides of the slab shall be cured as outlined in one of the methods indicated above.
- C. Major honeycombed areas will be considered as defective work and shall be removed and replaced. Any area or section so removed shall not be less than five feet in length nor less than full width of the lane involved. When it is necessary to remove and replace a section of pavement, any remaining portion of the slab adjacent to the joints that is less than five feet in length shall also be removed and replaced.

3.16 SEALING JOINTS

- A. When joints are specified to be sealed in the Standard Details of these Specifications or in the Plans, they shall be filled with joint-sealing material before the pavement is opened to traffic and as soon after completion of the curing period as is feasible.
- B. Just prior to sealing, each joint shall be thoroughly cleaned of all foreign material, including membrane curing compound, and the joint faces shall be clean and surface dry when the seal is applied.

- C. Material for seal shall be installed in accordance with the manufactures recommendations. A copy of the instructions shall be submitted to the ENGINEER for information.
- D. The sealing material shall be applied to each joint opening to conform to the Standard Details, Plans, or as directed by the ENGINEER.
- E. The pouring shall be done in such a manner that the material will not be spilled on the exposed surfaces of the concrete. Any excess material on the surface of the concrete pavement shall be removed, and the pavement surface shall be cleaned. The use of sand or similar material as a cover for the seal will not be permitted.
- F. Poured joint-sealing material shall not be placed when the air temperature in the shade is less than 50° F, unless approved by the ENGINEER.

3.17 PROTECTION OF PAVEMENT

- A. The CONTRACTOR shall protect the pavement and its appurtenances against both public traffic and traffic caused by his own employees and agents. This shall include watchmen to direct traffic and the erection and maintenance of warning signs and lights. He will indicate the location and type of device or facility required to protect the work and provide adequately for traffic.
- B. In order that the concrete may be properly protected against the effects of rain before the concrete is sufficiently hardened, the CONTRACTOR will be required to have available at all times materials for the protection of the edges and surface of the unhardened concrete. Such protection materials shall consist of standard metal forms or wood plank having a nominal thickness of not less than two inches and a nominal width of not less than the thickness of the pavement at its edge for the protection of the pavement edges, and covering material such as burlap or cotton mats, curing paper, or plastic sheeting material for the protection of the surface of the pavement. When rain appears imminent, all paving operations shall stop and all available personnel shall begin placing forms against the side of the pavement and covering the surface of the unhardened concrete with the protective covering.
- C. Any damage to the pavement occurring prior to final acceptance or opening to traffic shall be repaired or the pavement shall be replaced.

3.18 OPENING TO TRAFFIC

- A. The ENGINEER shall decide when the pavement shall be opened to traffic.
- B. Prior to being opened to traffic, the pavement shall be cleaned.

3.19 CONCRETE PAVEMENT - SLIPFORM METHOD

- A. Grade. After the subgrade or base course has been placed and compacted to the required density, the grade and areas which are to support the paving machine shall be cut to the proper elevation by means of an approved fine-grading machine.

1. The fine-grading machine shall be of sufficient weight, and shall be either self-propelled or towed by sufficient power to trim the compacted material without gouging or tearing the surface.
2. The machine shall have cutting edges or surface shavers controlled from an independent control reference wire by means of an automatic control device.
3. To avoid excessive depths of cut the machine may accomplish the fine grading by means of successive passes with each pass controlled from the independent reference line through the automatic control.
4. If the density of the base is disturbed by the grading operations, it shall be corrected by additional compaction before concrete is placed.
5. The grade shall be constructed sufficiently in advance of the placing of the concrete. If any traffic is allowed to use the prepared grade, the grade shall be checked and corrected immediately ahead of the placing of the concrete.

B. Placing Concrete: The concrete shall be placed with an approved slipform paver designed to spread, consolidate, screed, and float-finish the freshly placed concrete in one complete pass of the machine in such a manner that a minimum of hand finish will be necessary to provide a dense and homogenous pavement in conformance with the Plans and Specifications.

1. The machine shall vibrate the concrete for the full width and depth of the strip of pavement being placed. Such vibrations shall be accomplished with vibrating tubes or arms working in the concrete, or with a vibrating screed or pan operating on the surface of the concrete.
2. The sliding forms shall be rigidly held together laterally to prevent spreading of the forms. The forms shall trail behind the paver for such a distance that no appreciable slumping of the concrete occurs.
3. The concrete shall be held at a uniform consistency, having a slump of not more than two inches.
4. The slipform paver shall be operated with as nearly a continuous forward movement as possible, and all operations of mixing, delivering, and spreading concrete shall be so coordinated as to provide uniform progress with stopping and starting of the paver held to a minimum. If, for any reason, it is necessary to stop the forward movement of the paver, the vibratory and tamping elements shall also be stopped immediately. No tractive force shall be applied to the machine, except that which is controlled from the machine.

C. The surface smoothness and texture shall meet the requirements of Subsections 3.13 and 3.12E of this Section.

D. Curing shall be done in accordance with one of the methods included in Subsection 3.14 of this Section. The curing material shall be applied at the appropriate time and shall be applied uniformly and completely at all surfaces and edges of the pavement.

E. All joints shall be constructed in accordance with Subsection 3.11 of this Section.

3.20 TOLERANCE IN PAVEMENT THICKNESS

A. The thickness of the pavement shall be determined by average caliper measurement of cores tested.

B. For the purpose of establishing an adjusted unit price for pavement, a minimum of two cores per mile per lane or area such as intersections, entrances, crossovers, ramps, etc., will be considered as one unit and the thickness of each unit will be determined separately. Small irregular unit areas may be included as part of another unit. At such points as the ENGINEER may select in each unit, two cores will be taken for each 600 square yards of pavement, or fraction thereof, in the unit. Should any thickness deviation be found, additional cores may be taken to define the horizontal limits of the deviation.

C. When the measurement of the core from a unit is not deficient more than 0.2 inch from the plan thickness, full payment will be made.

D. When such measurement is deficient more than 0.2 inch and not more than 1.0 inch from the plan thickness, two additional cores at intervals not less than 300 feet will be taken and used in the average thickness for that unit.

E. In calculations for the average thickness of the pavement, measurements which are in excess of the specified thickness by more than 0.2 inch will be considered as the specified thickness plus 0.2 inch, and measurements which are less than the specified thickness by more than 1.0 inch will not be included in the average.

F. When the measurement of any core is less than the plan thickness by more than 1.0 inch, the actual thickness of the pavement in this area will be determined by taking additional cores at not less than ten-foot intervals parallel to the centerline in each direction from the affected location until in each direction a core is found which is not deficient by more than 1.0 inch. Areas found deficient in thickness by more than 1.0 inch shall be evaluated by the ENGINEER; if in his judgment the deficient area warrant removal, they shall be removed and replaced with concrete of the thickness shown in the Plans. Exploratory cores for deficient thickness will not be used in averages for adjusted unit prices.

G. Where the average thickness of pavement is deficient in thickness by more than 0.2 inch, but not more than 1.0 inch, payment will be made at an adjusted price as specified in the following table:

DEFICIENCY IN THICKNESS AS DETERMINED BY CORES	PROPORTIONAL PART OF CONTRACT PRICE
Inches	Allowed
0.00 to 0.20	100 percent
0.21 to 0.30	80 percent
0.31 to 0.40	72 percent
0.41 to 0.50	68 percent
0.51 to 0.75	57 percent
0.76 to 1.00	50 percent

H. When thickness of pavement is deficient by more than one inch and the judgment of the ENGINEER is that the area of such deficiency should not be removed and replaced, there will be no payment for the area retained.

3.21 REPAIR OF DEFECTIVE PAVEMENT SLABS

A. Spalls along joints shall be replaced by saw cutting at least ½ inch outside the spalled area and to a minimum of 2 inches. The area shall be chipped out at least three inches to solid concrete and then cleaned with compressed air sandblasting. First, the surface of the cavity shall be coated with an approved epoxy-resin binder. Then the cavity shall be filled with an approved non-shrink grout.

B. Random cracks which occur away from joints and, in the judgment of the ENGINEER, will not cause future maintenance problems may be routed and sealed. If not accepted, the slab shall be replaced at the CONTRACTOR's expense.

PART 4 – METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.01 METHOD OF MEASUREMENT:

A. Standard Items:

1. 03040.0X CONCRETE PAVEMENT – X”

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of square yards (SY) of X” thick concrete pavement installed.

2. 03040.01X COLORED CONCRETE PAVEMENT – X”

Measurement for this item will be made in the field with the quantity for payment determined by the actual number of square yards (SY) of X” thick colored concrete pavement installed.

4.02 BASIS OF PAYMENT:

A. Standard Items:

1. 03040.0X CONCRETE PAVEMENT – X”

Payment will be made at the Contract Unit Bid price per square yard (SY) of concrete pavement and will constitute full compensation for all materials, curing of concrete, for all premolded mastic material for expansion joints, contraction joints, joint sealant, sealing of joints, all sawcuts required to install expansion joints, for removing existing soils beneath existing concrete pavement or areas of new concrete pavement to provide for crushed base and concrete placement, and for placing and compacting crushed base under the sidewalk. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

2. 03040.01X COLORED CONCRETE PAVEMENT – X”

Payment will be made at the Contract Unit Bid price per square yard (SY) of concrete pavement and will constitute full compensation for all materials, curing of concrete, for all dyes or stains used, for all premolded mastic material for expansion joints, contraction joints, joint sealant, sealing of joints, all sawcuts required to install expansion joints, for removing existing soils beneath existing concrete pavement or areas of new concrete pavement to provide for crushed base and concrete placement, and for placing and compacting crushed base under the sidewalk. Price will also include all costs to cover labor, equipment, tools, and incidentals to complete the work in accordance with the Contract Documents.

END OF SECTION 03040

DIVISION 13
CORROSION PROTECTION

PART 1 GENERAL

1.01 WORK INCLUDED:

- A. Provide coatings and cathodic protection on all buried, submerged, or immersed ferrous metal (steel, ductile iron, and cast iron) piping and fittings.
- B. Provide galvanic anodes, joint bonds, and tight bonded coatings for all ferrous metallic pipe and fittings used in conjunction with plastic pipe sections.
- C. Maintain electrical isolation of cathodic protected pipes from other unprotected metallic pipes, structures, and grounding systems. Do not connect grounding system to cathodic protected portions of metallic pipelines, provide alternate grounds.
- D. Install tracer wire stations at location as shown in the Plans or listed on a Schedule. Final locations determined by the ENGINEER.
- E. The type of galvanic anode provided shall depend on the soil corrosion zone. See Subsection 2.07 of this Section and the Standard Details.
- F. Provide coatings, insulate and cathodic protection on all buried, submerged, or immersed copper services and fittings, per this Section and applicable Standard Details. Provide petrolatum tape coatings for isolated copper fittings if not cathodically protected.
- G. Provide petrolatum tape coatings for restraining glands and tie rods if not already coated with a specified factory applied coating. Asphaltic coating is not a specified coating.
- H. Polyethylene encase valve and curb boxes.
- I. When connecting to existing cast or ductile iron water lines, attach an anode to the existing pipe at the point of connection.
- J. Coat, then concrete encase buried metallic pipe sections under building or tanks or as required to provide protection between plastic pipe and building, pump station, tank, vault, or concrete pipeline connections as shown in the Plans.
- K. Below grade Fittings and Appurtenances Coating:
 - 1. Where coating and lining specified for main pipeline is not feasible, coat and line all buried metallic (steel, ductile iron, and cast iron) valves, fittings, flexible couplings, incidental metallic piping, glands, blow-offs, and hydrants internally and externally with liquid epoxy or fusion bonded epoxy coating in accordance with AWWA C116 or AWWA C550 and this specification. Internal coatings shall be NSF approved for potable water service.
 - 2. Provide Series 300 stainless steel materials or coat all other

miscellaneous buried metallic items, (tie rods, thrust restraints, tapping saddles, harnesses, etc.). Coat tie rods and rebar when directly exposed to soil. Provide with factory applied epoxy coating, fusion bonded epoxy coating, heat shrink sleeves, or with coating recommended by coating manufacturer for buried application and approved by ENGINEER for intended exposure.

3. Coat above-grade piping, vent pipe, bollards, etc. exposed to atmospheric conditions with two coats of polyamide epoxy and one top coat of polyurethane enamel or with a fusion bonded epoxy coating system. Color selected by OWNER.

1.02 RELATED WORK:

- A. Section 02641 – Valves and Valve Boxes
- B. Section 02644 – Fire Hydrants
- C. Section 02645 – Water Service Lines and Appurtenances
- D. Section 02710 – Water Main
- E. Section 02722 – Manholes

1.03 GENERAL:

- A. Like items of materials provided hereunder shall be the end product of one manufacturer in order to achieve standardization for appearance, maintenance, and replacement.
- B. The CONTRACTOR shall be responsible for all such material furnished by him/her and shall replace, at his/her own expense, all such material found defective in manufacture or damaged in handling after delivery by the manufacturer. This shall include the furnishing of all materials and labor required for the replacement of installed material discovered defective prior to the final acceptance of the Work or during the one-year correction period.
- C. The CONTRACTOR shall be responsible for the safe storage of materials furnished by him/her or to him/her and accepted by him/her and intended for the Work. The interior of all pipe and other accessories shall be kept free from dirt and foreign matter at all times.

1.04 REFERENCE STANDARDS:

- A. General: The latest revision of the following minimum standards shall apply to the materials and installation included in this specification, except where more stringent standards are applicable. In case of conflict, the most stringent requirements shall apply.
 1. American National Standards Institute (ANSI): C80.1-90, Rigid Steel Conduit-Zinc Coated.
 2. American Society for Testing and Materials (ASTM):
 - a. B418, Standard Specification for Cast and Wrought Galvanic Zinc Anodes.

- b. C94, Standard Specification for Ready-Mixed Concrete.
3. American Water Works Association (AWWA):
- a. AWWA C116, Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings for Water Supply Service.
 - b. AWWA C214, Tape Coating Systems for the Exterior of Steel Water Pipelines.
 - c. AWWA C216, Heat-Shrinkable Cross-Linked Polyolefin Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines.
 - d. AWWA C217, Cold-Applied Petrolatum Tape and Petroleum Wax Tape Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines.
 - e. AWWA C550, Protective Epoxy Interior Coatings for Valves and Hydrants.
4. American Wood Preservers Association (AWPA):
- a. C2, Commodity Standards for Lumber and Timber
 - b. P5, Waterborne Preservatives
5. National Association of Corrosion Engineers International (NACE),
- a. Recommended Practice RP0169, Control of External Corrosion on Underground or Submerged Metallic Piping Systems.
 - b. Recommended Practice RP-02-86, The Electrical Isolation of Cathodically Protected Pipelines.
6. National Electrical Manufacturers Association (NEMA):
- a. TC 2-83, Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).
 - b. WC 3-80, Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy (R 1986).
 - c. WC 5-73, Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy (R 1985).
 - d. WC 7-88, Cross-Linked-Thermosetting-Polyethylene-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

7. National Fire Protection Association, National Electrical Code, NFPA 70.

1.05 DEFINITIONS:

- A. Cathodic Protection, (Cathodic Protect, Cathodically Protected, etc.): An electrical method of reducing or eliminating corrosion by making previous anodic areas on a structure surface, turn into a cathode by creating a dc current flow to the structure surface. Two common cathodic protection methods are galvanic anodes and impressed current cathodic protection systems. A galvanic anode system consists of galvanic anode materials (usually magnesium or zinc) that naturally corrodes or sacrifices itself and does not require an outside power source. An impressed current type system utilizes an outside power source usually a rectifier (that converts ac to dc current) and forces (impresses) current from a number of anodes (or groundbed) through the environment to the structure to be protected.
- B. Electrically Continuous Pipeline: A pipeline which has a linear electrical resistance equal to or less than the sum of the resistance of the pipe plus the maximum allowable bond resistance for each joint as specified in this section.
- C. Electrical Isolation: The condition of being electrically isolated from other metallic structures (including, but not limited to, piping, reinforcement, casings, etc.) and the environment as defined in NACE PR0286, The Electrical Isolation of Cathodically Protected Pipelines.
- D. Ferrous or Metallic Pipe: Any pipe or fitting made of steel or iron, or pipe containing steel or iron as a principal structural material (such as steel, ductile iron, and cast iron), except reinforced concrete pipe or stainless steel.
- E. Fittings: Appurtenances to include but not be limited to valves, fittings, tees, angles, couplings, tapping saddles or sleeves, blow-offs, hydrants, including glands, etc.
- F. Fasteners: To include but not be limited to bolts, nuts, washers, tie-rods, screws, restraining devices, etc.
- G. Foreign Owned: Any buried pipe or cable not specifically owned or operated by the City of Sheridan.
- H. Functional and Performance Testing: Tests necessary to demonstrate that installed equipment and systems function as specified and operate in the manner intended. Functional testing is a prerequisite to performance testing for equipment and systems specified to have a performance test.
- I. Joint Bonds: A method of making the pipeline electrically continuous by connecting a wire(s) across each side of the pipe joint or fitting
- J. Lead, Lead Wire, Joint Bonds, Pipe Connecting Wires, Cable: Insulated copper conductor; the same as wire.
- K. Loose Bonded Coatings: A dielectric coating that is not bonded or physically attached to the pipe surface (polyethylene encasement).

- L. Manufacturer's Representative: Employee of manufacturer who is factory trained and knowledgeable in technical aspects of their products and systems.
- M. Petrolatum: A purified mixture of semisolid hydrocarbons obtained from petroleum jelly.
- N. Petroleum Wax: A refined mixture of solid hydrocarbons, paraffin in nature, obtained from petroleum. Provided as a refined paraffin wax or microcrystalline wax forms.
- O. Structure-to-reference electrode potential (also structure-to-reference electrode voltage): The difference in voltage (potential) between the subject metallic structure and the electrolyte in which it is buried or submerged, as measured to the standard specified reference electrode placed in contact with the electrolyte.
- P. Tight Bonded Coatings: A dielectric coating that is bonded or physically attached to the pipe surface.
- Q. PVC pipe wrap tape with a minimum of 10 mil thickness can be used in lieu of Petrolatum Tape, when approved by ENGINEER.

1.06 SUBMITTALS:

- A. Provide catalog cuts and other information for all products proposed for use that shows compliance of those materials with these Specifications (including Section 01300 and the General Conditions). In addition the following specific information shall be provided.
1. Installation, material, and safety requirements for thermite weld wire connections.
 2. Quality Assurance Submittals:
 - a. Manufacturer's Certificates of Compliance.
 - b. Field Test Reports.
 - c. Certificate of Compliance with independent laboratory analysis stating that galvanic anode and backfill material supplied meets the requirements of this Specification.
 - d. Certificate of Compliance from fitting and appurtenance manufacturer and supplier that bolting, nuts, and washers were provided with stainless steel Series 300 materials as specified.

1.07 QUALITY ASSURANCE

- A. CONTRACTOR's Competency: CONTRACTOR shall have a minimum of two (2) years of practical experience in the type of work called for in this specification, and shall have knowledge about local soil conditions. CONTRACTOR may be required to show proof and furnish a list of references substantiating this requirement to the satisfaction of the OWNER.
- B. The CONTRACTOR shall provide at all times a thoroughly experienced and competent field foreman, who will be present to supervise this portion of construction on-site. This person shall be responsible for the field test reports and have the authority to represent the CONTRACTOR, and be the point of contact with the ENGINEER for this section of the specifications.
- C. The galvanic anode corrosion protection system and monitoring systems shall be fully operational upon completion of pipe installation.

1.08 OBSERVATION OF WORK:

- A. Provide access to the project site for OWNER, ENGINEER, and manufacturer at all times during installation and to observe finished work.
- B. The CONTRACTOR shall give the ENGINEER a minimum of 14 days advance notice of the start of any work to allow scheduling for field observation of the construction relating to corrosion protection.

1.09 RECORD DRAWINGS

- A. CONTRACTOR shall maintain an accurate record of the construction and a marked-up drawing of all construction modifications. At completion of project, the CONTRACTOR shall provide a copy of the marked-up construction drawings of the corrosion control installations to the ENGINEER for preparation of Record Drawings.

1.10 SPECIAL GUARANTEE:

- A. The CONTRACTOR and Product Manufacturer shall jointly and severally warrant to the OWNER and guarantee the work under this section against defective workmanship and materials for a period of one (1) year(s) or longer if required by the General Conditions commencing on the date of final acceptance of the work.
 - 1. A warranty inspection of the corrosion protection systems shall be made within the warranty period. The CONTRACTOR and Product Manufacturer Representative at their option if desired may be present during the warranty inspection by the ENGINEER and OWNER. Any defects in the corrosion protection system discovered at this time shall immediately be repaired in a timely manner (within 60 days of notice) by the CONTRACTOR in accordance with the written product manufacturer's instructions as reviewed and approved by the ENGINEER.
 - 2. For all repairs, the CONTRACTOR shall provide an extended warranty (equal to the original warranty period) of one year(s) or longer if required

by the General Conditions commencing on the date of final acceptance of the repair work. All repair or any damage to other work caused by such defects or repairing of the defects including additional engineering, full-time inspection during repairs, and re-warranty inspections shall be at sole cost to CONTRACTOR or Product Manufacturer.

PART 2 - PRODUCTS

2.01 GENERAL:

- A. Unless otherwise indicated, provide all first-quality, new materials, free from defects, in first class condition suitable for the intended use. Provide materials and equipment, which are the standard products of manufacturers regularly engaged in the production of such materials and equipment. Provide the manufacturer's latest standard design that conforms to these specifications.
- B. Provide materials intended for this type of service in accordance with this specification and the referenced standards. Whenever the requirements of the Specifications or Plans exceed those of the codes or manufacturer's instructions, the requirements of the Specifications or Plans shall prevail. Where a larger size, higher quality, or better grade of material or a higher standard of workmanship is required, the most stringent requirement shall apply.
- C. The use of a manufacturer's name and model or catalog number is solely for the purpose of establishing the standard of quality and general configuration desired. Products of other manufacturers of equal standard and quality will be considered in accordance with the General Conditions.

2.02 MATERIAL SUPPLIERS:

- A. Suppliers listed below can usually supply the types of materials specified in this Section. Alternate suppliers will be considered, subject to approval of the ENGINEER. Address given is that of offices in the Western United States; contact these offices for information regarding the location of their representative nearest the project site:
1. Farwest Corrosion Control, Denver, CO (303-307-1447).
 2. MESA Products, Inc., Tulsa, OK (918-627-3188).
 3. Total Corrosion Services, TCS, Billings, MT (406-248-6985).

2.03 WIRES:

- A. General: Wire shall conform to applicable requirements of NEMA WC 3-80, WC 5-73, and WC 7-88. All cathodic protection wires and cables provided shall be insulated STRANDED copper wire. Wire size, type, and insulation type as specified in this Section.
- B. Joint Bonds:
1. General: Type of joint bonds shall depend on pipe joint coating and shall be either:

Insulated copper joint bond wires or insulated copper bond straps for all other locations.

2. Bond Lengths: Length of bond strap and joint bond wire may be adjusted for different pipe size and joint type per pipe manufacturer's recommendations so as to provide sufficient slack (1-inch minimum on each end or 2 inches total) for pipe or joint movement between each thermite weld connection with the following minimum lengths listed for each type of bond or strap and fitting or joint type.
3. Insulated Joint Bond Wires: Provide joint bond wires consisting of single-conductor, stranded insulated copper wire with 600-volt high molecular weight polyethylene (HMWPE) insulation. Supply all joint bonds complete with a formed copper sleeve on each end of the wire. Wire conductor for field-applied sleeves shall extend 1/4 inch beyond end of copper sleeve. End of factory formed copper sleeves shall be angled so as to allow end of wire to be exposed to thermite weld material.
 - a. For Pipe 16-inch or Larger Diameter:
 - 1) For Push-on, Mechanical, or Flanged Joints: No. 2 AWG wires, 18-inches long minimum.
 - 2) For Flexible Coupling Joints: No. 2 AWG wires, 24-inches long minimum, with two 12-inch long minimum insulated No. 12 AWG wire pigtails, as manufactured by Erico Products Inc. (Cadweld), Cleveland, OH; or equal. Smaller couplings than 24-inch OD pipe may allow shorter lengths. Larger couplings than for 36-inch OD pipe may require longer lengths. Confirm that bond wire length supplied provides a minimum of 1-inch slack on each end.
 - 3) Bond wires with pig-tail wires can be utilized at not only flexible couplings, but at fitting or valve locations, where it is easier to bond over the fitting or valve with the larger bond wire. At these locations, the pig tail wires shall be bonded to the fitting or valve body.
 - 4) For Insulated Flexible Coupling Joints: No. 2 AWG insulated copper wire, 18-inch long minimum, with one 12-inch long minimum No. 12 AWG wire pigtail.
 - b. For pipe smaller than 15-inch diameter, CONTRACTOR can utilize No. 4 AWG wire size instead of No. 2 AWG wire size, if desired.
 - c. Insulated Copper Strap Joint Bonds:
 - 1) Utilize insulated (heat shrink coated) copper bond straps, where bond strap is not to be coated with pipe joint heat shrink sleeve in place of insulated wire type joint bonds.

- 2) Acceptable pre-made insulated copper strap bonds are available from:

J-Four Pipeline Products, (800-331-3404), Broken Arrow, OK; or approved equal.

4. Cathodic Protection Bond Wires or Bonding Straps shall be continuous. Bolted, inline sleeve, or compression type connections are NOT acceptable.

C. Test Wires:

1. No. 12 AWG wire for prepackaged galvanic anode and No. 10 AWG and No. 12 AWG test leads and No. 12 AWG and No. 14 AWG reference electrode lead wires shall be single-conductor, stranded copper wire with 600-volt, TW, THWN, THHN or HMWPE insulation.
2. No. 8 AWG for pipe lead wires shall be single-conductor, stranded copper wire with 600-volt, HMWPE insulation.

D. Wire Identification:

1. Wire insulation color shall indicate the function of each wire and shall be as shown in the Plans and as follows:
 - a. Pipeline test wires:
 - 1) Water Pipeline: Blue STRANDED wire.
 - 2) Foreign Pipeline: White or as requested by foreign pipeline company.
 - 3) Unprotected Pipe: Black.
 - b. Anode lead wires: Black.
 - c. Reference electrode wires: Yellow.
 - d. Tracer wires: Copperhead reinforced tracer wire or approved equal colored Blue for water lines. The color shall be Green for sanitary sewer lines.

2.04 THERMITE WELD MATERIALS:

A. Electrical connection of copper wire or copper strap to metallic (steel, ductile iron, and cast iron) fittings, pipe, and structures shall be by the thermite weld (cadweld) method.

B. Supply the proper size and type of wire sleeves, cartridges, and welder molds as required for each type of connection and pipe material in accordance with the thermite weld manufacturer's written recommendations. Weld materials from different manufacturers shall not be interchanged.

C. Provide type of charges required for each pipe or fitting base material.

1. Provide steel charges for steel materials (Cadweld F-33 or Thermoweld P Standard Powder). Charge (cartridge) size shall be minimum of 15 grams and maximum of 25-grams for steel materials.
2. Provide cast iron charges for all ductile iron and cast iron materials (Cadweld XF-19 or Thermoweld CI Cast Iron Powder). Charge (cartridge) size shall be minimum of 25 grams and maximum of 32-grams for ductile and cast iron materials.
3. Maximum cartridge size for natural gas and petroleum pipelines and structures shall be 15-grams.

D. Welder molds shall be graphite molds. Ceramic "One-Shot" molds will not be acceptable. Special welders and materials are required for copper strap, formed joint, and flexible coupling bonds. Vertical type connections require special welders and materials as recommended by the weld manufacturer.

E. Adapter Sleeves:

1. Install adapter sleeves (Cadweld CAB 133H, Thermoweld A200, or approved equal) for all No. 12 AWG wires. Provide sleeve type as recommended by thermite weld manufacturer and attach in the field.
2. Install adapter sleeves for all No. 4 AWG and No. 2 AWG wires. Either premade factory sleeved wires or wires with sleeves made in the field with the appropriate sized sleeves and hammer die are acceptable.
 - a. Factory formed sleeves shall be beveled to allow molten thermite weld material to directly contact wire.
 - b. Field formed sleeves shall be attached with the appropriate sized and type of hammer die and method as recommended by the thermite weld manufacturer. Wire conductor for field installed adapter sleeves shall extend 1/4 inch beyond end of the sleeve to allow molten thermite weld material to directly contact wire.

F. Thermite weld materials are available as specified from Erico Products Inc. (Cadweld - 800-248-9356) Cleveland, OH; Continental Industries, Inc. (Thermoweld – 800-558-1373), Tulsa, OK; or approved equal.

2.05 THERMITE WELD CAPS:

A. Thermite weld caps shall consist of a 4-inch by 4-inch size premade weld cap filled with elastomeric mastic coating and suitable primer, such as the Handy Cap II with Royston Roybond 747 Primer, available from Royston Laboratories, or approved equal.

2.06 GROUND CLAMPS:

A. Ground clamps for wire connections to copper service pipe shall be sized to fit the pipe and wire and UL 467 listed for direct burial in earth or concrete. All parts of the clamp shall be bronze including bolts and nuts, as manufactured by Burndy, O. Z. Gedney, Thomas and Betts, or approved equal.

2.07 GALVANIC ANODES:

A. General: Zinc anodes shall be used in Corrosion Zone 1, while Magnesium anodes shall be used in Corrosion Zone 2. Refer to the Standard Details.

B. Zinc Anode:

1. Zinc anodes for buried soil conditions shall meet the requirements of ASTM B418, Type II, composition as follows:

ELEMENT	CONTENT
Aluminum (Al)	0.0050% maximum
Cadmium (Ca)	0.0030% maximum
Iron (Fe)	0.0014% maximum
Lead (Pb)	0.0030% maximum
Copper (Cu)	0.0020% maximum
Zinc (Zn)	Remainder

2. Prepackaged Zinc Anode Dimensions:

BARE ANODE SIZE	18 POUND ANODE	30 POUND ANODE	ZINC GROUND CELL
Bare Anode Nominal Dimensions	1.4 inches by 36 inches long minimum	2 inches by 30 inches long minimum	Two ea. 1.4" by 1.4" by 60" long, minimum
Packaged Weight	70 pounds minimum	70 pounds minimum	Each ground cell 30 pounds minimum
Nominal Package Size	5" diameter by 42 inches long minimum	5 inches by 36 inches long minimum	8 inches by 78 inches long minimum

C. Magnesium Anode:

1. High-Potential Magnesium Composition for buried soil applications shall have the composition as follows:

ELEMENT	CONTENT
Aluminum (Al)	0.010% maximum
Manganese (Mn)	0.500% to 1.300%
Zinc (Zn)	0.002% maximum
Silicon (Si)	0.002% maximum
Copper (Cu)	0.020% maximum
Nickel (Ni)	0.001% maximum
Iron (Fe)	0.030% maximum
Total Others	0.050% each or 0.300% maximum, total
Magnesium (Mg)	Remainder

2. Prepackaged Magnesium Anode Dimensions:

BARE ANODE SIZE	17 POUND ANODE	32 POUND ANODE
Bare Anode Nominal Dimensions	3 inches by 25 inches long minimum	5 inches by 21 inches long minimum
Packaged Weight	42 pounds minimum	68 pounds minimum
Nominal Package Size	6 inch diameter by 29 inches long minimum	7 inches by 30 inches long minimum

3. Acceptable High Potential Magnesium Anodes: Dow Galvomag, Magcorp (formerly Amax) Maxmag, or approved equal.

D. Prepackaged Galvanic Anode General Requirements:

1. Anode Wire: Supply each anode with No. 12 AWG stranded copper wire with TW, THWN, THHN or HMWPE TW, THWN, THHN or HMWPE insulation, 10 feet long minimum.
2. Wire-to-Anode Connection: The galvanic anode material shall be cast around a galvanized steel wire, strap, or pipe core. The anode connection to the steel core shall silver-soldered (45% silver) by the manufacturer's standard process and be stronger than the wire. Connection of lead wire to anode shall be electrically insulated with manufacturer's standard waterproof epoxy or electrical potting compound type insulation.

3. **Prepackaged Anode Backfill:** Backfill shall have a grain size so that 100 percent is capable of passing through a 20-mesh screen and 50-percent will be retained by a 100-mesh screen. The backfill mixture shall be thoroughly mixed and firmly packaged around the galvanic anode within the cloth bag or cardboard tube by means of adequate vibration. The complete packaged galvanic anode shall weigh a minimum of 2.0 times the bare anode weight. The quantity of backfill shall be sufficient to cover all surfaces of the anode to a depth of 1-inch.
4. **Packaging and Shipping:** Bare anodes shall be centered in cotton bag filled with specified backfill. Provide electrode packaged in a plastic or heavy multi-walled paper bag of sufficient thickness to protect the anode, wire, backfill, and cloth bag during normal shipping and handling.
5. **Compliance Statement:** Furnish an independent laboratory analysis certifying that all anode and backfill material supplied meets the requirements of this Specification.
6. **Field Verification:** At ENGINEER's option, a galvanic anode may be selected at random for CONTRACTOR to provide an independent laboratory analysis on to demonstrate anode and backfill material supplied meets the requirements of this Specification.
7. **Prepackaged Galvanic Anode Backfill Composition:**

ELEMENT	CONTENT
Ground Hydrated Gypsum	75 Percent
Powdered Wyoming Bentonite	20 Percent
Anhydrous Sodium Sulfate	5 Percent

2.08 REFERENCE ELECTRODES:

A. Prepackaged Copper/Copper Sulfate Reference Electrodes:

1. **General:** Permanent reference electrode for buried piping locations shall be a copper/copper sulfate reference electrode. Reference electrode dimensions shall be approximately 2 1/2-inches in diameter by 10-inches long. Reference electrode shall be suitable for permanent installation and designed for a 10-year minimum life expectancy with an accuracy of plus or minus 5-millivolts.
2. **Electrode manufacturer shall warrant electrode for 10-year design life and provide both labor and material replacement, if electrode becomes unstable by more than 20 millivolts during design life.**
3. **Prepackaging and backfill:** Electrodes shall be supplied prepackaged in a permeable cloth bag containing manufacturer's special low-resistivity backfill mixture formulated to retain moisture and maintain electrode

stability. Outside dimensions of electrode package shall be approximately 8-inches in diameter by 15-inches long.

4. Lead wire: Supply electrode with a lead wire attached and electrically insulated with the manufacturer's standard connection. The connection shall be stronger than the wire. Lead wire shall be single conductor No. 14 AWG or larger stranded copper wire insulated as specified under WIRE, this section.
5. Packaging: Package cloth bag with reference electrode in a plastic or heavy paper bag of sufficient mil thickness to protect the electrode, wire, backfill, and cloth bag during normal shipping, handling, and storage.
6. Acceptable CU/CUSO_4 reference electrodes are STAB-L-CELL as available from Cathodic Protection Services (Corrpro), Tulsa, OK; FWCC Series as available from Farwest Corrosion Control, Gardena, CA; Permacell 802 as available from Corrpro, Medina, OH; or approved equal.

2.9 PLASTIC REFERENCE MONITORING PIPE:

- A. IR Drop Plastic Reference Pipe: A 3-inch minimum diameter Schedule 40 PVC plastic pipe with a threaded pipe cap shall be provided at IR Drop Free Potential as shown in the Plans.

2.10 CONDUIT, LOCKNUTS, AND STRAPS:

- A. The minimum conduit size shall be 1-inch diameter unless otherwise indicated in the Plans or specified.
- B. Use intermediate metal conduit, including couplings, elbows, nipples, and other fittings, hot-dipped galvanized and meeting the requirements of UL and the NEC. Do not use setscrew type couplings, elbows, and nipples unless approved by the OWNER.
- C. Heavy wall rigid PVC conduit shall be Schedule 40, UL listed for concrete-encasement, underground direct burial, concealed and direct sunlight exposed use. Use conduits, couplings, elbows, nipples, and other fittings meeting the requirements of NEMA TC and TC 3, Federal Specification W-C-1094, UL, NEC, and ASTM specified tests for the intended use.
- D. Flexible metal conduit shall be UL listed, liquid-tight flexible metal conduit consisting of galvanized steel flexible conduit covered with an extruded PVC jacket and terminated with nylon bushings or bushings with steel or malleable iron body and insulated throat and sealing O-ring.
- E. Locknuts, two-hole straps, and other miscellaneous hardware shall be galvanized steel. Galvanized items shall be hot-dipped galvanized in accordance with ASTM A153.
- F. Conduit bushings shall be threaded plastic or plastic-throated galvanized steel fittings.

2.11 WIRE CONNECTIONS AND SPLICE MATERIALS:

- A. Compression Connectors: Compression connectors for in-line, multi-splices, and tap splices shall be "C" taps made of conductive wrought copper, sized to fit the wires being spliced. Compression connectors shall be applied with the crimp tool and die recommended by the manufacturer for the wire and tap connector size. Acceptable Type "YC" wire compression connectors as manufactured by Burndy Co., or approved equal.
- B. Silver Brazing Alloy: Brazing Alloy with 15 percent silver content, 1185 to 1300 degrees F melting range.
- C. Splice Kits: In-Line splice insulating kit for insulation repair shall be epoxy resin, 3M Company Scotch Cast; Royston Mini Splice-Right; or approved equal.
- D. Electrical Splicing Tape: Tape for wire splice insulation shall be 30 mil linerless rubber high voltage splicing tape, Scotch 130C; and 7 mil vinyl electrical tape, Scotch Super 33+; suitable for moist or wet environments, as manufactured by 3M Products; or approved equal.
- E. Wire Connector Terminals: A ring tongue terminal or single hole solderless lug (Lug-it) type connector shall be installed on the end of all stranded wire before connecting it to terminal box, or junction box terminal studs. Wire connector terminals shall be sized to fit wire and stud size.
1. One-piece copper, tin-plated crimp-on ring tongue terminal. Acceptable ring tongue wire connectors are manufactured by Burndy Co., 3M, Panduit, Thomas and Betts, IDEAL, or approved equal.
 2. Seamless copper Lug-it type connector rated shall be UL listed for 600 volt service with off-set tongue. Acceptable single hole solderless lugs are manufactured by ILSCO, or approved equal.
- F. Electrical Sealer: Provide electrical sealer Ivy-spray Type Scotch 1603, manufactured by 3M Company, or approved equal.
- G. Electrical Connectors: Hardware used in electrical connections including bolts, studs, nuts, washers, and lock-washers shall be tin or nickel plated copper, brass, bronze, or 300 series stainless steel for electrical conductivity and atmospheric corrosion resistance.

2.12 TRACER WIRE:

- A. Tracer Wire:
1. Tracer wire for open cut/open ditch shall be a #12 AWG HS-CCS high-strength copper clad steel conductor (HS-CCS), insulated with a 30 mil, high-density, high molecular weight polyethylene (HDPE) insulation, and rated for direct burial use at 30 volts. Tracer wire shall be Copperhead™ HS-CCS HDPE 30 mil or approved equal.

2. Tracer wire for horizontal directional drilling applications shall be Soloshot #12 EHS by Copperhead Industries, or approved equal, and have an average tensile break load of 1150 lbs, minimum tensile strength of 200,000 psi and a 45 mil HDPE jacket, rated for 30 volts.
3. Tracer wire insulation shall be resistant to corrosive soil and intended for extended direct burial service with color as specified under "Wires" this section.
4. Tracer wire tape shall be 1-inch minimum width polyethylene tape intended for direct burial service.
5. Wire connectors SHALL be Copperhead™ SnakeBite part # SCB-01-SR or approved equal

B. Tracer Wire Access Boxes:

1. Flush Mounted Terminal Box:
 - a. Use Copperhead SnakePit or approved equal tracer wire terminal boxes.
 - b. Acceptable flush mounted tracer wire access boxes are:
 - 1) SnakePit RB14B TP Roadway Box
 - 2) Or approved Equal
2. Post Mounted Terminal Box shall be requested and approved by the ENGINEER before installation. Once the post mounted terminal box is approved by the ENGINEER, it shall be as follows:
 - a. Condulet style terminal box with minimum two wire terminal board. Terminal board shall be non-conductive material suitable for outdoor exposure (Lexan, UV protected polycarbonate plastic, etc.). Terminal hardware for wire terminations shall be Series 300 stainless steel, nickel-plated brass, or bronze.
 - b. Condulet style terminal box shall be suitable for mounting on a threaded ¾-inch or larger rigid galvanized steel conduit. Terminal box shall be provided with all mounting hardware (conduit straps, wood screws, conduit bushing, etc.) necessary to provide a rigid support to a 4-inch by 4-inch by 5-foot long pressure-treated wood post. Wood post shall be pressure treated with a waterborne preservative intended for fresh water or soil (burial) contact to a retention of 0.40 pounds per cubic foot (6.4 kilograms per cubic meter) in accordance with AWPAs Standard C2 for Lumber and Timber and AWPAs Standard P9 for Waterborne Preservatives.
 - c. Acceptable post mounted tracer wire access boxes are:

- 1) T-2 or T-4 Condulet Style Test Heads available from Tinker and Rasor.
- 2) Finklet Test Station or Finkplate Condulet Terminal Board available from COTT Manufacturing Company.
- 3) Two wire condulet test station head available from Agra Equipment Company.
- 4) Or approved Equal

2.13 WARNING TAPE:

A. Warning tape shall be heavy-gauge, 4 mil minimum thickness, plastic tape for use in trenches.

1. Warning tape shall be non-traceable type. Warning tape shall be resistant to corrosive soil and intended for extended direct burial service.
2. Tape shall meet A.P.W.A. national color code and shall be imprinted with an appropriate legend to define the type of utility. Tape shall be labeled with bold black letters for full length of tape.
3. Warning tape for plastic and metallic water pipelines shall be a minimum of 12-inch width. Warning tape shall be blue, and labeled "CAUTION: WATER LINE BURIED BELOW".
4. Acceptable products are available from ITT Blackburn; Allen Systems, Inc.; Griffolyn Co.; or approved equal.

2.14 INSULATING JOINTS:

A. General: Insulating joints shall be dielectric unions, flanges, or couplings. The complete assembly shall have an ANSI rating equal to or higher than that of the joint and pipeline. All materials shall be resistant for the intended exposure, operating temperatures, and products in the pipeline.

B. Copper Service Line Insulators:

1. Insulated service fittings shall consist of brass union body that encapsulates nylon insulator specially designed to provide electrical isolation for this type of intended use:
 - a. Insulated corporation ball valves, insulated curb ball valves.
 - b. Service Line Insulators shall be provided to insulate copper or metallic service lines as shown in the Plans.
 - c. Service Line Insulator Model Number will depend on designated insulator location and piping connections.

2. Consult manufacture for model number and installation procedures for each application. Acceptable Service Line Insulators are available from:
 - a. Mueller Co., Decatur, IL (800-423-1323), or approved equal.

2.15 LININGS AND COATING:

- A. Supply pipe and fittings with linings and coatings of the same type as adjacent pipe, except where shown in the Plans or called out in the Specifications. Coat pipe and fittings installed as specified herein.
- B. Coat metallic pipe and fittings installed above-grade as specified herein. Provide exterior coating for all above-grade piping, fittings, bollards, and vent pipes with two coats of polyamide epoxy coats at 2.5 to 3.5 mils dry film thickness per coat (MDFTPC) and with one top coat of polyurethane enamel at 3 to 4 MDFT or with a 12-mil fusion bonded epoxy coating system. Minimum surface preparation shall be near-white metal blast (SSPC SP-10) for external surfaces. Color as selected by OWNER.
- C. Coat and line all buried metallic (steel, ductile iron, and cast iron) valves, fittings, miscellaneous piping, and hydrants internally and externally. Supply factory coated valves and fittings with linings and coatings of the same type as adjacent above grade pipe, except where shown in the Plans or where coating or lining specified for buried main pipeline is not feasible for fabricated items or special pipe pieces (such as incidental metallic piping, valves, fittings, flexible couplings, glands, hydrants, etc.).
- D. At CONTRACTOR's option, factory coat or line the incidental piping, valves, or fittings with liquid epoxy or with fusion-bonded epoxy coating in accordance with AWWA C116 or AWWA C550. Internal coatings shall be NSF approved for potable water service. Bolts, nuts, and washers, (including in valve bonnet and stuffing box) shall be Series 300 stainless steel.
- E. Internal linings and coatings in contact with water shall be NSF approved for potable water service.
- F. All ferrous interior mounting faces/surfaces shall be prepared and shop primed with a suitable rust-inhibitive holding primer applied in accordance with this specification and the coating manufacturer's recommendations. Holding rust-inhibitive primer shall be compatible with specified top coats. Apply per coating manufacturer's recommendations to a thickness that will not impair the clearances required for proper installation of the joint or fitting (valve) operation.
- G. Ductile Iron and Cast Iron Surface Preparation: Use SSPC SP grades as surface preparation guide only as it applies to cast iron or ductile iron in percentage cleanliness required and surface contaminants removed, not the color of the metal. The abrasive blast cleaning operation shall remove the same percentage of all surface contaminants (including tightly adhered annealing scale) as the SSPC SP grade referenced. The entire surface area shall be abrasive blasted. No rust stains shall be allowed. Avoid overblasting, high nozzle velocities, and excessive blast times. Cast iron and ductile iron attain a gray color when abrasive blasted due to the higher carbon content compared to steel. For

example if a SSPC SP-10 Near White Grade is specified for cast iron or ductile iron, the degree of surface cleanliness is comparable to a near white blast for steel and requires 95 percent removal of all surface contaminants including tightly adhered annealing scale. The one exception is that the ductile or cast iron will not be required to be near-white, but will only be required to be a near-gray color.

H. Liquid Epoxy: Provide factory applied liquid epoxy lining and coating in accordance with AWWA C210 and AWWA C550 and these specifications. Epoxy material shall meet the performance requirements of the referenced AWWA standards. Epoxy material shall be the product of a coating manufacturer normally engaged in production of such material and shall be for intended service conditions. The liquid epoxy coating shall be a two part chemically cured coating or 100-percent material. Coating shall be mixed and applied per coating manufacturer's directions. Liquid-epoxy lining of metallic pipe and fittings shall be potable grade epoxy coating approved for potable water contact and this type of intended service. Abrasive blast with material and in manner as recommended by coating manufacturer to produce surface profile depth and angular shape needed. Surface preparation shall be a minimum of SSPC SP-5 (White) for immersion service and SSPC SP10 (Near White) or better for external service. Coating shall be a minimum of two or more coat system with a minimum thickness of 14 to 16 mils dry film thickness (MDFT). Minimum adhesion to prepared steel shall be 400 psi per ASTM D1002 or per coating manufacturer's printed literature, whichever is higher.

Liquid Epoxy	ICI Devoe	Sherwin-Williams	Tnemec
Liquid Epoxy AWWA C210 and AWWA C550 (Coating in contact with potable water surfaces shall be approved for potable water contact and conforming to NSF Standard 61)	Bar-Rust 233 H	Epoxide II LT	Pota Poxy Series 20

I. Fusion-Bonded Epoxy: Provide factory applied fusion-bonded epoxy lining and coating in accordance with AWWA C213, AWWA C116, and AWWA C550, and these specifications. Fusion-bonded epoxy material shall meet the performance requirements of the referenced AWWA standards. Fusion-bonded epoxy material shall be the product of a coating manufacturer normally engaged in production of such resin and shall be for intended service conditions. The fusion bonded epoxy coating shall be a 100 percent powder epoxy based thermosetting coating. Coating shall be applied by flocking, fluidized bed, or electrostatic method per coating manufacturer's directions. Fusion-bonded epoxy lining of metallic pipe and fittings shall be potable grade epoxy coating approved for potable water contact and this type of intended service. Abrasive blast with material and in manner as recommended by coating manufacturer to produce surface profile depth and angular shape needed. Surface preparation shall be a minimum of SSPC SP-5 (White) for immersion service and SSPC SP10 (Near White) or better for external service. Fusion bonded epoxy coating shall be one or two-coat system with a minimum thickness of 8 to 10 mils dry film thickness

(MDFT). Minimum adhesion to prepared steel shall be 3,000 psi per ASTM D1002 or per coating manufacturer's printed literature, whichever is higher.

Fusion-Bonded Epoxy	3M Scotch Coat	Herberts O'Brien Nap Gard DuPont Powder Coatings	Valspar (formally Lilly Industries)
Fusion Bonded Epoxy AWWA C213, AWWA C116, and AWWA C550 (Coating in contact with potable water surfaces shall be approved for potable water contact and conforming to NSF Standard 61)	Scotchkote 206N (NSF 61 Internal and External) or Scotchkote 6233 for pipe	Nap-Gard Mark X 7 -2500 Pipe Coating (External Only)	Pipeclad 3100 Red (NSF 61 Internal and External) or Pipeclad 2000 Green (External Only)

J. Conduct dry film thickness measurements and 100-percent holiday inspection of all epoxy factory coated items prior to shipment. Repair all defects with approved repair material according to coating manufacturer's directions prior to shipment.

K. Provide repair kits for epoxy-coated materials.

L. Provide stainless steel materials or coat all other miscellaneous buried metallic items, (tie rods, thrust restraints, tapping saddles, harnesses, etc.). Coat tie rods and rebar when directly exposed to soil. Provide with factory applied epoxy coating, fusion bonded epoxy coating, heat shrink sleeves, or with coating recommended by coating manufacture for buried application and approved by ENGINEER for intended exposure.

2.16 BOLTS, NUTS, WASHERS:

A. All bolts, nuts, and washers installed below-grade (either buried, submerged, immersed in water, or in vaults) shall be Stainless Steel Series 300. All nuts shall be fully seated. Nuts shall be compatible with the bolts and have a proof stress equal or greater than the tensile strength of the bolts. Bolt size, lengths, and tensile strength shall be as designed for the application.

B. Stainless steel bolts shall be Type 304SS. Nuts shall be semi-finished heavy hex head ASTM A 194 (Type 303SS). Stainless steel washers shall be Type 304. Stainless steel nuts shall comply with ASTM F594. Stainless steel bolts and nuts shall be provided with an anti-galling lubricating compound. Provide with certification that stainless steel bolts, nuts, and washer materials provided were as specified with name of stainless steel manufacturer and Series 300 grade provided.

C. Fusion bonded coated steel bolts, nuts, and washers shall only be used if specially allowed in the Plans or Special Provisions. They shall be coated with 10 to 12 mils minimum epoxy coating per AWWA C213. Surface preparation shall be SSPC SP-10 (near white). The bolts shall be undersized or the nuts oversized as required to minimize damage to coatings, however, size shall still satisfy design and manufacturer's requirements for bolt strength and size in the particular application. Provide with applicator name, coating manufacturer and product number, and certification that coating was applied as specified.

D. All bolts and nuts shall be installed according to manufacturer's requirements including the use of anti-galling lubricant compound for stainless steel materials. If galling or seizing of the nut and bolt occurs they shall be cut off and replaced with a new nut and bolt. Exercise care to assure tightening of the nut is against the flange or gland and not due to galling or seizing.

E. Galvanized or black steel materials (piping, nipples, unions, fittings etc.) shall not be used in wet, immersed, or buried locations or vaults unless coated as specified.

2.17 PIPE AND FITTING FIELD COATING REPAIR MATERIALS:

A. Field Coating Repair Materials:

1. Heat Shrink Sleeve and Sleeve Repair Materials: Heat shrink sleeve repair materials shall consist of either heat shrink sleeve in tube form or heat shrink patch kit depending on size and shape of repair. Acceptable heat shrink products are Tapecoat TC LS/75 sleeve or Tapecoat TC SL/75 precut repair kit available from The TAPECOAT Company, Evanston, IL.; Raychem WaterWrap sleeve or PERP Repair Patch Kit available from Tyco Adhesive (Polyken Kendall) Mansfield, MA.; CANUSA Aqua-Shield Aqua-Sleeve or CANUSA CRPK Repair Patch Kit available from CANUSA, Inc., The Woodlands, TX.; or approved equal.
2. Tape: Cold-applied field repair polyethylene repair type coatings shall consist of suitable primer and minimum 35-mil thick patch/repair/joint tape with aggressive adhesive and release liner, 4 or 6-inches width. Suitable primer shall be provided with the repair coatings as recommended by the repair-coating manufacturer. Acceptable products are Tapecoat H35 Gray available from The TAPECOAT Company, Evanston, IL.; Polyken 1027 primer and Polyken 934-35 tape available from Tyco Adhesive (Polyken Kendall) Mansfield, MA.; Tek-Rap 200-23 Series primer and Tek-Rap 280 tape available from Tek-Rap, Inc., Houston, TX.; or approved equal.
3. Epoxy Coatings: Provide acceptable epoxy coatings that can cure under wet or dry conditions are "A-788 Splash Zone Compound" by Koppers, Pittsburgh, PA; "Aquata Poxy" by Raven (King Adhesive Corporation), St. Louis, MO; "Concresive No. 1438 or No. 1170" by Adhesive Engineering Company, San Carlos, CA; or approved equal.
4. Four layer petrolatum wax-tape system (AWWA C-217) intended for burial conditions. Acceptable petrolatum coating systems are STAC Coating System as manufactured by Central Plastics Company, Shawnee, OK.; Denso Pipe and Fittings Petrolatum System as manufactured by Denso Products, Houston, TX.; No. 1 Wax-tape Coating Systems for buried locations and No. 2 Wax-tape Coating Systems for above grade and vault applications as manufactured by The Trenton Corporation, Ann Arbor, MI; or approved equal.

PART 3 – EXECUTION

3.01 GENERAL:

- A. All materials and equipment associated with pipe connecting wires, joint bonding, reference electrodes, galvanic anodes, insulating joints, and casing insulators as shown and specified herein shall be furnished and installed by the CONTRACTOR.
- B. Coordinate installation of the specified work as necessary such that installation of the items herein specified can be completed concurrently with pipeline installation. Items not installed before backfilling of the pipe shall be installed at the CONTRACTOR's sole expense.
- C. The CONTRACTOR shall examine all Plans and coordinate his work so as to avoid conflicts, errors, delays, and unnecessary interference with construction of the facilities and to avoid duplication of the work such as excavation, backfilling, etc.
- D. All work shall present a neat and finished appearance. Any changes in the design or method of installation of an item as specified shall be reviewed and approved by ENGINEER prior to installation.
- E. In the event of any conflicts in the Plans or Specifications, the ENGINEER shall be consulted. If departures from the Plans are deemed necessary by the CONTRACTOR, details of such departures and the reasons therefore shall be submitted to the ENGINEER in writing for review as soon as practical, but not later than 30 days before installation.
- F. Weather Conditions: Installation of the corrosion protection system components, such as splices, bonds, and wire installation shall not be allowed when ambient temperature is below or approaching 0° F. (-18° C.) to minimize wire insulation damage.

3.02 MATERIAL STORAGE AND HANDLING:

- A. Store materials in secure, protected location. Store thermite weld materials, prepackaged galvanic anodes, and reference electrodes off the ground and keep them dry at all times. Protect against weather, condensation, and mechanical damage. Handle with care to prevent damage. Wire shall not be sharply bent or tightly coiled to minimize possibility of damage to the wire insulation during manufacture, shipment, or installation. Equipment or materials damaged in shipment or in the course of installation shall be replaced. Immediately remove from site all mechanically damaged materials. Prepackaged anodes or reference electrodes shall be handled with care to prevent loss of backfill material. Do not lift or hold anodes and reference electrodes by the lead wire.

3.03 PIPE JOINT AND FITTING BONDING:

- A. If joint bonding to form an electrically continuous section of pipeline and associated appurtenances is required, all joints including all bolted and restrained joints shall be joint bonded, except those joints specified to be threaded, welded, or insulated. Do NOT joint bond across insulating joints.
- B. Wire connections to pipes or fittings shall be as specified under WIRE CONNECTIONS.
- C. Install one insulated joint bond wire or bond strap per joint on all pipe or fittings 10 inches in diameter or smaller. Install a minimum of two insulated joint bond wires or bond straps per joint on all pipe or fittings 12 inches in diameter or larger for redundancy. Bond wire size may be No. 4 AWG on pipe sizes equal to or smaller than 15-inch diameter. Insulated joint bond wires or coated or bare copper straps may be utilized depending on joint coating type. Place bond wires on top quadrant of pipe. Minimum number of bond wires or straps per pipe size are as follows:

Pipe Size (Diameter Inches)	Minimum No. of Joint Bond Wires Required	Minimum Joint Bond Wire Size Required	Minimum No. of Joint Bond Straps Required
10-Inches or Smaller	1 Bond Wires	No. 4 AWG	1 Strap Bond
12-Inches to 15-Inches	2 Bond Wires	No. 4 AWG	2 Strap Bonds
16 to 36 Inches	2 Bond Wires	No. 2 AWG	2 Strap Bonds
40 to 54 Inches	3 Bond Wires	No. 2 AWG	2 Strap Bonds

- D. Bond metallic gland connection pieces on fittings for plastic pipe into cathodic protected metallic fittings with single No. 12 AWG stranded insulated copper wire.
- E. Joint bonding of cast iron soil pipe not required unless specifically shown in the Plans. Joint bonds for cast iron soil pipe and fittings and high silicon cast iron pipe and fittings shall be in accordance with the manufacturer's recommendations.
- F. Bronze wedges, bolted or compression sleeved wires or copper straps, or welded "Z" bars are NOT acceptable methods of achieving electrical continuity.

3.04 WIRE CONNECTIONS:

- A. The electrical connection of copper wire or copper strap to metallic (steel, cast iron, and ductile iron) surfaces shall be by the thermite weld method. Assure that pipe or fitting wall thickness is of sufficient thickness that the thermite weld process will not damage the pipe or fitting wall's integrity or damage the lining in any way.
- B. The CONTRACTOR is responsible for repair of any damage to pipe, fitting, lining, or coating as a result of the thermite weld process.

- C. Make thermite weld connections at locations as directed by pipe manufacturer so as to not damage pipe gasket or internal linings exposed to liquid.
- D. The electrical quality and resistance of the connection is dependent on proper adhesion of the welded connection to the pipe or fitting surface. Observe proper thermite weld material selection, safety precautions, surface preparation, and welding procedures as recommended by the material manufacturer.
- E. Connections to gas and petroleum piping systems shall be according to ANSI/ASME B31.8 and ANSI/ASME B31.4 codes. Maximum charge size shall be 15 grams.
- F. Before the connection is made, clean the surface to bare metal by making a 2-inch by 2-inch window in the coating, and then filing or grinding the surface with a grinding wheel to produce a bright (white) metal finish.
- G. All power grinding shall be with a vitrified type-grinding wheel. The use of resin, rubber, or shellac-impregnated type grinding wheels is not recommended by the thermite weld manufacturer and will not be acceptable.
- H. CONTRACTOR shall take appropriate actions for existing coatings with asbestos to minimize worker exposure and to contain, handle, and dispose of asbestos per regulations.
- I. After the surface is cleaned to a smooth, white metal finish, lightly tap the pipe surface so as to produce dimples to improve surface profile and adhesion for the weld material. In cold weather or on cold or wet surfaces, preheating of the metal surface may be required to improve successful connections. Exothermic welding should be completed immediately following preparation of the metal surface before surface flash rusting or oxidation can occur.
- J. Where specified wire sleeves shall be firmly attached to the end of the wire before thermite welding to the metal surface. Wire and sleeve shall be clean and dry. Wire shall extend 1/4-inch out of field formed sleeves. Factory formed sleeves shall be provided with end of sleeve angled so that wire is exposed to thermite weld material.
- K. The mold and base metal should always be clean and dry. Replace worn molds at intervals as recommended by manufacturer.
- L. Place a metal disk in the bottom of the graphite mold and then pour in the weld material. Be sure to squeeze the plastic cylinder to get all of the starting powder out. Close the mold body lid. Place the graphite mold on the prepared pipe surface and install the wire in the slot at the bottom of the mold. Hold the wire and mold steady and firm on the pipeline.
- M. Ignite the weld material with the spark gun. Lightly tap the mold body during the ignition fusion process. Carefully remove the graphite mold after the fusion process is completed.
- N. Care should be taken during the thermite welding process, as the exothermic process is extremely hot (4,000 degrees F). Do not breathe the fumes.

- O. The graphite mold should not be touched or allowed to come in contact with the pipe coating or other flammable or meltable materials, as it is extremely hot. Carefully clean the slag out of the graphite mold body.
- P. Pipe coating shall be protected during thermite welding procedure. Coating damaged by welding or weld splatter shall be repaired per this specification. Welded area shall be allowed to cool to "warm to touch" condition prior to application of primer and field coating.
- Q. After the weld connection has cooled, remove slag, visually and physically test quality of connection by tapping with a hammer and lightly pulling on the wire. The completed weld should visually present a good appearance of a well-formed connection with a minimum loss of weld material or splatter. All portions of the wire and sleeve shall be covered with the weld material. Remove and replace all visually defective welds.
- R. Attach copper wire to copper service lines with grounding clamp.

3.05 WIRE CONNECTION COATING:

- A. Clean weld area, prime, and install a prefabricated thermite weld cap per manufacturer's directions over each completed connection after testing unless to be coated by heat shrink joint coating. In cold weather, store primer and cadweld cap materials in a heated location and keep warm until installation.
- B. The pipe and factory-coating surface shall be clean and dry before application of primer. Primer shall be thoroughly mixed and applied to pipe surface in an even manner to obtain a minimum dry film thickness of 1 mil. Primed area shall provide uniform coverage around cadweld area and extend a minimum of 3 inches onto coated surface. Skips or misses and runs and sags shall be reprimed or repaired to provide even uniform coverage.
- C. Primed surface shall be kept free of all contamination. Allow primer to dry for one to five minutes depending on application and weather conditions. Primer shall be dry-to-touch condition and have a non-glossy appearance, before application of prefabricated cadweld cap.
- D. Prefabricated cadweld cap shall be applied at connection according to manufacturer's directions. The filler material shall be placed over the thermite weld connection and worked around and under the wire and connection. Apply pressure to the prefabricated cadweld cap to assure good adhesion.
- E. Completed cadweld cap assembly shall adhere tightly to pipe and wire connection with no voids or gaps. Inadequate adhesion is demonstrated if there are visible gaps or voids under the cap or if the cap can be easily removed from the pipe surface by pulling with fingertip pressure. At all locations where inadequate adhesion is evident, reprime and replace cap or prime and apply either a minimum 6-inch by 6-inch square of field repair tape, a 55-mil thick Tapecoat Gray "Pads", or heat shrink repair material over existing cadweld cap. Apply per tape coating or heat shrink manufacturer's directions.

F. Wire connections at pipe joints or fittings to be coated with heat shrink sleeve do not require cadweld cap assembly. Wire connections shall be completely encapsulated under heat shrink sleeve.

G. All exposed metallic surfaces not covered by the thermite weld cap or heat shrink sleeve shall be repaired per PIPE AND FITTING COATING REPAIR.

3.06 PREPACKAGED GALVANIC ANODE INSTALLATION:

A. General:

1. Remove plastic or paper shipping wrap from prepackaged anode prior to placement. Galvanic anodes packaged in cardboard type chip-tube shall be thoroughly perforated just prior to installation.
2. Install galvanic anodes a minimum of 1-foot below the pipe invert and 3 to 5-feet from buried metallic piping or 3-feet from metallic fittings to be protected. Space galvanic anodes equally around the fitting, pipe section, or appurtenance. Locate at bottom edge of pipe trench as shown in the Plans or as specified. Alternate anode placement on opposite sides of the pipe. If two or more anodes installed at the same location, place on opposite side of the pipe or fitting. Provide a minimum anode spacing of 5-feet from other unprotected pipelines.
3. Handle prepackaged anode with care. Damage to the anode, anode to wire connection, or prepackaged backfill bag will require replacement of the entire assembly.
4. Place anode in native earth backfill do not use pipe zone bedding material.
5. Earth backfill around each anode shall be thoroughly compacted to a point 1-foot above the anode. Backfill material around each anode shall be native soil free of roots, organic matter, trash, and rocks. Stop backfill at specified grade to allow for placing of topsoil, pavement, or concrete, when required.
6. All anode wires shall be buried a minimum of 36-inches below finish grade. Wires shall be handled with care. Splices or damage to the insulation on any wire shall be repaired in accordance with WIRE INSULATION REPAIR and be approved by ENGINEER.
7. Electrical connection of the anode wire to steel, cast or ductile iron metallic pipe or fittings shall either be directly to the pipe or fitting by the thermite weld method or through a test station with shunt as shown on the Drawings.
8. Electrical connection to copper services shall either be directly to the copper service by a ground clamp.

B. Installation:

1. Each buried or submerged metallic (steel, ductile, or cast iron) pipeline section, appurtenance, valve, or fitting and copper service shall receive a minimum of one galvanic anode.
2. Type of Prepackaged Anodes is project specific. For this project utilize:

Prepackaged zinc or magnesium galvanic anodes (depending on the soil corrosion zone: Zinc for zone 1 and Magnesium for zone 2) for protection of buried metallic pipe, valves and fittings.
3. Where two or more metallic fittings are adjacent to each other, install joint bonds as specified in PIPE CONNECTING WIRES, and install the specified quantity of galvanic anodes for each metallic pipe section, appurtenance, valve, or fitting used in conjunction with nonmetallic pipe.
4. At the CONTRACTOR's option, larger anodes may be used in place of multiple smaller anodes for a group of bonded metallic components on non-metallic piping provided the same total bare weight of galvanic anode is used.
5. For ductile iron and cast iron fittings, where specified coating thickness is not provided or specified holiday testing and/or 100% holiday free coatings are not completed by the fitting manufacturer, or bare fitting is coated with petrolatum tape type coating system; then install one size larger anode or double the number of anodes for each fitting than listed on the following table. When a 17 or 18 pound anode is required per the following table and coating thickness is not as specified, then at CONTRACTOR's option, install either a 30-pound anode or two 17 or 18 pound anodes. Existing fittings that are exposed and coated with a four layer petrolatum tape type coating system, shall receive double the number of anodes specified or the next largest anode size shown in these specifications. For example, a bare fitting (16-inch or less) is exposed and petrolatum tape coated, it shall receive a 17 or 18 pound size anode.
4. The minimum number of anodes to be installed on buried or submerged factory coated metallic fittings, pipeline sections, or appurtenances with non-metallic pipelines shall be:

PREPACKAGED ANODE SPACING FOR FITTINGS FOR DIFFERENT NON-METALLIC PIPE SIZES				
	16" or less	18" to 30"	32" to 46"	48" or larger
ITEM	NUMBER OF AND BARE ANODE SIZE (Reference Type of Anode Required For Project Per Specification)			
Single Coated Metallic Fitting	1 - 17 pd Magnesium or Zinc anode	1 - 17 pd Magnesium or 18 pd Zinc anode	2 - 17 pd Magnesium or 2 - 18 pd Zinc anodes	3- 17 pd Magnesium or 3 - 18 pd Zinc anodes
Multiple (2 to 3) Coated Metallic Fittings	1 - 17 pd Magnesium or 18 pd Zinc anode	2 - 17 pd Magnesium or 2 - 18 pd Zinc anodes	3 - 17 pd Magnesium or 3 - 18 pd Zinc anodes	4 - 17 pd Magnesium or 4 - 18 pd Zinc anodes
Coated Fire or Flushing Hydrant with 6-inch coated metallic pipe leg or plastic pipe leg and plastic pipe main. (less than 20 foot leg)	2 - 17 pd Magnesium or 2 - 18 pd Zinc anodes	2 - 17 pd Magnesium or 2 - 18 pd Zinc anodes	2 - 17 pd Magnesium or 2 - 18 pd Zinc anodes	2 - 17 pd Magnesium or 2 - 18 pd Zinc anodes
1-inch Coated Copper Service Line (less than 20 foot service to insulator)	1 - 17 pd Magnesium or Zinc anode	1 - 17 pd Magnesium or Zinc anode	1 - 17 pd Magnesium or Zinc anode	1 - 17 pd Magnesium or Zinc anode
1-inch Bare Copper Service Line (less than 20 feet)	1 - 17 pd Magnesium or 18 pd Zinc anode	1 - 17 pd Magnesium or 18 pd Zinc anode	1 - 17 pd Magnesium or 18 pd Zinc anode	1 - 17 pd Magnesium or 18 pd Zinc anode
Existing Metallic Pipe Tie-In, Leak Location, or Concrete Encased Stub Piece.	1 - 17 pd Magnesium or 18 pd Zinc anode	1 - 17 pd Magnesium or 18 pd Zinc anode	1 - 17 pd Magnesium or 18 pd Zinc anode	1 - 17 pd Magnesium or 18 pd Zinc anode

3.07 CONCRETE:

A. Concrete for flush mounted tracer wire stations or pipe concrete encasement shall conform to the requirements for concrete in Division 3 CONCRETE.

3.08 REFERENCE ELECTRODE INSTALLATION – TIGHT BONDED COATED PIPE

A. Prepackaged Reference Electrodes:

1. Remove reference electrode and cloth bag from the shipping bag and place 6 inches from the pipe below the centerline of the pipe in a horizontal position. Do not hold or lower the reference electrode by the wire lead. Prepackaged reference electrode shall be backfilled with clean native soil.

3.09 WIRE INSULATION REPAIR:

A. Wire splices shall be made with suitably sized Type C compression connectors as specified, or mechanically secured and soldered with rosin cored 50/50 solder. Inline type butt connectors are not allowed.

- B. Minor insulation damage to small cathodic protection wires (equal to or smaller than No. 8 AWG) shall be repaired by spirally wrapping (minimum of 50 percent overlap) with two layers of high voltage rubber splicing tape and two layers of vinyl electrical tape.
- C. Insulation damage or splices to large cathodic protection cables (No. 4 AWG or larger) shall be made with epoxy insulated splice kits (3M Scotchcast 90-B1 or 82-A1 or approved equal). Allow epoxy splice kits to cool and set before moving.
- D. All wire splices and wire insulation repair locations shall be approved by ENGINEER.

3.10 WARNING TAPE:

- A. Bury warning tape above all underground cathodic protection cable, conduit, and/or all pipelines. Warning tape shall be placed approximately 18 - 24 inches below the ground surface or at specified depths as required in other Sections of this Specification or as shown in the Standard Details. Align parallel to and within 2 inches of the centerline of pipe run.

3.11 PIPE TRACING WIRE:

- A. Insulated tracer wire shall be installed on all non-metallic pipe sections.
- B. Pipe tracing wire shall be taped to top of plastic or non-metallic pipeline at a maximum distance of every 10 feet with polyethylene tape.
- C. Do not attach tracing wire directly to metallic fittings or appurtenances.
- D. Install approved tracer wire access boxes at all fire hydrant assemblies.
- E. Maximum tracer wire span distance shall be 500 feet. If no existing pipe appurtenances are available for a distance up to 1,000 feet, then install either a post or flush type tracer wire access boxes. Equally divide span distance and install tracer wire access box at mid-point in a protected location. Selection of type and location of tracer wire terminal box will depend on field conditions and shall be in accordance with ENGINEER's directions.
- F. Field terminate tracer wires in accordance with the Drawings by:
 - 1. Bring end of tracing wire leg to near ground surface elevation by installing a tracer wire flush or above grade access box or test station.
 - 2. Terminate tracing wire above grade at flush or above grade test access boxes or test stations located next to pipe appurtenances (vaults, vent pipes, blow-offs, or at fire hydrant bases).
 - 3. Make tee or inline splices and insulate as specified under section "Wire Insulation Repair".
 - 4. Tracing wire shall be terminated inside tracer wire boxes where available on a separate terminal from anode or pipe/fitting leads.

5. At bases of above grade structures terminate in a flush or above grade access boxes.
6. Above grade terminations next to above grade appurtenances shall consist of a minimum 3/4-inch diameter, 3-foot long rigid galvanized steel conduit terminated approximately 6-inch above grade in an above grade access box.
7. Terminate in vaults next to ladder to allow easy access for attachment, or drill vault and terminate outside vault next to the vent pipe (if present).

G. Test tracer wire for continuity prior to final acceptance of the pipeline installation.

3.12 INSULATED JOINTS:

- A. Install copper insulating joints where copper services are connected to metallic water mains and at service meters or curb stops where ownership of copper service changes.
- B. Carefully align and install insulating joints according to the manufacturer's recommendations to avoid damaging insulating materials.

3.13 COATING FOR PIPING, FITTINGS AND ACCESSORIES:

- A. Install coated valves, fittings, and miscellaneous metallic pieces so as to not damage coating or lining. Conduct dry film measurements and holiday test to confirm conformance with specifications and referenced standards.
- B. Provide corrosion protection for ferrous metal piping appurtenances such as tie-rods, thrust restraints, tapping saddles and bands, harnesses, and similar items: Stainless steel, fusion bonded epoxy coated, or heat shrink tube wrapped.
- C. Coat restraining harnesses, rebar or tie-rods where utilized as tie-downs or thrust restraints and exposed to soil or liquid with field applied four layer petrolatum tape system.
- D. Flange bolts, Nuts, and Similar Items: Series 300 stainless steel or fusion bonded epoxy coated.
- E. Conduct testing of Series 300 stainless steel materials with magnet to confirm stainless steel provided prior to installation.
- F. If approved by ENGINEER, coat miscellaneous hard to coat items with four layer petrolatum tape system or heat shrink repair coating.

3.14 PIPE AND FITTING COATING REPAIR:

- A. Inspect and repair any coating or lining damage with original manufacturer's approved repair kit. Follow coating manufacturer's written directions for surface

preparation and repair coating application. Utilize potable water approved materials for coatings and linings in contact with potable water.

- B. Field coating for field repair of damaged coating on new or existing pipe, piping, appurtenances, and fittings shall be in accordance with this specification.
- C. External pipe and fitting repair coatings shall consist of external coating materials and repair procedures as recommended by the pipe or fitting coating manufacturer.
 - 1. Fusion-bonded epoxy coated items shall be repaired with liquid epoxy repair kits provided by the fusion-bonded coating manufacturer.
 - 2. Epoxy coated items shall be repaired with repair coating from the original coating manufacturer.
 - 3. Spot coating damage at thermite weld connections not covered by standard thermite weld cap coating repair procedure shall be repaired with a field applied 6-inch minimum piece of tape coating, 6-inch minimum size of heat shrink repair material, or a 100 percent solids epoxy coating that can cure in either wet or dry conditions.

3.15 FIELD COATING FOR STEEL AND DUCTILE IRON STUB PIECES AND/OR COPPER SERVICE PIPING OR ISOLATED COPPER FITTINGS:

- A. Field tape coat or heat shrink sleeve, short sections of buried metallic piping such as vent pipes, blow-off assemblies, and pipe stubs to be concrete encased under or next to buildings or tanks if not already coated with an approved specified factory applied coating system. Bituminous asphaltic coating does not qualify as an approved factory coating.
- B. Field coat, buried copper service, copper fittings, or galvanized steel service piping where specified or shown in the Plans.
 - 1. Follow this specification, the coating manufacturer's recommendations, and the referenced AWWA Standards.
 - 2. Acceptable products are specified under "PIPE AND FITTING COATING REPAIR MATERIALS".
 - 3. Hand tool clean surfaces. Copper service lines shall not be sandblasted.
Field Tape Coating:
 - a. For hand taping, provide suitable field primer (if required) and 35-mil field applied repair tape with aggressive adhesive and release liner, 4 or 6-inches width.
 - b. Pipe shall be clean and dry prior to and during application of both primer and tape coating. Tape shall be applied in a spiral wrap with a 50 percent overlap in accordance with AWWA Standard C209 Cold-Applied Tape Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines.

5. Heat Shrink Field Coating:
 - a. For heat shrink sleeve installation, provide suitable filler material and heat shrink sleeve material for pipe size required.
 - b. Pipe shall be clean and dry prior to and during installation of heat shrink sleeve. Install sleeve in accordance with AWWA C216, Heat-Shrinkable Cross-Linked Polyolefin Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines.
6. Petrolatum Tape Coating System
 - a. Field apply petrolatum tape system for all restraining fittings and rods if not already coated with an approved specified factory applied coating system.
 - b. Provide petrolatum system coating for isolated copper fittings if not already protected by a galvanic anode system.
 - c. For petrolatum system tape installation (AWWA C217), provide suitable primer, filler material (mastic), petrolatum tape and outer wrap material for burial application. Pipe or fitting shall be clean and dry prior to and during installation of four layer petrolatum wax tape system. Install petrolatum tape system in accordance with coating manufacturer's instructions and these specifications. Apply primer in an even uniform manner to entire tie rod, pipe, or fitting surface area to be coated to achieve minimum primer thickness of 3-mil wet film thickness. Increase amount of primer at and work primer into threads, cavities, pits, angles, edges, and other irregular areas. Apply primer with brush or glove. Apply mastic or tape immediately after application of primer, drying of primer is not required. Work and mold mastic into irregular shapes so as to fill voids and achieve a uniform contour to provide a smooth even support for the tape coating system to avoid bridging. Apply petrolatum tape layer in a spiral wrap fashion around the tie rod or fitting circumference with a 50 percent minimum overlap onto the proceeding layer. Apply the 10-mil PVC outer wrap tape layer in a spiral fashion around the pipe or fitting with a 50 percent minimum overlap. The completed petrolatum coating system shall be a minimum of 40 MDFT and adhere tightly to the coated structure and present a smooth unwrinkled appearance.

3.16 FUNCTIONAL AND PERFORMANCE TESTING:

A. Electrical Insulating Joints:

1. Test each insulated joint after assembly for electrical isolation in accordance with the insulation checker manufacturer's written instructions.

2. Buried electrical insulating joints shall be tested both before and after burial.
3. All defective insulating joints and/or damaged or defective insulation parts shall be corrected or replaced by the CONTRACTOR at his sole expense.

B. Galvanic Anode Energizing and Testing:

1. Do not connect anode and pipe leads together until ENGINEER is present. Provide the ENGINEER with 14 days' advance notice before beginning tests or repairs.
2. The ENGINEER shall make sufficient tests throughout the network of protected pipe to determine proper installation of the galvanic anode cathodic protection system. Any construction defects identified during energizing and testing shall be located and corrected by the CONTRACTOR at his sole expense.

3.17 FINAL TESTING:

- A. After construction is complete, the ENGINEER shall test the pipeline to ensure proper installation of the joint bonds, galvanic anodes, test stations, and insulated joints. At CONTRACTOR's option, he may be present during this testing if desired. Any construction defects identified during the final testing shall be located and corrected by the CONTRACTOR at his sole expense. Provide the ENGINEER with a minimum of 14 days' advance notice before beginning final testing repairs.

END OF SECTION 13900

FORMS

**REQUEST TO REVISE THE
CITY OF SHERIDAN STANDARD SPECIFICATIONS
FOR STREET AND UTILITY CONSTRUCTION**

Please submit this form or a document with the following information to request a change to the "City of Sheridan Standard Specifications for Street and Utility Construction". The City of Sheridan will consider each request in its annual specification review process. Please be as specific as possible for each request. Proposed wording and supporting documentation for the proposed specification change will increase the chances for approval.

Requester's Name:

Address:

Telephone Number:

E-mail Address:

Specification Section Proposed for Change: _____
(Please submit individual forms for each specification section proposed to be changed)

General description of proposed change:

Specific Wording for Proposed Specification Section Change:

Supporting documentation for proposed change such as AWWA Standard, WYDOT Standard, etc...

Does this proposed change impact or require changes to other specifications sections or details:
 Yes No

If Yes, which sections are impacted?

Submit Request to:
City of Sheridan
Attn: City Engineer
Proposed Specification Revision
55 Grinnell Plaza
Sheridan, WY 82801

NOTICE OF AWARD

Dated _____, 20 _____

TO: _____
(BIDDER)

ADDRESS: _____

PROJECT: _____

You are notified that your Bid dated _____, 20____ for the above Contract has been considered. You are the apparent successful bidder and have been awarded a contract for

(Indicate total Work, alternates or sections of Work awarded)

The Amount of your Contract is _____ Dollars (\$_____).

Three copies of each of the proposed Contract Documents accompany this Notice of Award. Also included are three copies of the Contract Agreement.

You must comply with the following within ten days of the date of this Notice of Award:

1. Deliver to the ENGINEER three fully executed counterparts of the Agreement.
2. Deliver the required Insurance Certificates and Performance and Payment Bonds as specified in the Contract Documents.
3. (List other conditions) _____

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

Within ten days after you comply with those conditions, OWNER will return to you one fully signed counterpart of the Agreement with the Contract Documents attached.

Please acknowledge your receipt of this notice in the space provided below and return a copy along with any and all future project correspondence to _____

(Engineer name and address)

Receipt Acknowledged:

By: CITY OF SHERIDAN _____

(Owner's Authorized Representative)

By: _____
Representative

Title

Title

Date

PROJECT NAME

NOTICE TO PROCEED

TO: _____
(CONTRACTOR)

DATED: _____, 20__

ADDRESS: _____

PROJECT NAME: _____

OWNER'S CONTRACT NO.: _____

You are notified that the Contract Time under the above contract will commence to run on _____, 20__. By that date, you are to start performing your obligations under the Contract Documents. In accordance with Article 3 of the Agreement, the dates of Substantial Completion and completion and readiness for final payment are _____, 20__ and _____, 20__.

Before you may start any Work at the site, you must (add requirements):

(City of Sheridan)

By: _____
(Authorized Signature)

(Title)

PROJECT NAME
CONTRACTOR

RETAINAGE FORMS FOR ESCROW ACCOUNT

PROJECT _____

CONTRACTOR _____

DATE OF CONTRACT _____

CERTIFICATION

I, _____, a duly authorized representative of _____ (Depository) of _____, do hereby certify that Account # _____ has been set up by _____ (CONTRACTOR). I further certify this account meets all of the following criteria:

- 1.) All costs of establishing this account and maintaining this account will be paid by the CONTRACTOR;
- 2.) All interest and income paid on this account will be paid to the CONTRACTOR in accordance with W.S. 16-6-705;
- 3.) For tax purposes, interest accrued on this account will be reported in the name and tax number of the CONTRACTOR;
- 4.) No funds paid into this account shall be released to the CONTRACTOR, until a fully executed Retainage Release form has been received from the OWNER. A sample copy of this form and authorized signatures are on file with the Depository;
- 5.) Upon notification by OWNER that all or a portion of the funds in this account are due and owing to the OWNER as a result of the acts or omissions of the CONTRACTOR, such amount shall be paid to OWNER;
- 6.) This account has been assigned by the CONTRACTOR to the OWNER;
- 7.) All responsibility and liability for the safety of these funds lie with the CONTRACTOR and this Depository;
- 8.) This Depository shall provide an agent for the account, at no cost to the OWNER, as provided in the Interest Bearing Deposit Agreement with the OWNER; and
- 9.) Attached to this Certification is written notice of this account by CONTRACTOR to the CONTRACTOR's surety.

Signed: _____

Title: _____

Notary

My Commission Expires: _____

PROJECT NAME
CONTRACTOR

ASSIGNMENT

WHEREAS, _____, hereinafter referred to as ASSIGNOR, has been awarded a contract to construct the _____ for the City of Sheridan, hereinafter referred to as ASSIGNEE, through funds provided by the City of Sheridan and _____, hereinafter referred to as _____, and pursuant to the provisions of W.S. 16-6-702, ASSIGNOR is required to assign to ASSIGNEE a retainage account which is in the name of ASSIGNOR.

ASSIGNOR does hereby assign and transfer to ASSIGNEE its right, title and interest in and to Account # _____ established at _____. This agreement shall be conditioned upon the ASSIGNEE agreeing to release the funds in this account and return them to ASSIGNOR upon the satisfactory completion of the aforementioned construction contract and upon the final acceptance by ASSIGNEE and the _____ of the contract work. ASSIGNEE may, prior to final acceptance, and with the express written approval of the _____, authorize a release of a part of the funds held within the account, assigned to ASSIGNEE, in the manner provided by W.S. 16-6-702. The release of any funds from the account shall be made only upon the joint signatures of the authorized representatives of both the ASSIGNEE and the _____, by written request from ASSIGNOR, and with written approval from any surety furnishing bonds for the contract work. The conditions of the attached Certification and the attached Interest Bearing Deposit Agreement are binding hereto and a part hereof.

DATED this _____ day of _____, 20_____.

ASSIGNOR:

ASSIGNEE: City of Sheridan

By: _____

By: _____

ATTEST

ATTEST

By: _____

By: _____

RETAINAGE RELEASE

The undersigned representative of the OWNER does hereby authorize _____
_____ (Depository) to release _____
_____ (Dollars) \$ _____ and all accrued interest in funds from
Account # _____, held in the name of _____
_____ (CONTRACTOR) on or after _____, 20___. The
written approval from any surety furnishing bonds for the contractor work is attached hereto.

OWNER: _____ CITY OF SHERIDAN _____

By: _____

Date

ENGINEER'S FIELD ORDER

City of Sheridan

Owner
 Contractor

Field
 File

PROJECT: _____

FIELD ORDER NO.: _____

OWNER: City of Sheridan

DATE: _____

TO: _____

ENGINEER: _____

ENGINEER'S PROJECT NO. _____

CONTRACT DATE: _____

In accordance with the General Condition Article 10, the Engineer hereby authorizes the minor variations in the Work described below which do not involve a change on Contract Time or Contract Price and are consistent with the overall intent of the Contract Documents. This Field Order is binding on the Owner and also on the Contractor, who shall perform the Work involved promptly. If Contractor believes this Field Order justifies an increase in Contract Price or an extension in Contract Time, Contractor may make a claim as provided in General Condition Articles 11 and 12.

DESCRIPTION:

ATTACHMENTS: Yes _____ No _____

ENGINEER:

BY: _____

ENGINEER'S FIELD ORDER – FORCE ACCOUNT

City of Sheridan

Owner
 Contractor

Field
 File

PROJECT: _____

FIELD ORDER NO.: _____

OWNER: City of Sheridan

DATE: _____

TO: _____

ENGINEER: _____

ENGINEER'S PROJECT NO. _____

CONTRACT DATE: _____

In accordance with the General Conditions, the Engineer hereby authorizes the variation in the Work or additional Work described below which does not involve a change on Contract Time or Contract Price, and is consistent with the overall intent of the Contract Documents. Payment for any additional work will be under the "Force Account" or "Miscellaneous Additional Work" bid item (if included in the Bid Schedule for this particular project), therefore this Field Order does not increase the Contract amount. This Field Order is binding on the Owner and also on the Contractor, who shall perform the Work involved promptly.

The Engineer will determine whether Bid Unit Prices, Time and Materials, or agreed-to Lump Sum applies to the calculation of any additional work paid under this Field Order. The Engineer will calculate time involved if Time and Materials is used, and only time actually spent on completing the additional work will apply. The Engineer will present the Contractor a tabulation of hours for labor and equipment for the Force Account work at the end of each day, unless agreed otherwise with the Contractor.

Unit prices and mark-up for Time and Materials work will be per approved labor and equipment rates that comply with both the General Conditions and Modifications to the General Conditions, and invoice price for materials plus allowed mark-up.

The Force Account bid item will only be used when pre-approved by the Engineer.

DESCRIPTION: _____

ATTACHMENTS: Yes _____ No _____

ENGINEER: _____

BY: _____

WORK CHANGE DIRECTIVE

[] Owner
[] Contractor

[] Field
[] File

PROJECT: _____
OWNER: City of Sheridan
TO: _____

WORK DIRECTIVE NO.: _____
DATE: _____
ENGINEER: _____
ENGINEER'S PROJECT NO.: _____

CONTRACT DATE: _____

DESCRIPTION:

Attachments: (List documents supporting change)

Method of determining change in
Contract Price:

Method of determining change in
Contract Price:

- Unit Prices
- Lump Sum
- Other _____

- Contractor's records
- Engineer's records
- Other _____

Estimated increase (decrease) in Contract Price:

Estimated increase(decrease)in Contract Time:

\$ _____
If the change involves an increase, the estimated amount is not to be exceeded without further authorization.

Substantial Completion: _____ days
Ready for final payment: _____ days
If the change involves an increase, the estimated times are not to be exceeded without further authorization.

RECOMMENDED:

AUTHORIZED:

(ENGINEER)
By: _____
(Authorized Signature)

(City of Sheridan)
By: _____
(Authorized Signature)

ACCEPTED:

(CONTRACTOR)
By: _____
(Authorized Signature)

DATE: _____

SUSPEND WORK NOTICE

To: _____ Date: _____
Project: _____
Project No: _____

Gentlemen:

Under the terms of your Contract, dated _____, 20__ on the referenced project, you are hereby directed to SUSPEND WORK on this project for the following reason(s):

This Notice is effective at the close of business on _____, 20 ____. At which time there remains _____ calendar days in which to complete your Contract. A Resume Work Order will be issued when conditions are such that work can be performed in accordance with the Specifications.

Please acknowledge your receipt of this Notice in the space provided below and return a copy to this office.

Very truly yours,

By: _____
City of Sheridan

By: _____
Engineer

Table with 3 columns: Receipt Acknowledged, Description, Cal. Days. Rows include Stipulated Contract Time, Authorized Extensions, Suspend Work Order Extensions, Total Contract Time Allowed, Suspend Order Time Elapsed, Calendar Days Charged to Date, and Calendar Days Remaining.

RESUME WORK ORDER

To: _____ Date: _____
_____ Project: _____
_____ Project No: _____

Gentlemen:

Under the terms of your Contract, dated _____, 20____ on the referenced project, you are hereby directed to RESUME WORK on this project, effective 7:00 a.m. on _____.

According to our records, ____ calendar days were authorized to complete the Contract. You have used ____ calendar days, leaving _____ calendar days in which to complete your Contract, beginning and including the effective date listed above.

Please acknowledge your receipt of this Order in the space provided below and return a copy to this office.

Very truly yours,

By: _____
City of Sheridan

By: _____
Engineer

Table with 3 columns: Receipt Acknowledged, Cal. Days, and various contract terms like Stipulated Contract Time, Authorized Extensions, etc.

CHANGE ORDER

No. _____

DATE OF ISSUANCE: _____

PROJECT: _____

EFFECTIVE DATE: _____

OWNER's Contract No.: _____

OWNER: City of Sheridan

ENGINEER: _____

CONTRACTOR: _____

DATE OF CONTRACT: _____

TO: _____

You are directed to make the following changes in your Contract for the above project. These changes are made in accordance with the General Conditions of this contract.

Description of changes:

Reason for Change Order:

Attachments: (List documents supporting change)

CHANGE IN CONTRACT PRICE:

CHANGE IN CONTRACT TIME:

Original Contract Price \$ _____

Original Contract Time _____

Substantial Completion: _____

Final Completion: _____

Net Changes from Previous Change Orders

Net change from previous Change Orders

No. _____ to No. _____

No. _____ to No. _____

\$ _____

days

Contract Price prior to this Change Order

Contract Times Prior to this Change Order

\$ _____

Substantial Completion: _____

Final Completion: _____

days or date

PROJECT NAME

Net Increase (decrease) of this Change Order
\$ _____

Contract Price with all approved Change Orders
(including this one):
\$ _____

Net Increase (decrease) of this Change Order
_____ days

Contract Times with all approved Change
Orders (including this one):
Substantial Completion: _____

Final Completion: _____
days or date

CONTRACTOR:

By: _____

Title: _____

Date: _____

ENGINEER:

By: _____

Title: _____

Date: _____

CITY OF SHERIDAN:

By: _____

Title: _____

Date: _____

Change Order Detail

CO #	Time (Days)	Bid Item #	Name	Quantity	Units	Unit Price	Total Price	
Total							\$	-

CO #	Time (Days)	Bid Item #	Name	Quantity	Units	Unit Price	Total Price	
Total							\$	-

Water Line Test Report

Project: _____ Report #: _____

Contractor: _____ Date: _____

Portion of Project Covered: _____

Performed by: _____ Observed by: _____

Pressure Test:

Date: _____ Time Start: _____ Time Stop: _____

Starting Pressure: _____ Ending Pressure: _____

Comments: _____

Disinfection:

Initial Residual: _____ Date: _____ Time: _____

Final Residual: _____ Date: _____ Time: _____

Comments on Flushing: _____

Water Quality:

Chlorine Residual: _____ Date: _____ Time: _____

Bacti Sample Taken by: _____ Date: _____ Time: _____

Laboratory & how sent: _____

Coliform Results: _____ Turbidity: _____

Comments: _____

Follow-up items or any Retesting required: _____

By: _____

Sanitary Sewer Inspection Report

Project: _____ Report # _____

Contractor: _____ Date: _____

Portion of Project Covered: _____

Performed by: _____ Observed by: _____

Exfiltration Test:

Date: _____ Time Start: _____ Time Stop: _____

Method of Testing: _____

Measurement Point: _____

Results: _____

Manhole Test:

Manhole: _____ Date: _____ Accepted?: _____

Manhole: _____ Date: _____ Accepted?: _____

Manhole: _____ Date: _____ Accepted?: _____

Manhole: _____ Date: _____ Accepted?: _____

Manhole: _____ Date: _____ Accepted?: _____

Video:

Date: _____ Results: _____

Retesting Summary: _____

By: _____

Storm Drain Inspection Report

Project: _____ Report # _____

Contractor: _____ Date: _____

Portion of Project Covered: _____

Performed by: _____ Observed by: _____

Comments on Infiltration/Exfiltration/Joint Condition: _____

Comments on Video: _____

Repairs/Retesting/Cleaning: _____

By: _____

Street Surfacing Testing Report

****Note:** This form is not for recording all test results. Those will be kept on forms by the Testing Laboratory. This form is only for summarizing testing on new street surfacing.**

Project: _____ Report # _____

Contractor: _____ Date: _____

Portion of Project Covered: _____

Performed by: _____ Observed by: _____

Testing Laboratory: _____

Subgrade:

Date: _____ Procedure for Scarification/Compaction: _____

Max Density: _____ Optimum Moisture: _____

Test Results: _____

Follow-up (soft areas, rework, etc.) _____

Crown/Grade/Elevation/Smoothness Issues: _____

Base Course:

Date: _____ Depth: _____ # Lifts: _____

Max. Density: _____ Optimum Moisture: _____

Test Results: _____

Follow-up (soft areas, rework, etc.) _____

Asphalt:

Date: _____ Depth: _____ # Lifts: _____

Paving Contractor & Foreman: _____

Weather: _____

General Appearance of Asphalt (gradation, joints, edge @ gutter, etc.) _____

Density Tests: _____

Mix Analysis: _____

Cores: _____

Areas Requiring Rework: _____

Other Comments: _____

Summary of rework required or other comments: _____

By: _____

FINAL WAIVER OF LIEN

To All Whom It May Concern:

WHEREAS, the undersigned has been employed by _____(Contractor) to furnish labor and/or materials for work, under a contract **DATED** _____ for the _____ (Project) in **CITY OF Sheridan, STATE OF Wyoming** of which the City of Sheridan is the Owner.

NOW, THEREFORE, this _____ day of _____, 20____, for and in consideration of the sum of _____ Dollars paid simultaneously herewith (if any payment is due at this time), the receipt whereof is hereby acknowledged by the undersigned, the undersigned does hereby waive and release any lien rights to, or claim of lien with respect to and on said above described premises, and the improvements thereon, and on the monies or other considerations due to become due from the OWNER, on account of labor, services, material, fixtures, apparatus or machinery heretofore or which my hereafter be furnished by the undersigned to or for the above described premises by virtue of said contract.

_____(SEAL)
(Name of Sole Ownership, Corporation Partnership)

Affix Corporate Seal here

_____(SEAL)
(Signature of Authorized Representative)

Printed Name

Title

AFFIDAVIT ON BEHALF OF CONTRACTOR

STATE OF _____

COUNTY _____

CITY _____

DATE _____

I CERTIFY TO THE BEST OF MY KNOWLEDGE AND BELIEF THAT ALL WORK HAS BEEN performed and materials supplied in strict accordance with the terms and conditions of the corresponding Contract Documents between City of Sheridan THE OWNER, AND _____ THE CONTRACTOR, DATED _____ for the _____ Project.

And further declare that all bills, for materials, supplies, utilities and for all other things furnished or caused to be furnished by the above named CONTRACTOR and used in the execution of the above contract have been fully paid, and that there are no unpaid claims or demands of State Agencies, sub-contractors, material men, mechanics, laborers or any other resulting form or arising out of any work done or ordered to be done by said CONTRACTOR under the above identified contract.

In consideration of the prior and final payments made and all payments made for authorized changes, the CONTRACTOR releases and forever discharges the OWNER from any and all obligations and liabilities arising by virtue of said contract and authorized changes between the parties hereto, either verbal or in writing, and any and all claims and demands of every kind and character whatsoever against the OWNER, arising out of or in any way relating to said contract and authorized changes.

This statement is made for the purpose of inducing the OWNER to make FINAL PAYMENT under the terms of the Contract, relying on the truth and statement contained therein.

CONTRACTOR: _____

DATE: _____

ADDRESS

CITY

STATE

ZIP CODE

SIGNATURE AND PRINTED NAME _____

TITLE: _____

SUBSCRIBED AND SWORN TO BEFORE ME THIS _____ DAY OF _____, 20_____.

NOTARY PUBLIC _____

My Commission Expires:

AFFIDAVIT OF RELEASE OF LIENS

To All Whom It May Concern:

WHEREAS, _____, the Contractor, has furnished labor and/or materials for work, under a contract **DATED** _____ for the _____ Project in the **CITY** of Sheridan, STATE OF Wyoming of which City of Sheridan is the Owner.

NOW, THEREFORE, this _____ day of _____, 20____,

The undersigned, as the Contractor for the above-named Contract pursuant to the conditions of the Contract hereby certifies that to the best of his knowledge, information and belief, except as listed below, the Releases or Waivers of Lien attached hereto include the Contractor, all Subcontractors, all suppliers of materials and equipment, and all performers of Work, labors or services, who have or may have liens against any property of the Owner arising in any manner out of the performance of the Contract referenced above.

EXCEPTIONS: (If none, write "None". The Contractor shall furnish bond satisfactory to the Owner for each exception.)

ATTACHMENTS:

- 1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.
- 2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers.

CONTRACTOR (Name of Sole Ownership, Corporation or Partnership) (SEAL)

Affix Corporate Seal here

(Signature of Authorized Representative) (SEAL)

TITLE _____

CONSENT OF SURETY
For Final Payment

Project: _____
Contractor: _____
Location: _____
Owner: City of Sheridan, Wyoming
Engineer: _____
Project No.: _____ Contract No.: _____
Type of Construction: _____

Amount of Contract: _____

In accordance with the provisions of the above named contract between the Owner and the Contractor, the following named surety:

on the Payment Bond of the following named Contractor:

hereby approves of final payment to the Contractor, and further agrees that said final payment to the Contractor shall not relieve the Surety Company named herein of any of its obligations to the following named Owner: as set forth in said Surety company's bond:

Surety Company acknowledges that above named contract requires Bonds to remain in effect for one year after final payment is due.

IN WITNESS WHEREOF, the Surety Company has hereunto set its hand and seal this _____ day of _____, 20__.

(Name of Surety Company)

Affix Corporate
Seal here

(Signature of Authorized Representative)

TITLE: _____

CERTIFICATE OF SUBSTANTIAL COMPLETION

Project: _____

OWNER'S Project No. _____ ENGINEER's Project No. _____

CONTRACTOR: _____ ENGINEER: _____

Contract For: _____ Contract Date: _____

This Certificate of Substantial Completion applies to all Work under the Contract Documents, or to the following specified parts thereof:

To: City of Sheridan (OWNER)
And to: _____
CONTRACTOR

The Work to which this Certificate applies has been inspected by authorized representatives of OWNER, CONTRACTOR and ENGINEER, and that Work is hereby declared to be substantially complete in accordance with the Contract Documents on:

DATE OF SUBSTANTIAL COMPLETION

A tentative list of items to be completed or corrected is attached hereto. This list may not be all-inclusive, and the failure to include an item in it does not alter the responsibility of CONTRACTOR to complete all the Work in accordance with the Contract Documents. The items in the tentative list shall be complete or corrected by CONTRACTOR within _____ days of the above date of Substantial Completion.

The responsibilities between OWNER and CONTRACTOR for security, operation, safety, maintenance, heat, utilities, insurance and warranties shall be as follows:

RESPONSIBILITIES:
OWNER: _____

CONTRACTOR: _____

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

PROJECT NAME

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

Executed by ENGINEER on _____, 20____

(Engineer)

By _____
(Authorized Signature)

CONTRACTOR accepts this Certificate of Substantial Completion on _____, 20____

(Contractor)

By _____
(Authorized Signature)

OWNER accepts this Certificate of Substantial Completion on _____, 20____

(City of Sheridan)

By _____

PUNCH LIST

PROJECT: _____ PROJECT NO.: _____

LOCATION: _____

Inspection was conducted at above project by _____

at _____ o'clock this date _____.

CONTRACTOR:

OWNER:
(City of Sheridan)

ENGINEER:

Items noted represent specific deviations and discrepancies which must be corrected. Any and all such deviations and discrepancies, whether or not specifically noted, are hereby included by reference.

The following items are to be completed or corrected to comply with the Contract Documents.

DESCRIPTION/ITEM	APPROVED BY ENG./ DATE COMPLETE

CERTIFICATE OF FINAL COMPLETION

Project: _____

OWNER'S Project No.: _____ ENGINEER's Project No.: _____

CONTRACTOR: _____ ENGINEER: _____

Contract For: _____ Contract Date: _____

This Certificate of Final Completion applies to all Work under the Contract Documents, or to the following specified parts thereof:

To: City of Sheridan (Owner)
And To _____
(Contractor)

The Work to which this Certificate applies has been inspected by authorized representatives of the OWNER, CONTRACTOR, and ENGINEER, and that Work is hereby declared to be complete in accordance with the Contract Documents on: _____
(Date of Final Completion)

The project has been advertised according to WS 16-6-116, and the Affidavit on Behalf of Contractor is attached to and made a part of this Certificate.

Executed by ENGINEER on _____, 20__

(Engineer)

By: _____
(Authorized Signature)

CONTRACTOR accepts this Certificate of Final Completion on _____, 20__

(Contractor)

By: _____

OWNER accepts this Certificate of Final Completion on _____, 20__

(City of Sheridan)

By: _____

WARRANTY

_____, hereinafter the CONTRACTOR, does expressly affirm, promise and guarantee all project improvements including materials, equipment and workmanship on the _____ for a period of one year from the date of Final Completion.

CONTRACTOR further agrees in the event that any or all of the Project improvements fail to conform to the Contract Documents or require any maintenance, rebuilding, construction or reconstruction to keep Project improvements in conformity with the Contract Documents or to bring Project improvements up to the Contract Document Specifications that CONTRACTOR will pay all necessary, reasonable and normal costs whatsoever, incurred by the City of Sheridan in repairing, maintaining, construction, reconstruction, or rebuilding any of the Project improvements which at any time within the above mentioned period of one year are not in conformity with the Contract Documents.

Provided, however: That the City of Sheridan shall give written notice to CONTRACTOR that the City of Sheridan intends to perform work on the Project improvements and that said notice shall specify the improvement, its location and the cause or kind of non-conformity with reference to the relevant Contract Documents. Said notice shall be sent to CONTRACTOR by first class mail before the City begins any work or incurs any cost, unless an emergency situation occurs. The occurrence of an emergency shall be determined in the reasonable discretion of the City Public Works Director of the City of Sheridan, and is declared to be an event which renders advance notice contrary to the health, safety or welfare of the residents of the City of Sheridan. In case the City Engineer finds the existence of an emergency requiring immediate action he/she shall serve notice to CONTRACTOR in the form above mentioned as soon as practical and shall include an explanation of the state of affairs requiring emergency action.

Provided, further: That the obligation of CONTRACTOR shall be to compensate the City of Sheridan for bringing any improvements up to the Contract Document Specifications and this obligation shall cover all work necessary to bring the improvement into conformity, even if the work occurs after the expiration of the one year period specified above if the City sent notice as provided above within the one year period or, in the case of any emergency as provided above if the City actually began work on the improvement within the one year period.

Provided, further: That according to the General Conditions 13.07D where defective work has been corrected, the correction period hereunder with respect to such work will be extended for an additional period of one year after such correction has been satisfactorily completed.

CONTRACTOR and the City of Sheridan agree and acknowledge that this Agreement is the consideration for acceptance by the City of Sheridan of the Project improvements for maintenance by the City of Sheridan including, but not limited to the release of any performance or penal bonds, letters of credit, cash escrows, promissory notes or other securities posted and approved to secure the installation of required Project improvements for _____.

DATED this _____ day of _____, 20__.

(Contractor)

By: _____

Title: _____

STATE OF WYOMING)

COUNTY OF SHERIDAN)

The foregoing instrument was acknowledged before me by _____
_____, this _____ day of _____, 20__.

Witness my hand and official seal

(Notary Public)

My commission expires _____

SEAL

APPROVED BY CITY OF SHERIDAN

(Mayor, City of Sheridan)

ATTEST:

(City Clerk)

NOTARY (MAYOR & CLERK)

PUBLIC NOTICE

**NOTICE OF ACCEPTANCE
AND FINAL PAYMENT AND SETTLEMENT**

Notice is hereby given that on the ____ day of _____ 20____, final settlement will be made by the City of Sheridan, for and on account of a contract with _____ for the _____ Project.

The above work having been completed and accepted according to the plans and specifications of _____ and the above date being the 41st day after the first publication of this notice, the said Contractor will be entitled to final settlement and payment therefore.

Any person, partnership, association, agency or corporation who shall have any unpaid claims against said Contractor for or on account of the furnishing of labor, materials, equipment, sustenance, provisions, or other supplies used or consumed by such contractor and/or subcontractor in or about the performance of said work may at any time, up to and including the date of final settlement and payment, file a verified statement of any and all amounts due on account of such claim with:

Failure on the part of the claimant to file such statement prior to final settlement and payment will relieve absolutely the City of Sheridan, for all or any liability for such claim.

Mayor, City of Sheridan

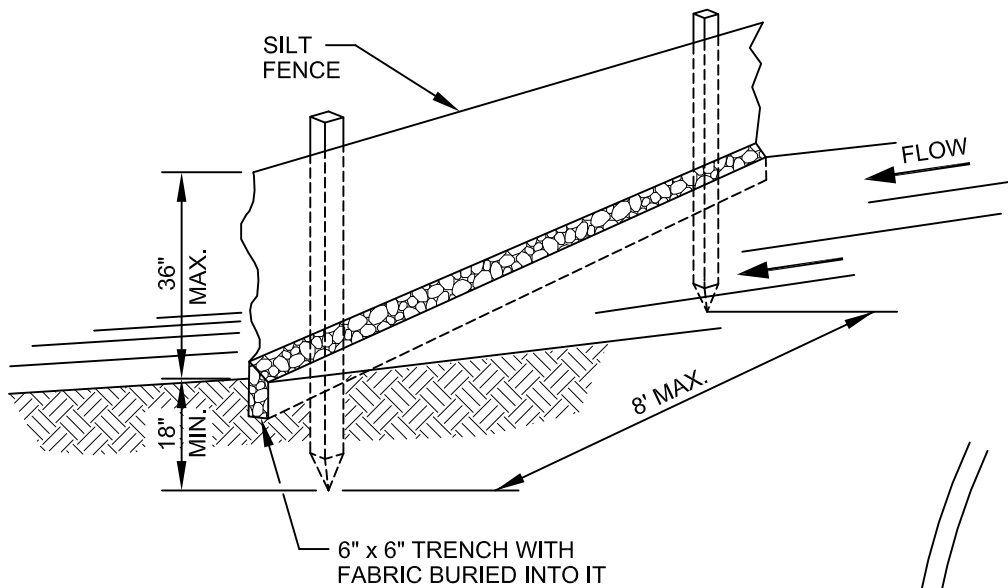
Published: _____, 20 ____; _____, 20 ____; _____, 20 ____

DETAILS

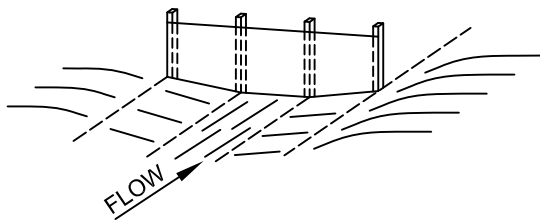
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STANDARD SPECIFICATIONS AND DETAILS FOR STREET AND UTILITY CONSTRUCTION CITY OF SHERIDAN

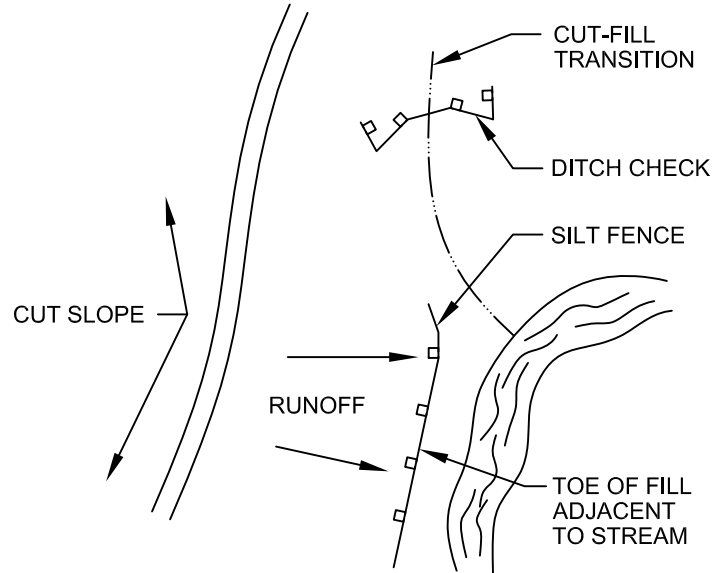
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Street Intersections, Approaches, Double Gutter, ADA Ramps.....	03030	- 1 to 09
Concrete Joints and Concrete Paving.....	03040	- 1 to 04
Cathodic Protection.....	13900	- 1 to 17
Decorative Lighting.....	26000	- 1 to 01



SILT FENCE CONSTRUCTION



DITCH CHECK



PROTECTION OF LIVE STREAM

NOTES:

1. A SILT FENCE IS A VERTICAL BARRIER OF GEOTEXTILE FABRIC DESIGNED TO REMOVE PARTICLES FROM THE WATER PASSING THROUGH IT.
2. SILT FENCES ARE PLACED AROUND INLETS, ACROSS MINOR SWALES, AND AT THE TOE OF SLOPES ADJACENT TO STREAMS AND DEVELOPED PROPERTY. SILT FENCE USAGE SHOULD BE LIMITED TO HANDLE AN AREA EQUIVALENT TO 1000 SQ. FT. PER 10 FT. OF FENCE. CAUTION SHOULD BE USED WHERE THE SITE SLOPE IS STEEPER THAN 1:1 AND WATER FLOW RATES EXCEED 1 CU. FT. PER SECOND PER 10 FT. OF FENCE.
3. THE SILT FENCE SHALL BE BUILT AND GRADING CONTROLLED SO THAT WATER IS FILTERED UNIFORMLY ALONG THE FENCE. THE ENDS OF THE FENCE SHALL BE TAPERED UPHILL. POSTS SHALL BE DRIVEN TO A MIN. DEPTH OF 18 INCHES AT A MAX. SPACING OF 8 FEET. WHERE AN 18-INCH DEPTH IS IMPOSSIBLE TO ACHIEVE, THE POSTS SHOULD BE ADEQUATELY SECURED TO PREVENT OVERTURNING OF THE FENCE. THE FENCE SHALL BE ATTACHED TO THE POSTS BY WIRE, CORD, STAPLES, POCKETS OR OTHER ACCEPTABLE MEANS. A MIN. OF 6 INCHES OF GEOTEXTILE FABRIC AT THE BOTTOM OF THE FENCE SHALL BE DRAPED INTO A TRENCH, BACKFILLED WITH SOIL AND COMPACTED. FENCE CONSTRUCTION SHALL BE ADEQUATE TO HANDLE THE STRESS OF THE SEDIMENT LOADING.
4. THE CONTRACTOR SHALL MAINTAIN THE SILT FENCE UNTIL THE FENCE IS REMOVED OR UNTIL THE PROJECT IS ACCEPTED. THE FABRIC SHOULD BE CHECKED FOR RIPS, TEARS, AND OTHER TYPES OF DETERIORATION AND REPLACED AS NEEDED. SEDIMENT DEPOSITS SHALL BE REMOVED WHEN THE DEPOSIT REACHES APPROXIMATELY ONE HALF THE HEIGHT OF THE SILT FENCE. WHEN PERMANENT SOIL EROSION CONTROL IS ACHIEVED, THE FENCE SHALL BE REMOVED AND THE ACCUMULATED SEDIMENT SPREAD AND SEEDDED.

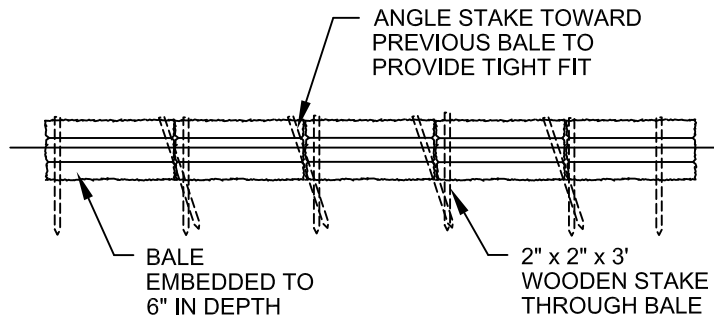
NOT TO SCALE

**EROSION CONTROL
SILT FENCE DETAIL**

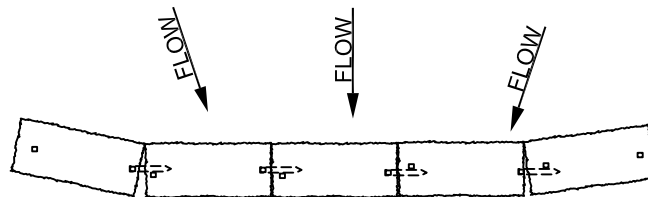
DWG. NO. 01560-3.05a

CITY of SHERIDAN

NOVEMBER 2015



SECTION



PLAN

DITCH CHECK

NOTES:

1. EROSION CONTROL BALES ARE USED AS FILTERS ALONG THE TOES OF FILLS, AROUND DRAINAGE INLETS, AND AS EROSION CHECKS IN DITCHES. DUE TO THEIR LOW POROSITY AND WEIGHT PER UNIT VOLUME, USE OF EROSION CONTROL BALES SHOULD BE LIMITED TO SITUATIONS WHERE EXPECTED STORM FLOW VOLUMES ARE LOW.
2. EROSION CONTROL BALES SHALL BE STRAW OR HAY AND CERTIFIED WEED FREE. EROSION CONTROL BALES SHALL BE PLACED SO THAT THEY ARE BUTTED TIGHTLY TOGETHER. THE BALES SHALL BE BURIED TO 6-INCHES IN DEPTH AND THE SOIL COMPACTED AROUND THE BALES. BALES SHALL BE FURTHER ANCHORED WITH 2"x2"x3' WOODEN STAKES. EROSION CONTROL BALES IN DITCH LINES SHOULD BE EXTENDED A SUFFICIENT LENGTH SO THAT THE ELEVATION OF THE BALES IS 2 FT ABOVE THE ANTICIPATED HIGH WATER LINE. THESE CONSTRUCTION PRACTICES SHALL BE FULLY CARRIED OUT TO ENSURE THAT WATER IS NOT ALLOWED TO FLOW BETWEEN, AROUND, OR UNDERNEATH THE BALES.
3. EROSION CONTROL BALES REQUIRE FREQUENT INSPECTION, AS THEY DETERIORATE QUICKLY AND MAY NEED TO BE REPLACED. WHEN NO LONGER NEEDED, THE ACCUMULATED SEDIMENT SHALL BE SPREAD, SEEDED AND MULCHED WITH THE REMAINING STRAW OR HAY FROM THE EROSION CONTROL BALES.

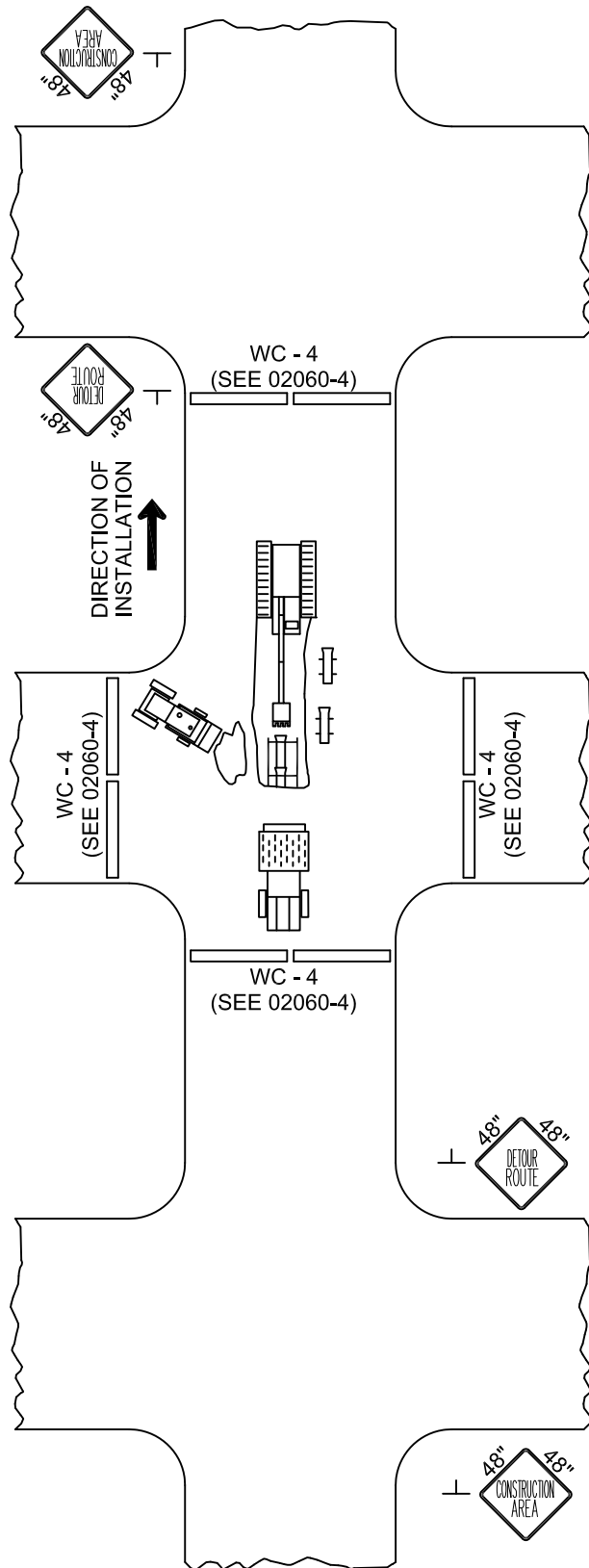
NOT TO SCALE

EROSION CONTROL
BALES DETAIL

DWG. NO. 01560-3.05b

CITY of SHERIDAN

NOVEMBER 2015



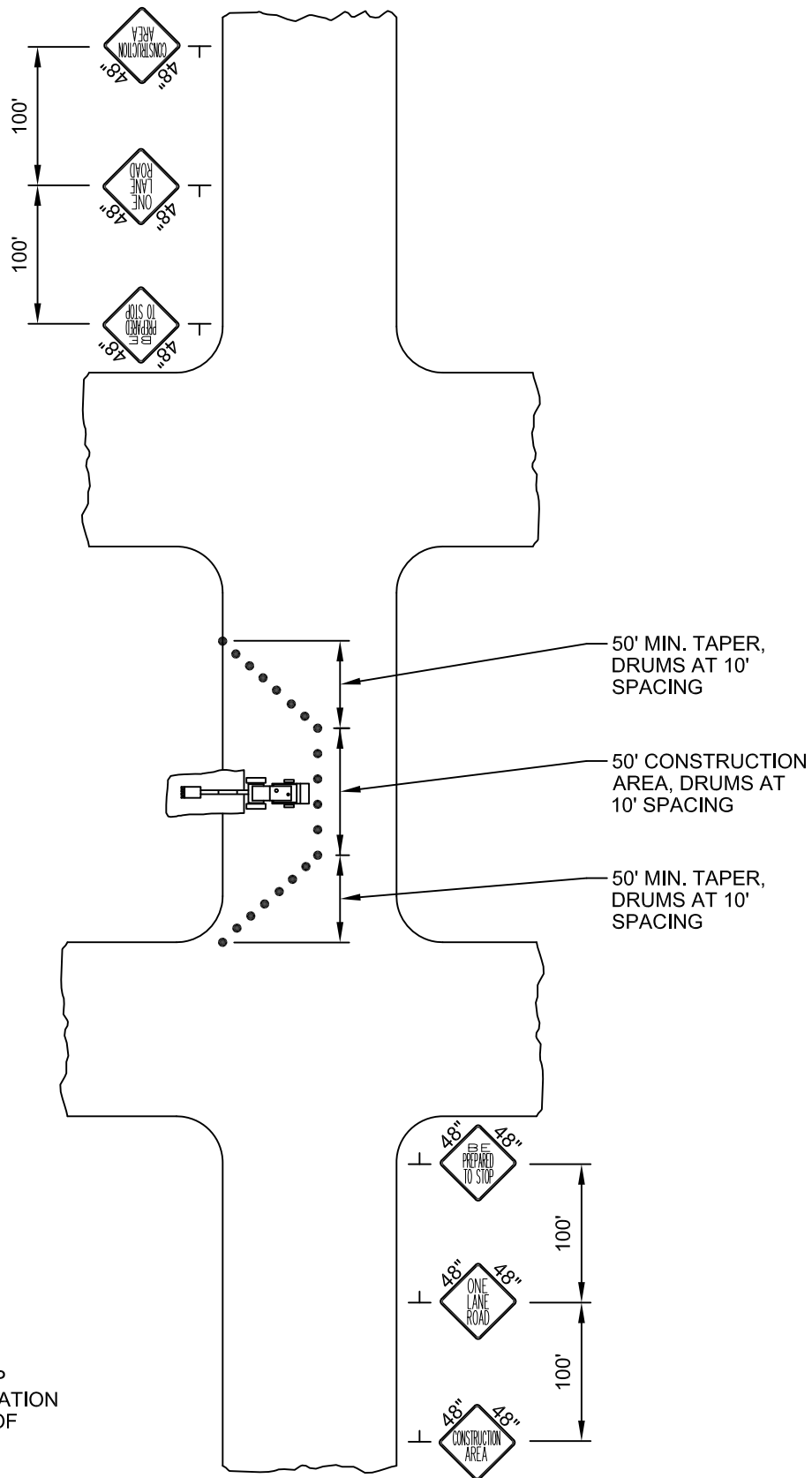
NOT TO SCALE

TYPICAL STREET BARRICADE
SETUP DETAIL

DWG. NO. 02060-1

CITY of SHERIDAN

NOVEMBER 2015



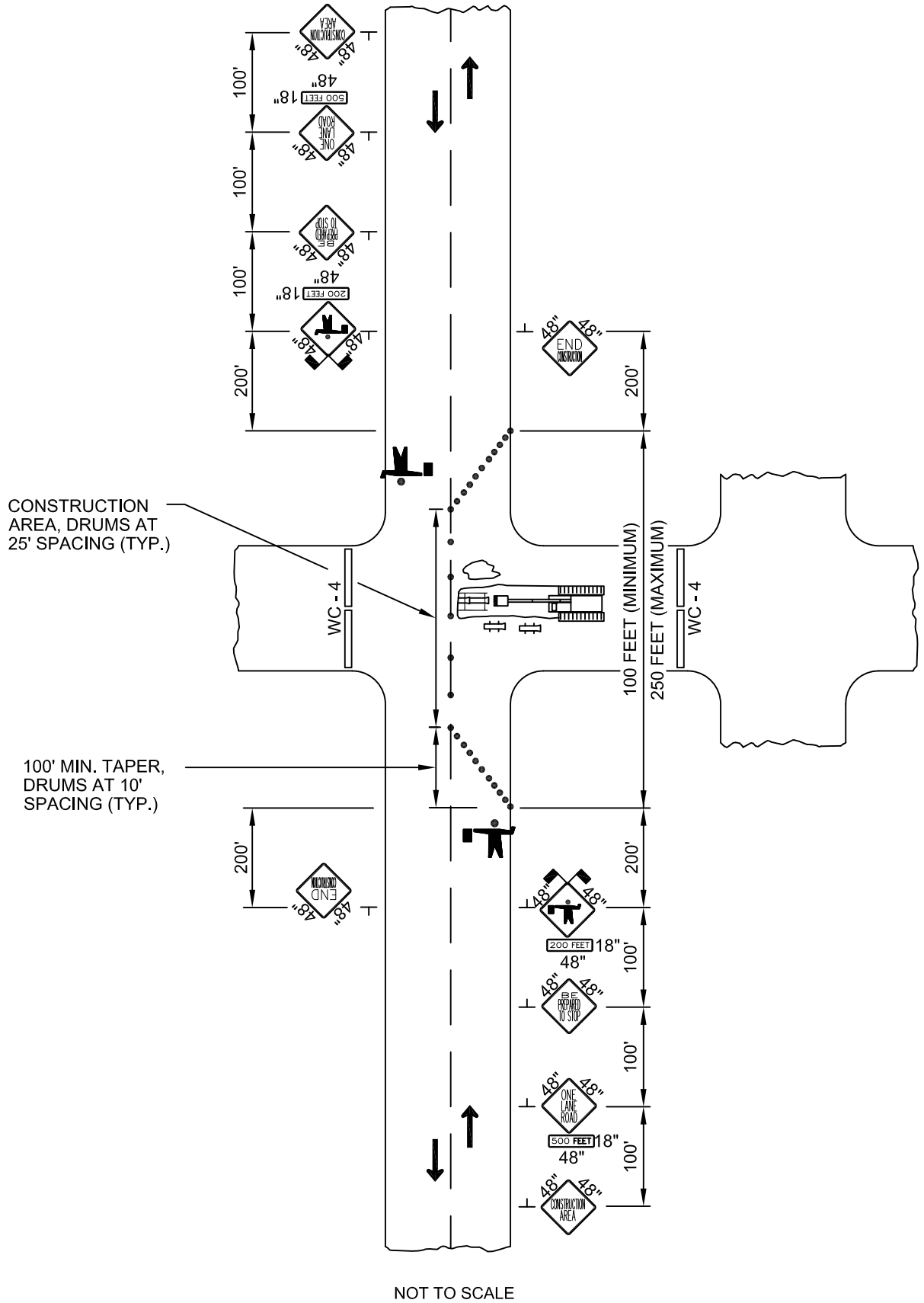
NOTE:
 FOR USE ONLY WHEN SETUP
 IS LESS THAN 8 HOURS DURATION
 AND ONLY DURING HOURS OF
 DAYLIGHT.

NOT TO SCALE

**TYPICAL TRAFFIC CONTROL FOR LANE
 CLOSURE ON LOCAL STREETS DETAIL**

DWG. NO. 02060-2

CITY of SHERIDAN
 NOVEMBER 2015

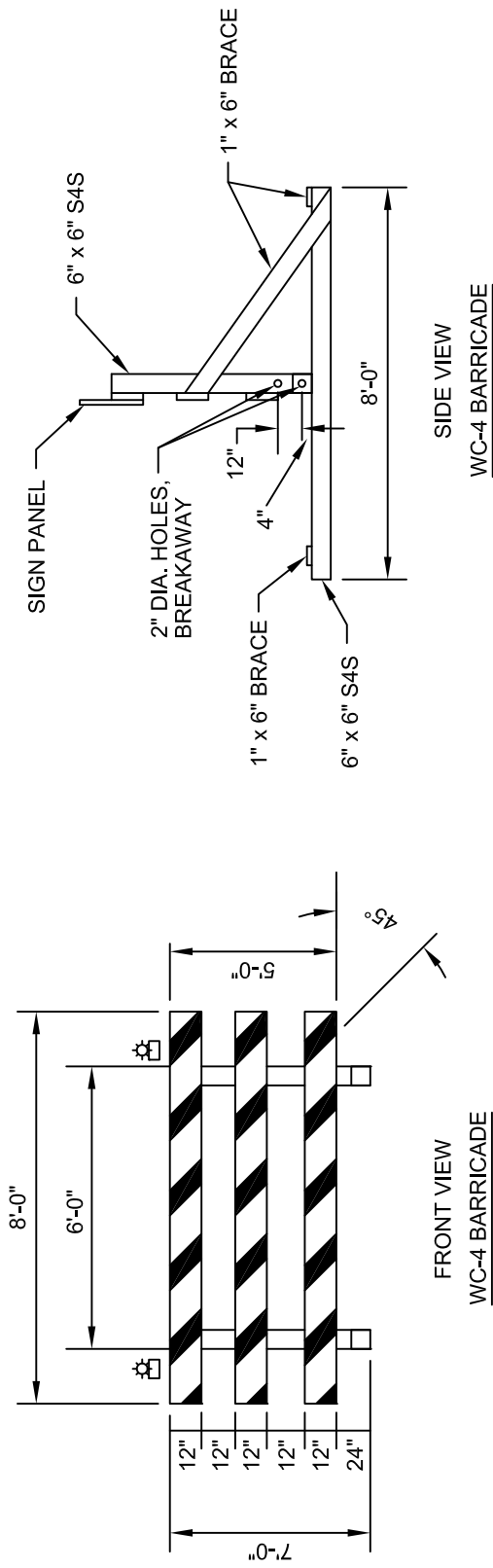
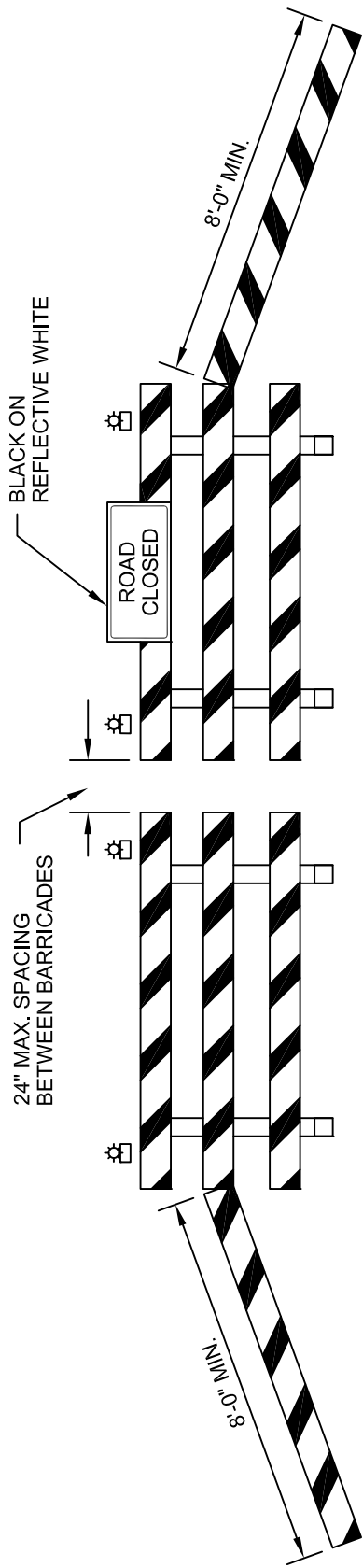


TYPICAL TRAFFIC CONTROL FOR LANE CLOSURE ON ARTERIAL STREETS DETAIL

DWG. NO. 02060-3

CITY of SHERIDAN

NOVEMBER 2015



TYPICAL STREET CLOSURE AND BARRICADE
SETUP DETAIL

DWG. NO. 02060-4

CITY of SHERIDAN

NOVEMBER 2015

NOT TO SCALE

**GENERAL NOTES FOR PLACEMENT
AND USAGE OF CONSTRUCTION
TRAFFIC CONTROL DEVICES**

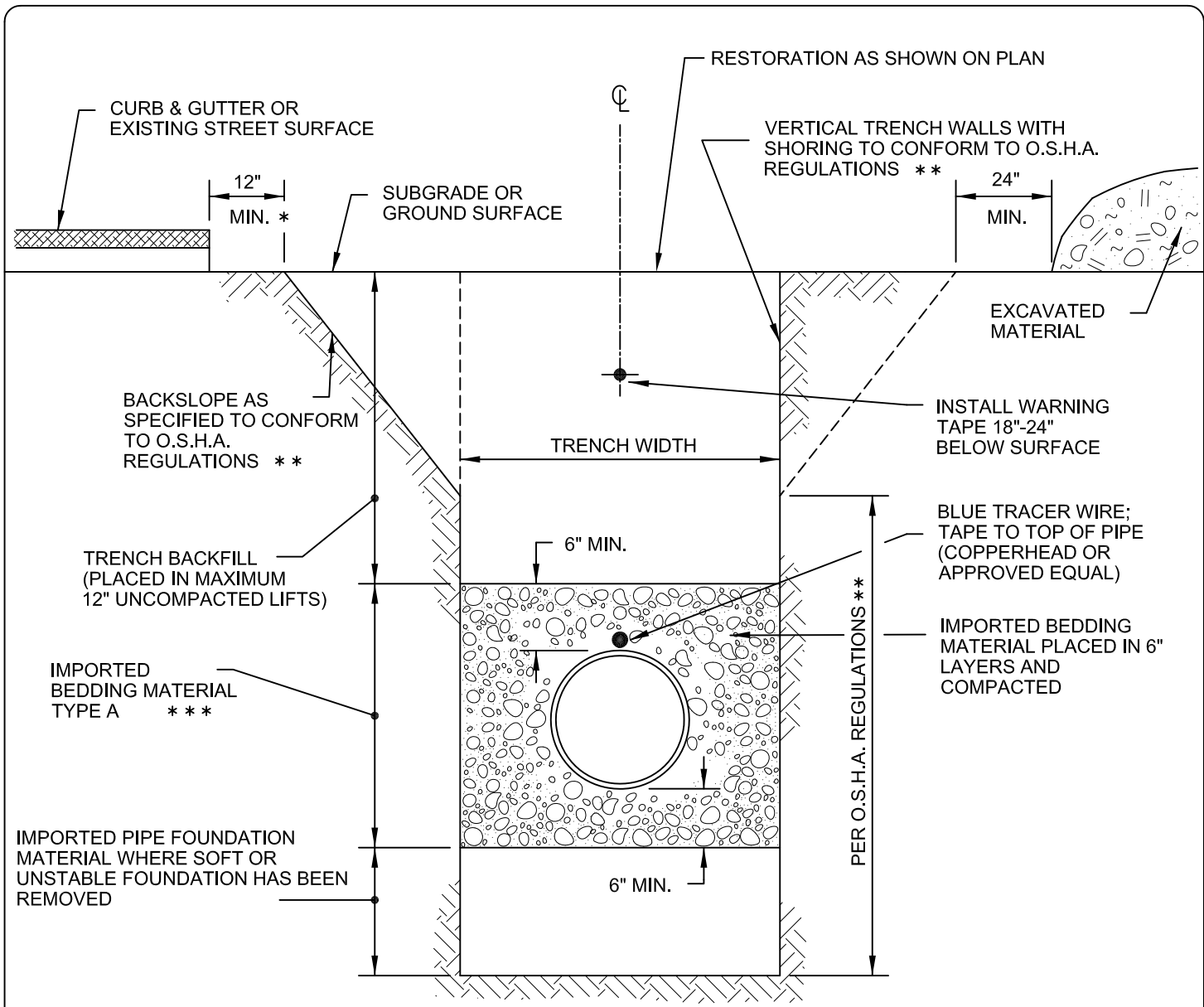
1. WORK ACTIVITY ON OR ADJACENT TO THE TRAVELED WAY THAT MAY AFFECT THE TRAVELING PUBLIC OR WORKERS SHALL NOT COMMENCE UNTIL ALL NECESSARY CONSTRUCTION TRAFFIC CONTROL DEVICES ARE IN PLACE AND APPROVED BY THE ENGINEER. (CONSTRUCTION TRAFFIC CONTROL DEVICES SHALL INCLUDE SIGNS, BARRICADES, CHANNELIZING DEVICES, STRIPING, ETC.)
2. ALL SIGNS SHALL BE STAND-MOUNTED AND KEPT CLEAN, LEGIBLE AND MAINTAIN REFLECTIVITY.
3. FLASHERS SHALL BE INSTALLED AND IN WORKING ORDER ON ALL WC-4S AND BARRELS.
4. ONLY TWO BLOCKS SHALL BE CLOSED AT A TIME UNLESS APPROVED BY THE CITY OF SHERIDAN
5. ALL CONSTRUCTION SITES SHOULD BE CHECKED PERIODICALLY, DAY AND NIGHT, TO ENSURE ADEQUATE TRAFFIC CONTROL.
6. ALL CONSTRUCTION TRAFFIC CONTROL DEVICE SPACING IS APPROXIMATE AND SHOULD BE ADJUSTED TO FIT FIELD CONDITIONS. ROADWAY CONDITIONS, OBSTACLES, GEOMETRICS AND PERMANENT SIGNING SHOULD BE CONSIDERED IN PLACEMENT OF CONSTRUCTION SIGNS AND / OR FLAGGERS, TO PROVIDE MAXIMUM VISIBILITY OF WARNING DEVICES TO ONCOMING MOTORISTS.
7. ADDITIONAL CONSTRUCTION TRAFFIC CONTROL DEVICES MAY BE ADDED AS CONDITIONS WARRANT.
8. ALL CONSTRUCTION TRAFFIC CONTROL DEVICES REQUIRED FOR THE CONSTRUCTION PROJECT SHALL BE FURNISHED AND INSTALLED BY THE CONTRACTOR. REPLACEMENT DEVICES SHALL BE AVAILABLE AS REQUIRED. DEVICES SHALL BE MAINTAINED IN A STATE OF GOOD REPAIR BY THE CONTRACTOR.
9. ALL CONSTRUCTION TRAFFIC CONTROL DEVICES REQUIRED, INCLUDING ALL POSTS AND SIGNS, SHALL COMPLY WITH ALL REQUIREMENTS OF THE CURRENT EDITION OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
10. EXISTING TRAFFIC CONTROL DEVICES CONFLICTING WITH THESE TRAFFIC CONTROL PLANS SHALL BE COVERED OR REMOVED AS DIRECTED BY THE ENGINEER AND RETURNED TO THEIR PREVIOUS LOCATIONS AS NEEDED. (NOT A PAY ITEM; SUBSIDIARY TO OTHER CONTRACT ITEMS.)
11. CONSTRUCTION TRAFFIC CONTROL DEVICES SHALL BE REMOVED OR COVERED WHEN NOT NEEDED.
12. PORTABLE SIGN SUPPORTS AND BARRICADES TURNED AWAY FROM THE ROADWAY AND NOT REMOVED AT LEAST 30 FEET FROM THE EDGE OF THE TRAVELED WAY SHALL HAVE A TYPE II OBJECT MARKER VISIBLE TO ALL APPROACHING TRAFFIC.
13. WHEN CONSTRUCTION CEASES DURING THE WINTER, ANY CONSTRUCTION TRAFFIC CONTROL DEVICES, INCLUDING POSTS UNNEEDED AT THIS TIME, SHALL BE REMOVED. REQUIRED DEVICES SHALL BE MAINTAINED THROUGHOUT THE WINTER.
14. ALL CONSTRUCTION MATERIALS AND EQUIPMENT SHALL BE STORED IN AREAS AS FAR FROM THE USABLE TRAVELED WAY AS POSSIBLE (30 FEET MINIMUM).
15. ADDITIONAL WARNING LIGHTS MAY BE REQUIRED ON CONSTRUCTION TRAFFIC CONTROL DEVICES FOR ADDITIONAL EMPHASIS AT NIGHT. ONLY STEADY BURN WARNING LIGHTS SHALL BE USED ON TAPERS. DRUMS WITH ARROWS SHALL BE USED ON TAPERS, AND DRUMS WITHOUT ARROWS SHALL BE USED ON TANGENTS. SIGNS AND CHANNELIZING DEVICES SHALL BE REFLECTORIZED WHEN USED AT NIGHT.
16. ADDITIONAL FLAGGERS MAY BE UTILIZED AT THE DISCRETION OF THE CONTRACTOR. ADDITIONAL WARNING SIGNS FOR THE FLAGGERS SHALL THEN BE INSTALLED. LIGHTING SHALL BE PROVIDED IF FLAGGERS ARE UTILIZED DURING HOURS OF DARKNESS.
17. ALL DRUMS USED FOR TEMPORARY TRAFFIC CONTROL SHALL BE PLASTIC AND MEET ALL REQUIREMENTS OF THE CURRENT EDITION OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
18. IN URBAN AREAS, PEDESTRIAN SAFETY AND MOVEMENTS SHALL BE CONSIDERED WHEN PLACING TRAFFIC CONTROL DEVICES.
19. THE ENGINEER RESERVES THE RIGHT TO ADD, DELETE OR MODIFY ANY CONSTRUCTION TRAFFIC CONTROL DEVICE OR SETUPS AS REQUIRED TO COMPLY WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES AND TO PROVIDE FOR THE SAFETY OF TRAVELING MOTORISTS OR PEDESTRIANS.
20. ANY ADDITIONS OR MODIFICATIONS TO TRAFFIC CONTROL WILL BE CONSIDERED SUBSIDIARY TO THE BID ITEM.

**TRAFFIC CONTROL
GENERAL NOTES**

DWG. NO. 02060-5

CITY of SHERIDAN

NOVEMBER 2015



NOTES:

- * WHERE TRENCH PASSES THROUGH EXISTING PAVEMENT, THE PAVEMENT SHALL BE CUT ALONG A NEAT, VERTICAL LINE A MIN. OF 12" FROM THE EDGE OF THE TRENCH OPENING. WHERE NEAT LINE IS LESS THAN 3' FROM EDGE OF EXISTING PAVEMENT OR CURB & GUTTER SECTION, REMOVE AND REPLACE ENTIRE PAVEMENT SECTION BETWEEN TRENCH AND EDGE OF PAVEMENT OR CURB & GUTTER SECTION.
- ** SEE O.S.H.A. SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION, SECTION 1926.652. TRENCH WALLS SHALL BE IN COMPLIANCE WITH THE CURRENT O.S.H.A. REQUIREMENTS.
- *** SEE SPECIFICATIONS (SECTION 02221).

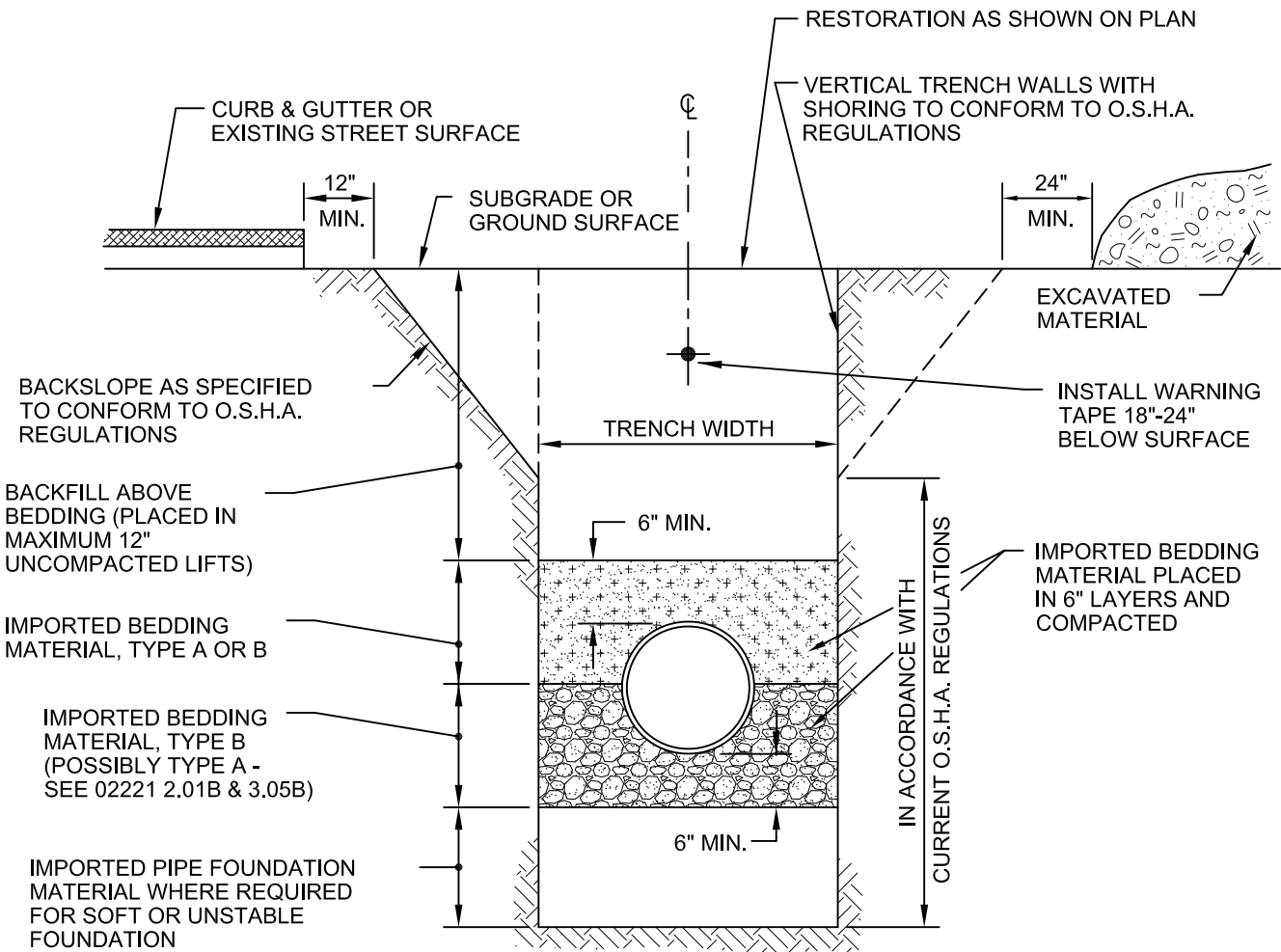
NOT TO SCALE

**TYPICAL WATER
MAIN TRENCH DETAIL**

DWG. NO. 02221-2.01Ba

CITY of SHERIDAN

NOVEMBER 2015



NOTES:

1. THE TRENCH BOTTOM SHALL BE FREE FROM LARGE STONES, DIRT CLOUDS, AND ANY FROZEN MATERIAL PRIOR TO PLACING PIPE.
2. BELL HOLES SHALL BE PROVIDED TO ENSURE A UNIFORMLY SUPPORTED PIPE.
3. PIPE BEDDING SHALL BE PER SPECIFICATIONS (02221).
4. ROLLING EQUIPMENT MAY BE USED WHEN 18" OF FILL HAS BEEN PLACED ABOVE THE PIPE.
5. COMPLY W/ ALL CURRENT O.S.H.A. REGULATIONS FOR TRENCH EXCAVATION.
6. WHERE TRENCH PASSES THROUGH EXISTING PAVEMENT, THE PAVEMENT SHALL BE CUT ALONG A NEAT, VERTICAL LINE A MIN. OF 12" FROM THE EDGE OF THE TRENCH OPENING. WHERE NEAT LINE IS LESS THAN 3' FROM EDGE OF EXISTING PAVEMENT OR CURB & GUTTER SECTION, REMOVE AND REPLACE ENTIRE PAVEMENT SECTION BETWEEN TRENCH AND EDGE OF PAVEMENT OR CURB & GUTTER SECTION.

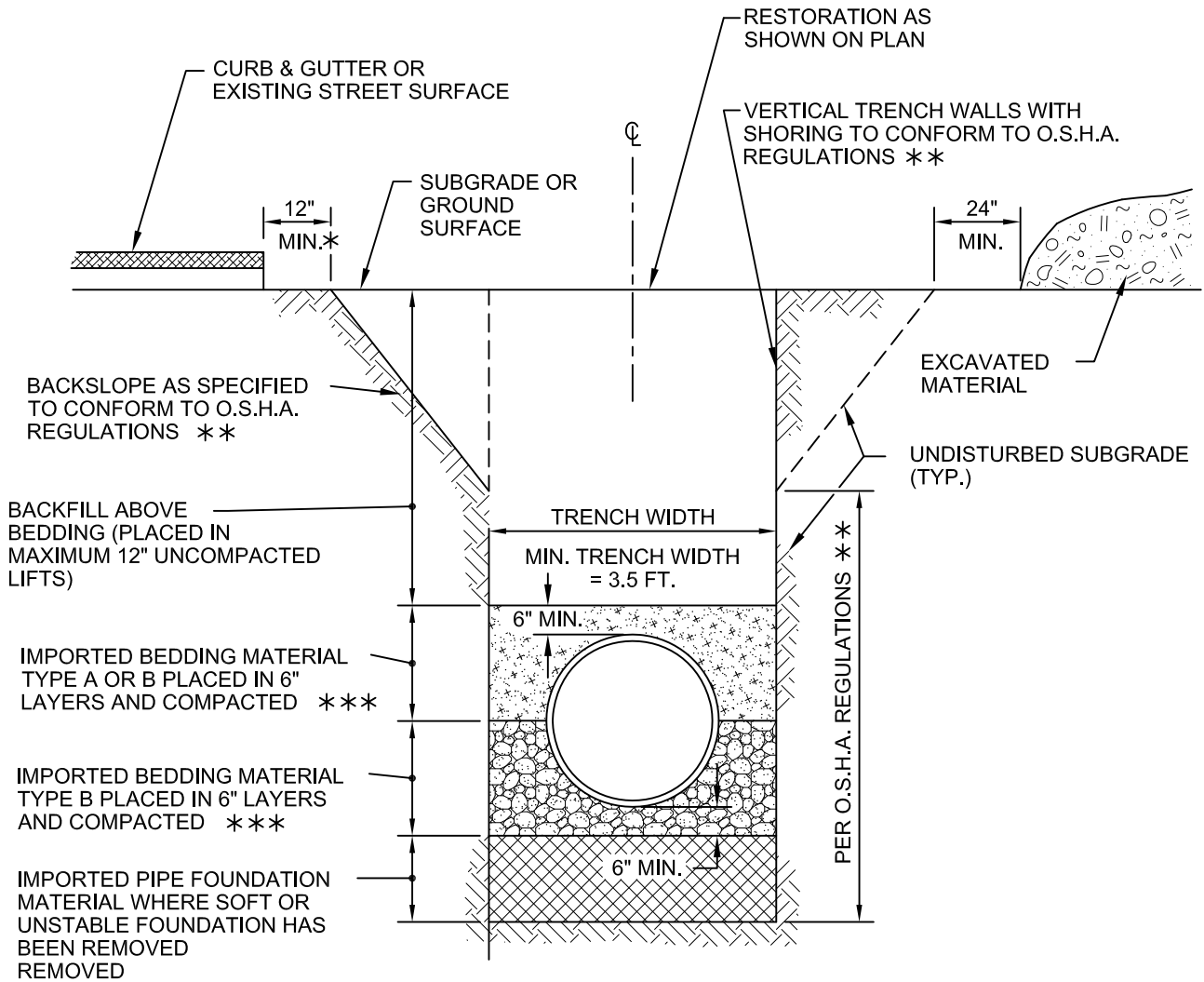
NOT TO SCALE

**TYPICAL SANITARY SEWER
TRENCH DETAIL**

DWG. NO. **02221-2.01Bb**

CITY of SHERIDAN

NOVEMBER 2015



NOTES:

- * WHERE TRENCH PASSES THROUGH EXISTING PAVEMENT, THE PAVEMENT SHALL BE CUT ALONG A NEAT, VERTICAL LINE A MIN. OF 12" FROM THE EDGE OF THE TRENCH OPENING. WHERE NEAT LINE IS LESS THAN 3' FROM EDGE OF EXISTING PAVEMENT OR CURB & GUTTER SECTION, REMOVE AND REPLACE ENTIRE PAVEMENT SECTION BETWEEN TRENCH AND EDGE OF PAVEMENT OR CURB & GUTTER SECTION.
- ** SEE O.S.H.A. SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION, SECTION 1926.652. TRENCH WALLS SHALL BE IN COMPLIANCE WITH THE CURRENT O.S.H.A. REQUIREMENTS.
- *** NATIVE BEDDING MATERIAL MAY BE USED FOR RCP STORM DRAINS, IF ALLOWED BY THE SPECIAL PROVISIONS. TYPE A BEDDING MAY POSSIBLY BE USED (SEE 02221 2.01B & 3.05B).

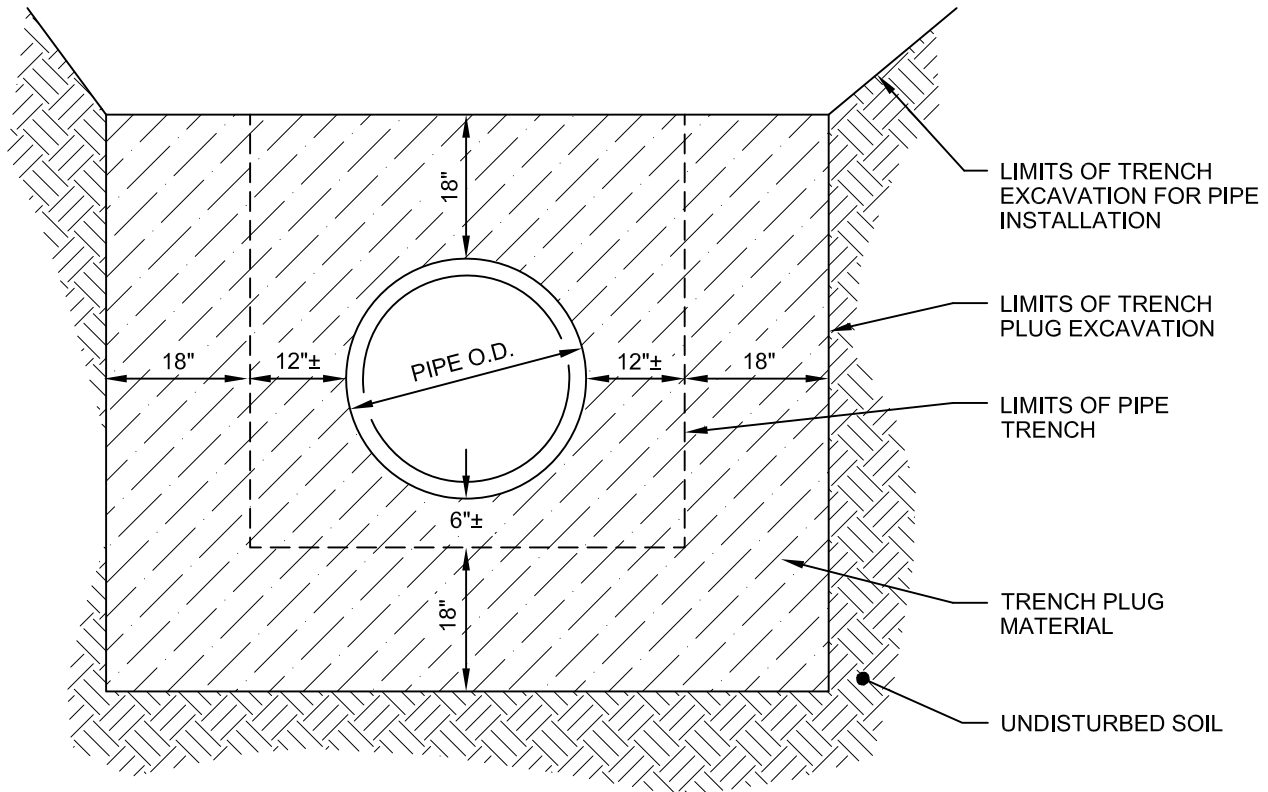
NOT TO SCALE

**TYPICAL STORM DRAIN
TRENCH DETAIL**

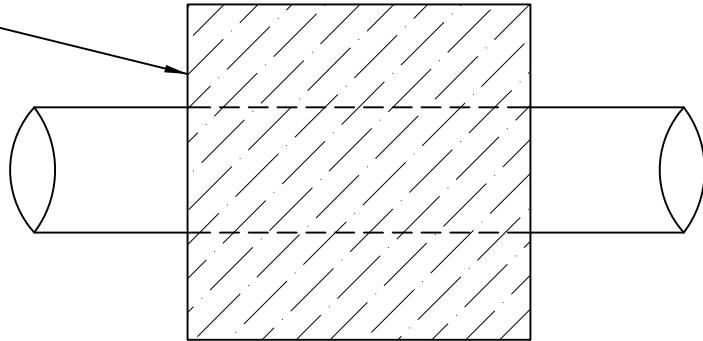
DWG. NO. 02221-2.01Bc

CITY of SHERIDAN

NOVEMBER 2015



PLUG SHALL BE CENTERED ON ONE FULL SECTION OF PIPE



NOTES:

1. TRENCH PLUG SHALL BE 4 FEET LONG (MIN.) AND INSTALLED AT 200 FOOT INTERVALS, UNLESS REQUESTED OTHERWISE BY THE ENGINEER.
2. TRENCH PLUG MATERIAL IS TO COMPLY WITH SPECIFICATION 02221 2.01E.
3. TRENCH PLUG MATERIAL IS TO BE PLACED AT A MIN. OF 95% MAX. DRY DENSITY (ASTM D698) AT 1% - 3% ABOVE OPTIMUM MOISTURE.

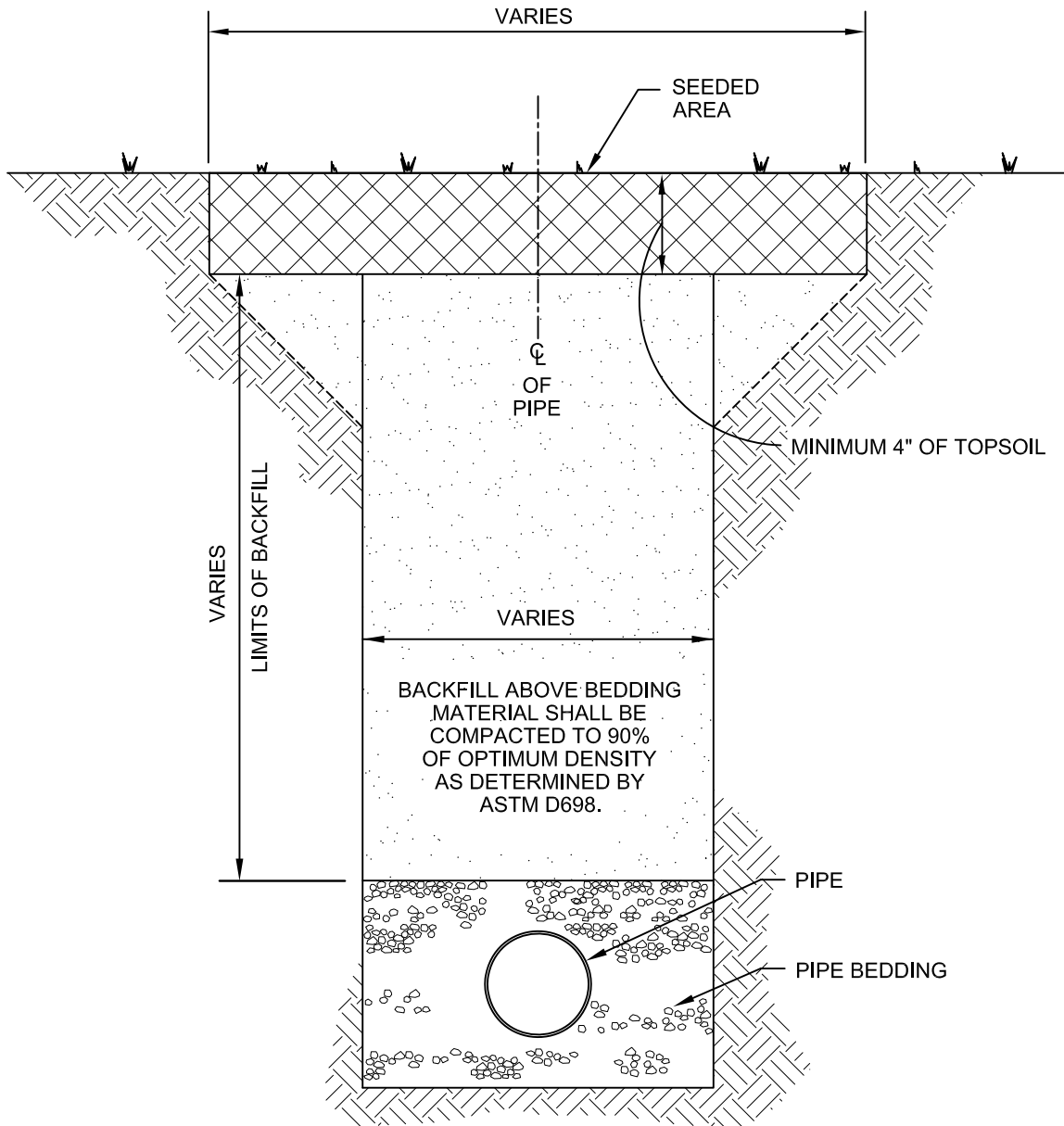
NOT TO SCALE

TRENCH PLUG DETAIL

DWG. NO. 02221-2.01E

CITY of SHERIDAN

NOVEMBER 2015



FOR REQUIREMENTS OF SEED MIXTURE
AND APPLICATION SEE SPECIFICATION 02480.

NOTES:

1. THIS RESTORATION WILL BE REQUIRED ON ALL DISTURBED AREAS THAT WILL NOT BE COVERED WITH SOD OR OTHER SURFACING.
2. ROCKS LARGER THAN 2" CANNOT BE PLACED WITHIN TOPSOIL.

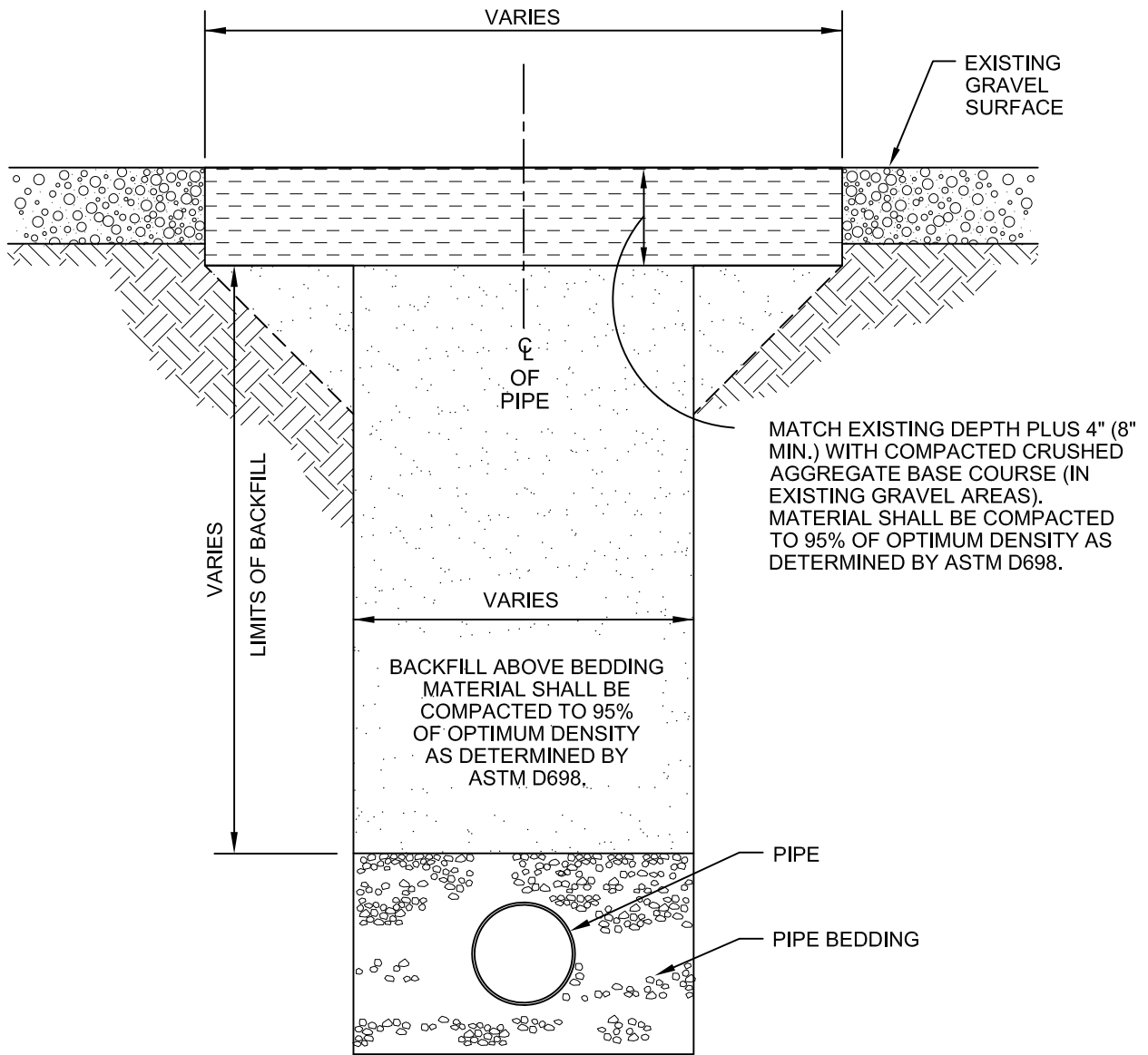
NOT TO SCALE

**RESTORATION -
OPEN AREAS DETAIL**

DWG. NO. 02221-3.09A

CITY of SHERIDAN

NOVEMBER 2015



NOTE: REQUIRED WITHIN ANY ROAD R.O.W. OR OTHER AREA WITH GRAVEL SURFACING.

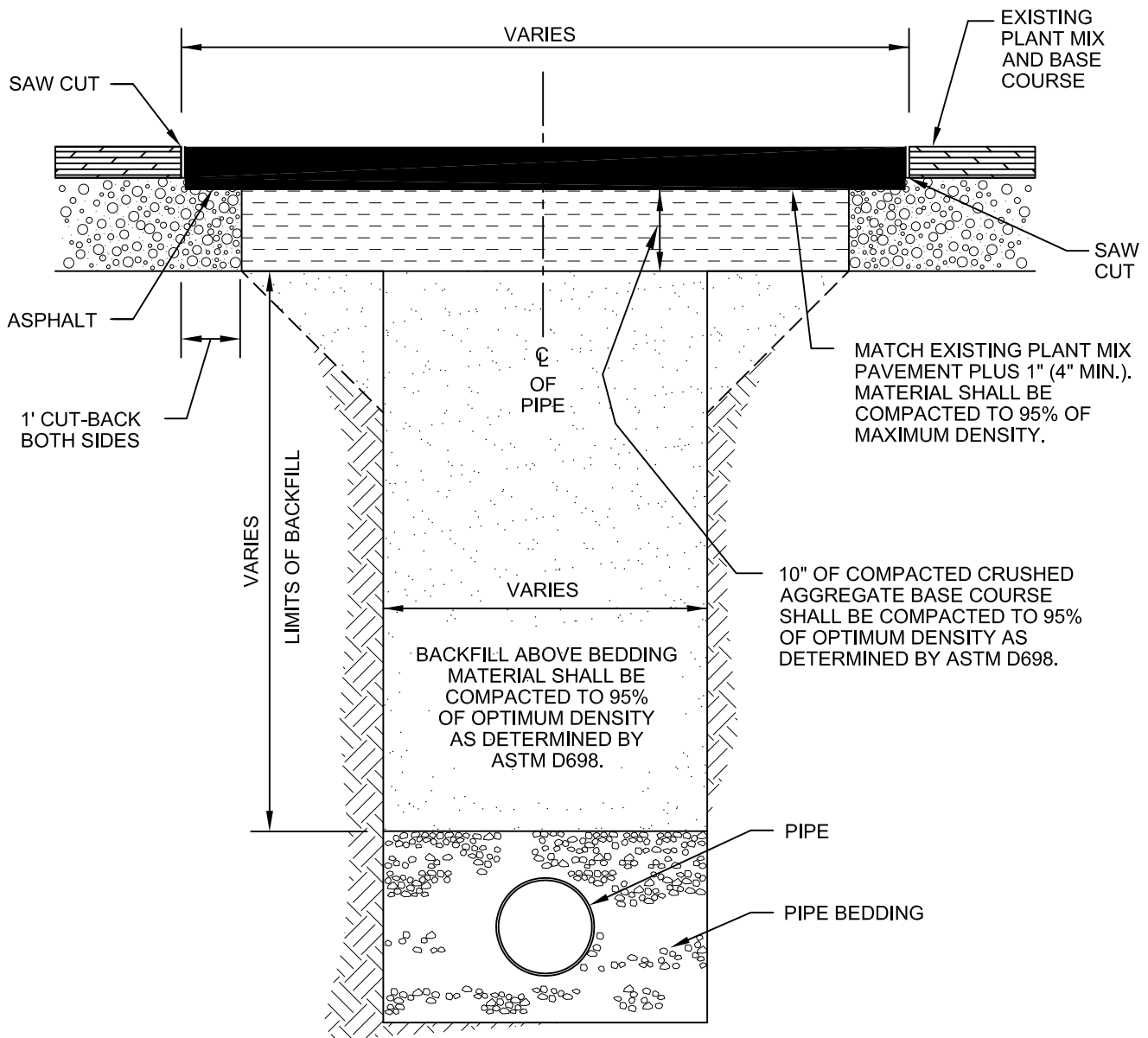
NOT TO SCALE

**RESTORATION -
GRAVEL SURFACES DETAIL**

DWG. NO. **02221-3.09B**

CITY of SHERIDAN

NOVEMBER 2015



NOTE: THIS RESTORATION WILL BE REQUIRED ON ALL PRIVATE ROADWAYS, COUNTY ROADS, CITY STREETS, PARKING AREAS, AND STATE HIGHWAYS WITH AN EXISTING ASPHALT SURFACE.

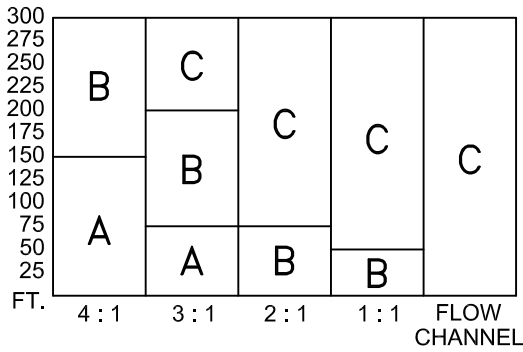
NOT TO SCALE

RESTORATION - ASPHALT PAVEMENT DETAIL

DWG. NO. 02221-3.09C

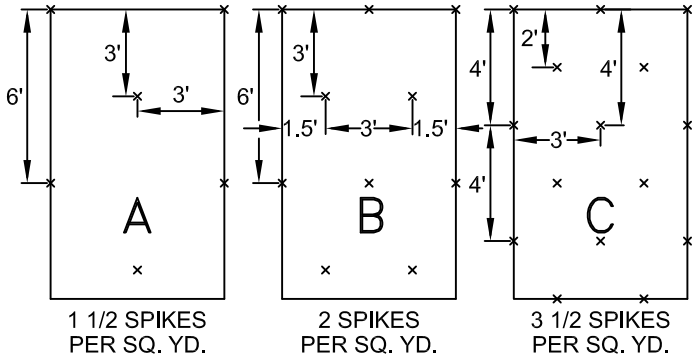
CITY of SHERIDAN

NOVEMBER 2015

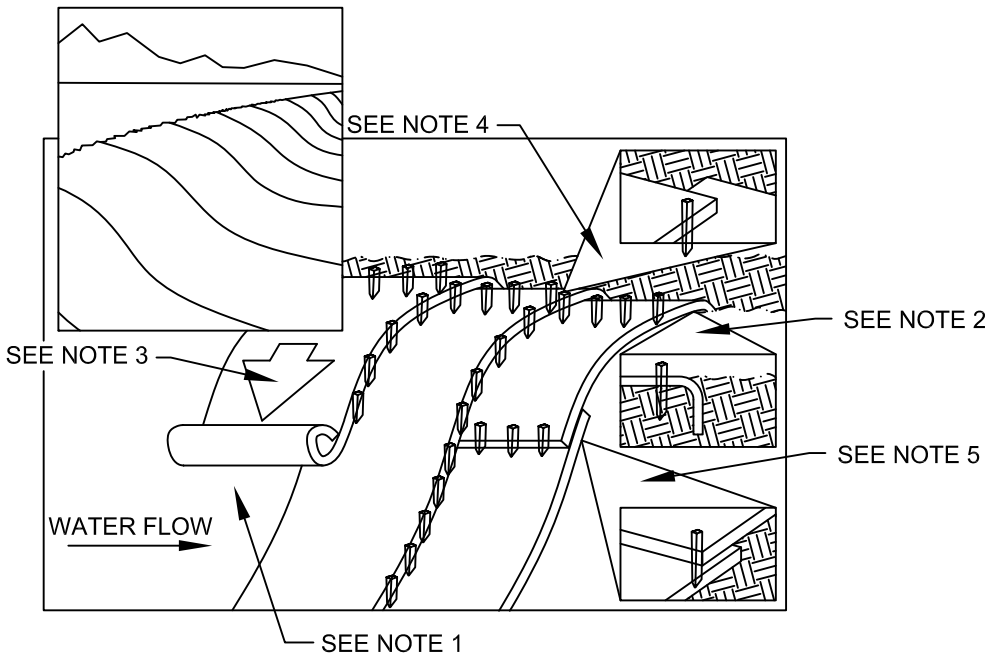


NOTES:

1. PREPARE SOIL BEFORE INSTALLING BLANKET, INCLUDING APPLICATION OF FERTILIZER AND SEED.
2. BEGIN AT THE TOP OF THE SLOPE BY ANCHORING THE BLANKET IN A 12" DEEP x 6" WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER SPIKING.
3. ROLL THE BLANKET DOWN THE SLOPE IN THE DIRECTION OF THE WATER FLOW.
4. THE EDGES OF PARALLEL BLANKET MUST BE SPIKED WITH APPROXIMATELY 3" OVERLAP.
5. WHEN BLANKET MUST BE SPLICED DOWN THE SLOPE, PLACE BLANKET END-OVER-END (SHINGLE STYLE) WITH APPROXIMATELY 6" OVERLAP. SPIKE THROUGH OVERLAPPED AREA, APPROXIMATELY 12" APART.
6. USE WOODEN (BIODEGRADABLE) SPIKES.
7. FOR SPIKE PATTERN GUIDE FOR SLOPE INSTALLATIONS, SEE DETAIL 2. SPIKE PATTERNS ARE A MINIMUM.



DETAIL 2: EROSION CONTROL BLANKET SPIKE PATTERN GUIDE (MINIMUM)



DETAIL 1: EROSION CONTROL BLANKET

NOT TO SCALE

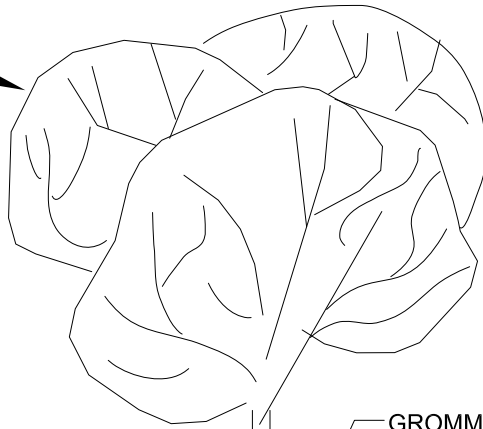
EROSION CONTROL BLANKET DETAILS

DWG. NO. 02480-2.05

CITY of SHERIDAN

NOVEMBER 2015

TREE TYPE PER CONTRACT

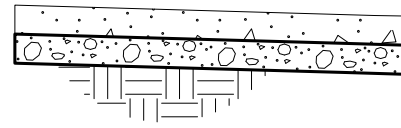


GROMMETED NYLON STRAPS

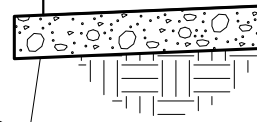
STAKE TREES WITH 3
6FT. STEEL FENCE
T-POSTS MIN. 6" AWAY
FROM ROOT BALL DRIVEN
IN UNDISTURBED SOIL

2" THICK AGED CEDAR WOOD CHIPS
OR BARK EXTENDING 12" BEYOND
EDGE OF PLANTING PIT. KEEP 4" FROM
TREE TRUNK.

BOULEVARD WIDTH
VARIES



PLANTING SOIL MIXTURE:
70% TOPSOIL
20% COMPOST
10% POROUS CERAMIC



BAG AND BURLAP ROOT BALL.
REMOVE ALL TWINE, ROPE, BURLAP
AND WIRE FROM ENTIRE ROOT BALL
AND TRUNK.

UNDISTURBED BACKFILL

PLANTING HOLE DEPTH AT LEAST 6"
BELOW BOTTOM OF TREE BALL

NOTES:

- 1. ALL TREES PLANTED SHALL BE SUITABLE FOR USDA HARDINESS ZONE 4.
- 2. REFERENCE SPECIFICATIONS FOR PROPER TREE INSTALLATION.

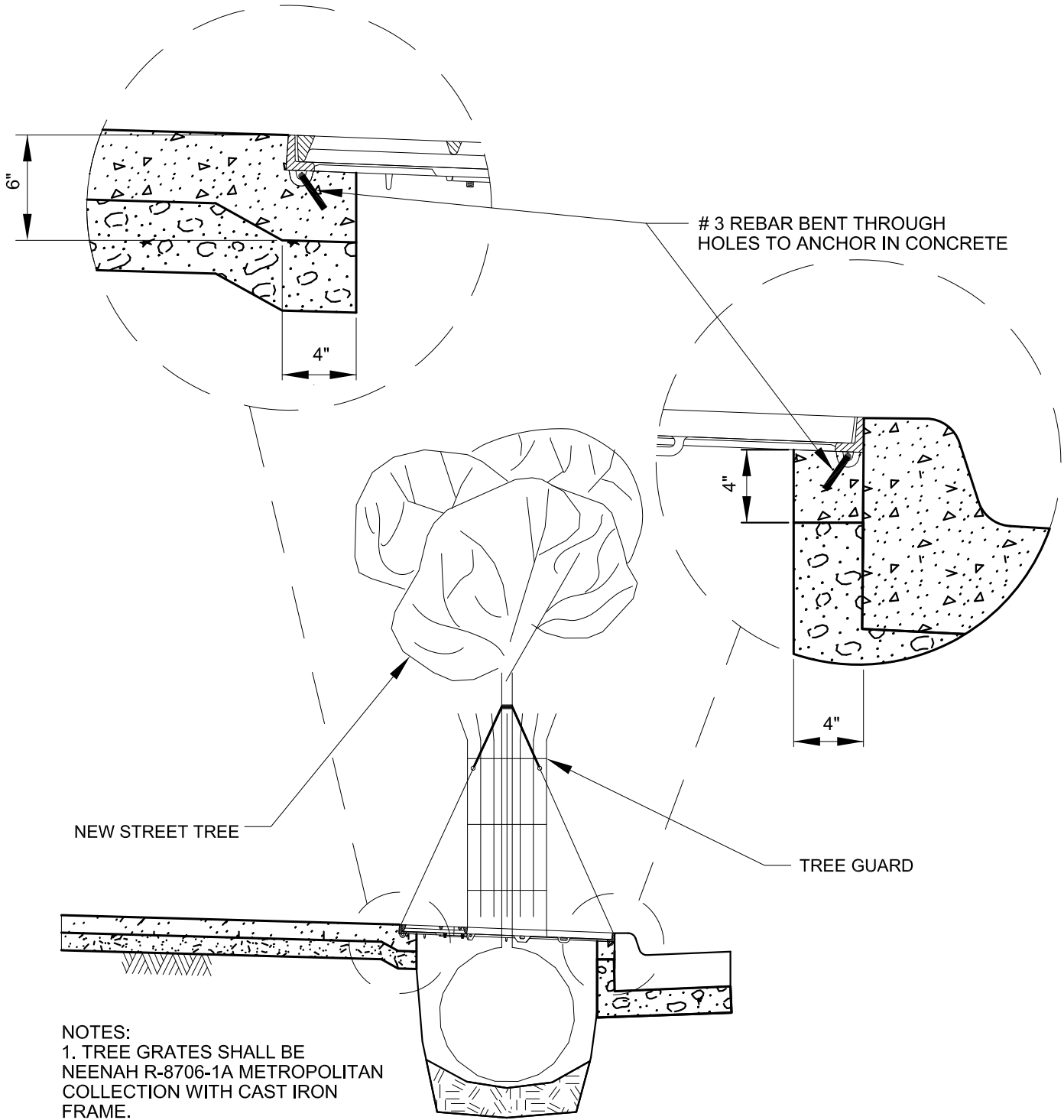
NOT TO SCALE

TREE PLANTING DETAIL

DWG. NO. 02490-3.02A

CITY of SHERIDAN

NOVEMBER 2015



- NOTES:
1. TREE GRATES SHALL BE NEENAH R-8706-1A METROPOLITAN COLLECTION WITH CAST IRON FRAME.
 2. TREE GUARD STYLE TO BE DETERMINED BY OWNER.
 3. REFERENCE SPECIFICATIONS FOR PROPER TREE INSTALLATION.

NOT TO SCALE

TREE GRATE DETAIL

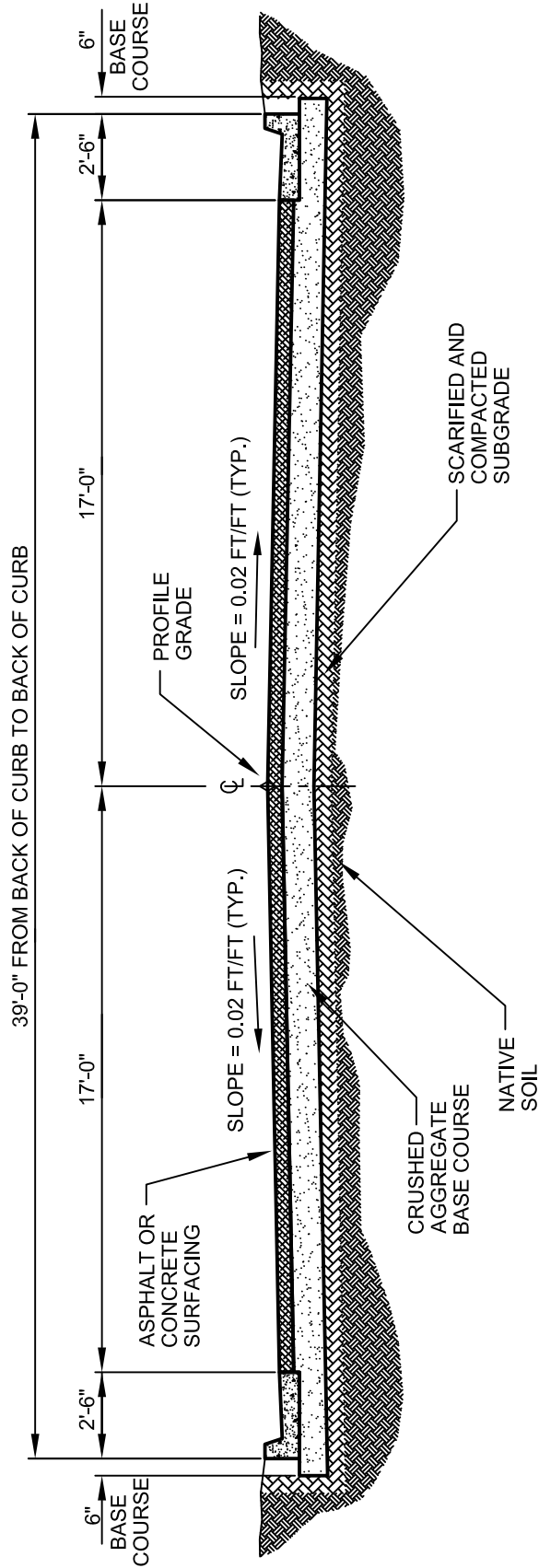
DWG. NO. 02490-3.02C

CITY of SHERIDAN

NOVEMBER 2015

NOTES:

1. TYPICAL SECTION SHOWN IS 39'-0" FROM BACK OF CURB TO BACK OF CURB, WHICH IS USED ON MOST MINOR COLLECTORS AND LOCAL STREETS. SEE DRAWINGS FOR PROJECT-SPECIFIC CHANGES.
2. SEE DRAWINGS OR SPECIAL PROVISIONS FOR TYPE OF SURFACING, THICKNESS OF SURFACING, AND THICKNESS OF CRUSHED AGGREGATE BASE COURSE.



TYPICAL STREET CROSS SECTION

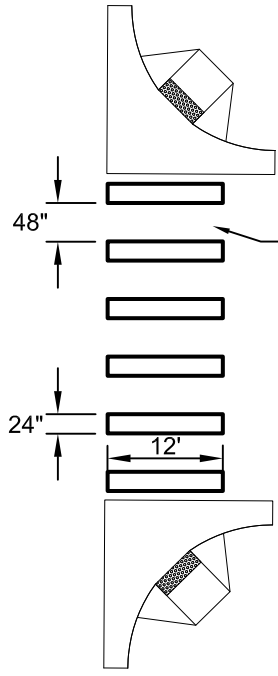
NO SCALE

TYPICAL STREET CROSS SECTION DETAIL

DWG. NO. 02525/03040

CITY of SHERIDAN

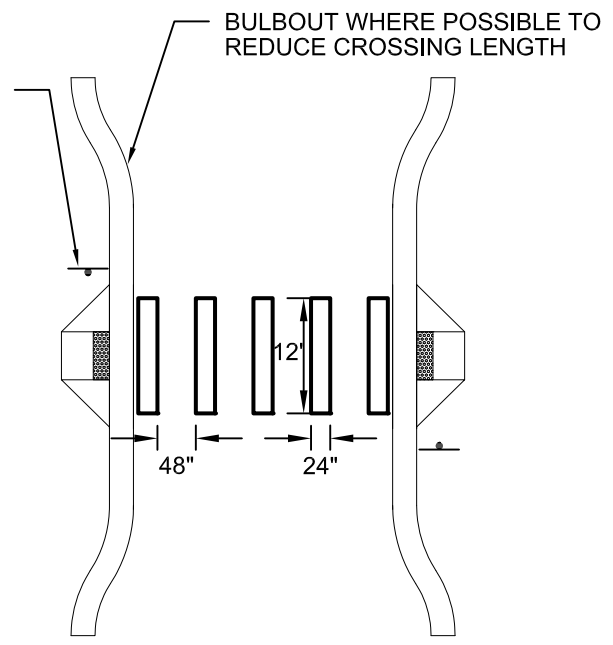
NOVEMBER 2015



WARNING SIGN, TYP. SEE NOTES

PLACE MARKINGS TO AVOID WHEELPATHS, IF POSSIBLE

INTERSECTION
TYPICAL LAYOUT



BULBOUT WHERE POSSIBLE TO REDUCE CROSSING LENGTH

MID-BLOCK
TYPICAL LAYOUT

NOTES:

1. THE FOLLOWING MEASURES ARE RECOMMENDED AT MID-BLOCK CROSSINGS BECAUSE THEY ARE NOT TYPICALLY EXPECTED BY ROADWAY USERS: PARKING PROHIBITIONS AND WARNING SIGNS TO INCREASE VISIBILITY; BULBOUTS OR SIMILAR GEOMETRIC MODIFICATIONS TO REDUCE THE CROSSWALK LENGTH.
2. SEE 02605-3.01d and 02605-3.01e AND SPECIFICATION SECTION 02605 FOR WARNING SIGN DETAILS.

NOT TO SCALE

PEDESTRIAN CROSSWALK DETAIL

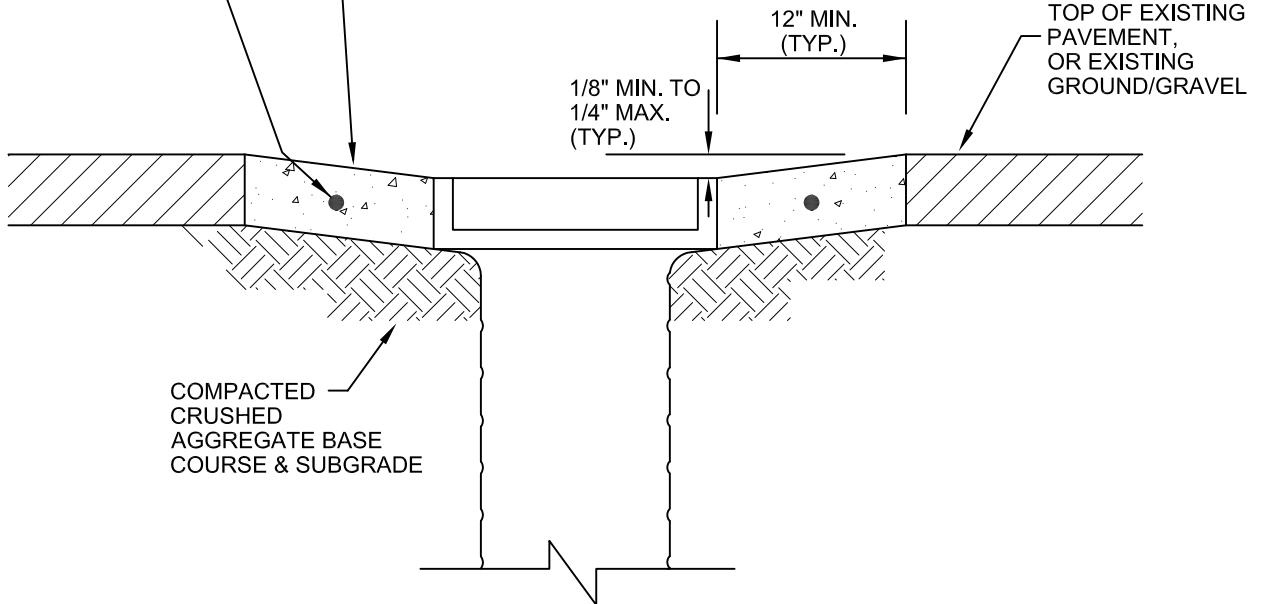
DWG. NO. 02530-3.04

CITY of SHERIDAN

NOVEMBER 2015

REINFORCED CONCRETE COLLAR
(WHERE REQUIRED--SEE NOTE 2)

#4 REBAR (TYP.)
(SEE 02722-3.02 FOR
PLACEMENT)



NOTES:

1. ADJUST WATER VALVE BOXES UPWARD OR DOWNWARD AS REQUIRED.
2. WHERE REQUIRED, CONCRETE COLLAR TO BE PLACED AS SHOWN AND AS PER DWG. NO. 02722-3.02. SEE STANDARD SPECIFICATION SECTION 02570 FOR GUIDELINES ON CONCRETE COLLAR REQUIREMENTS.
3. NO ADDITIONAL PAYMENT SHALL BE MADE FOR ADJUSTMENT OF NEW VALVE BOXES TO FINAL GRADE.

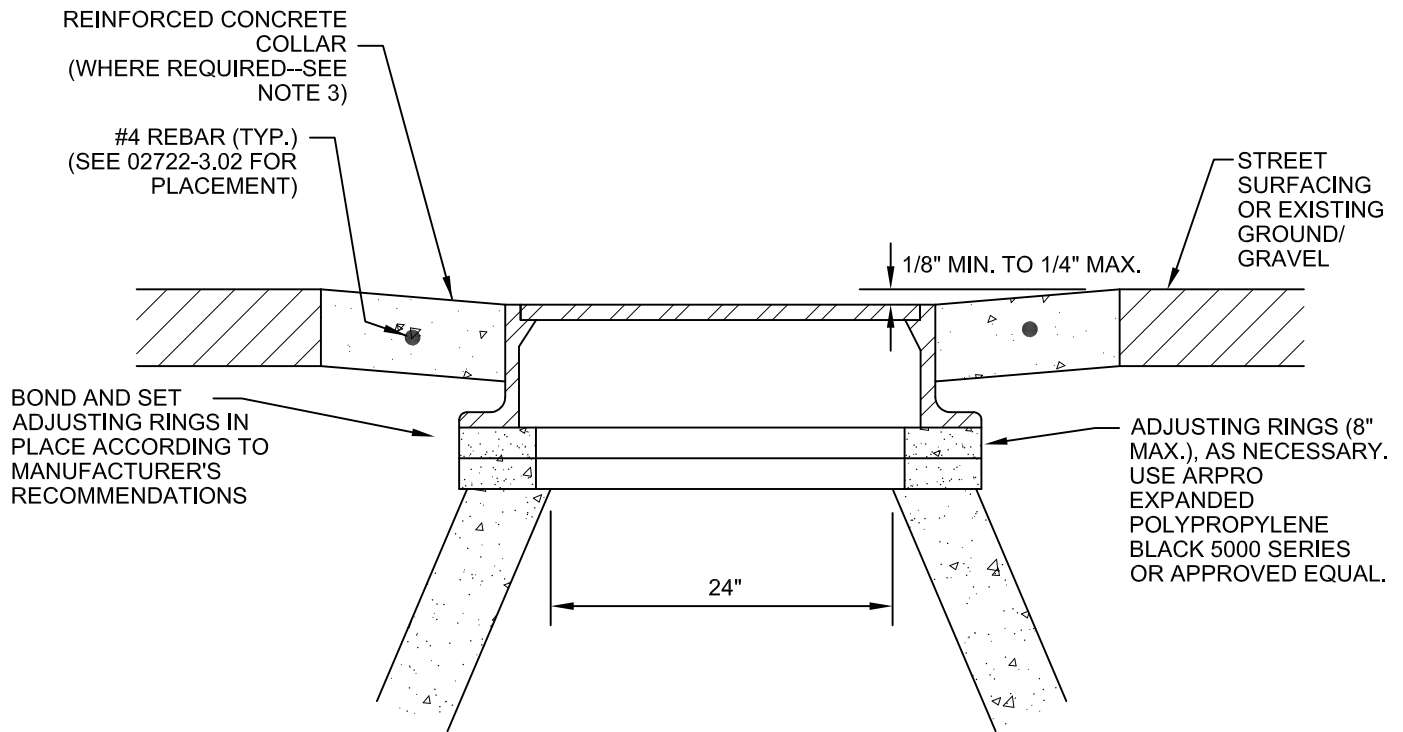
NOT TO SCALE

**WATER VALVE BOX
ADJUSTMENT DETAIL**

DWG. NO. 02570-3.01a

CITY of SHERIDAN

NOVEMBER 2015



NOTES:

1. ADJUST MANHOLES UPWARD WITH ADJUSTING RINGS UNDER FRAMES. CONCRETE ADJUSTING RINGS SHALL NOT BE USED.
2. ADJUST MANHOLES DOWNWARD BY REMOVING CONE AND BARREL SECTIONS, AS NECESSARY, AND REPLACING WITH SECTIONS OF HEIGHT REQUIRED TO MATCH GRADE.
3. CONCRETE COLLAR TO BE PLACED AS SHOWN AND AS PER DWG. NO. 02722-3.02 WHERE REQUIRED. SEE STANDARD SPECIFICATION SECTIONS 02570 AND 02722 FOR GUIDANCE ON CONCRETE COLLAR REQUIREMENTS.
4. NO ADDITIONAL PAYMENT SHALL BE MADE FOR ADJUSTMENT OF NEW MANHOLES TO FINAL GRADE.
5. SLOPE MANHOLE FRAMES AS REQUIRED TO MATCH SLOPE OF STREET.
6. DO NOT GROUT SMOOTH INTERNALLY.

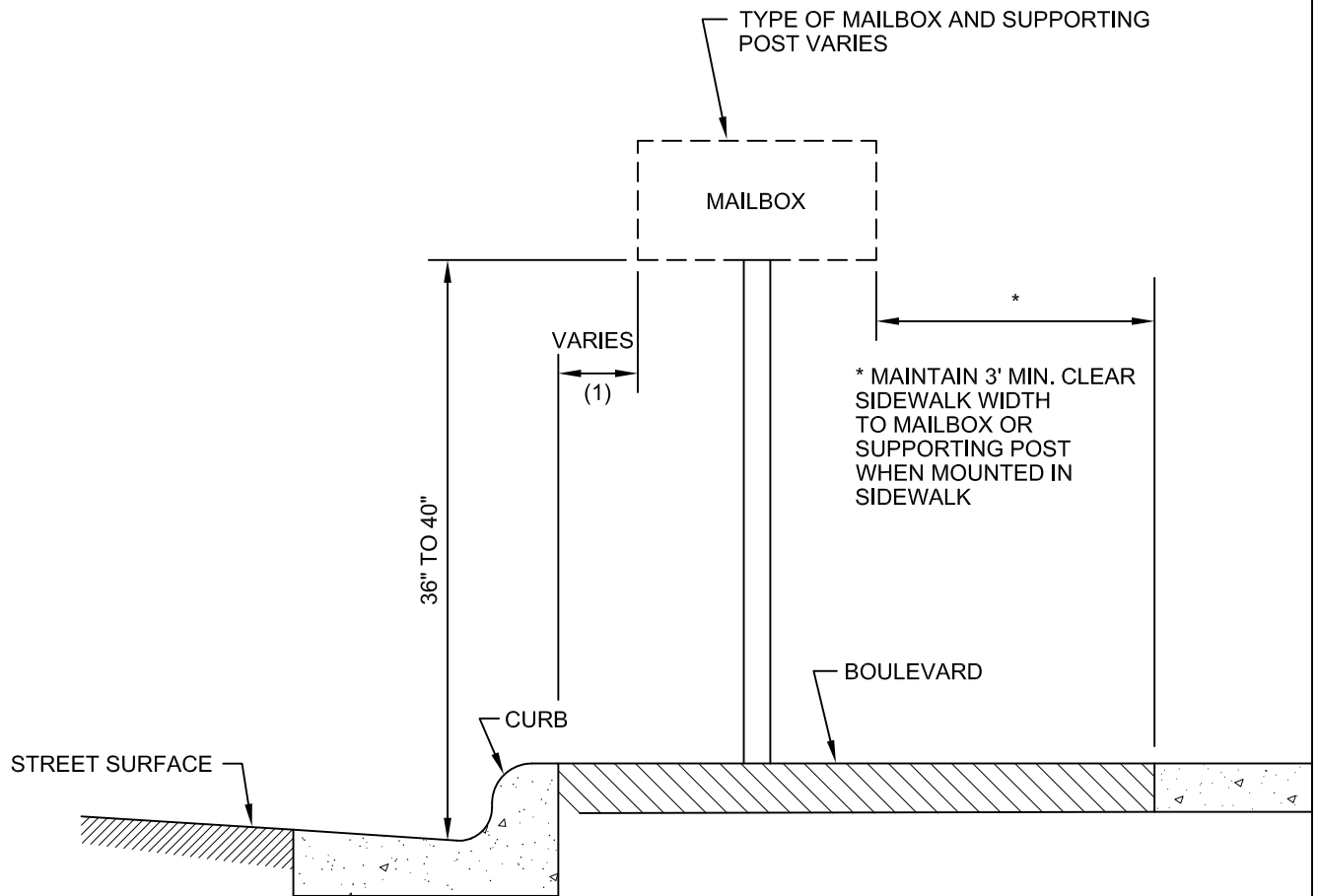
NOT TO SCALE

**MANHOLE ADJUSTMENT
DETAIL**

DWG. NO. 02570-3.01b

CITY of SHERIDAN

NOVEMBER 2015



NOTES:

1. POSTMASTER GENERAL TO DETERMINE LOCATION OF MAILBOX.

NOT TO SCALE

**MAILBOX MOUNTING FOR CURBLINE
DELIVERY DETAIL (NO SIDEWALK)**

DWG. NO. 02605-3.01a

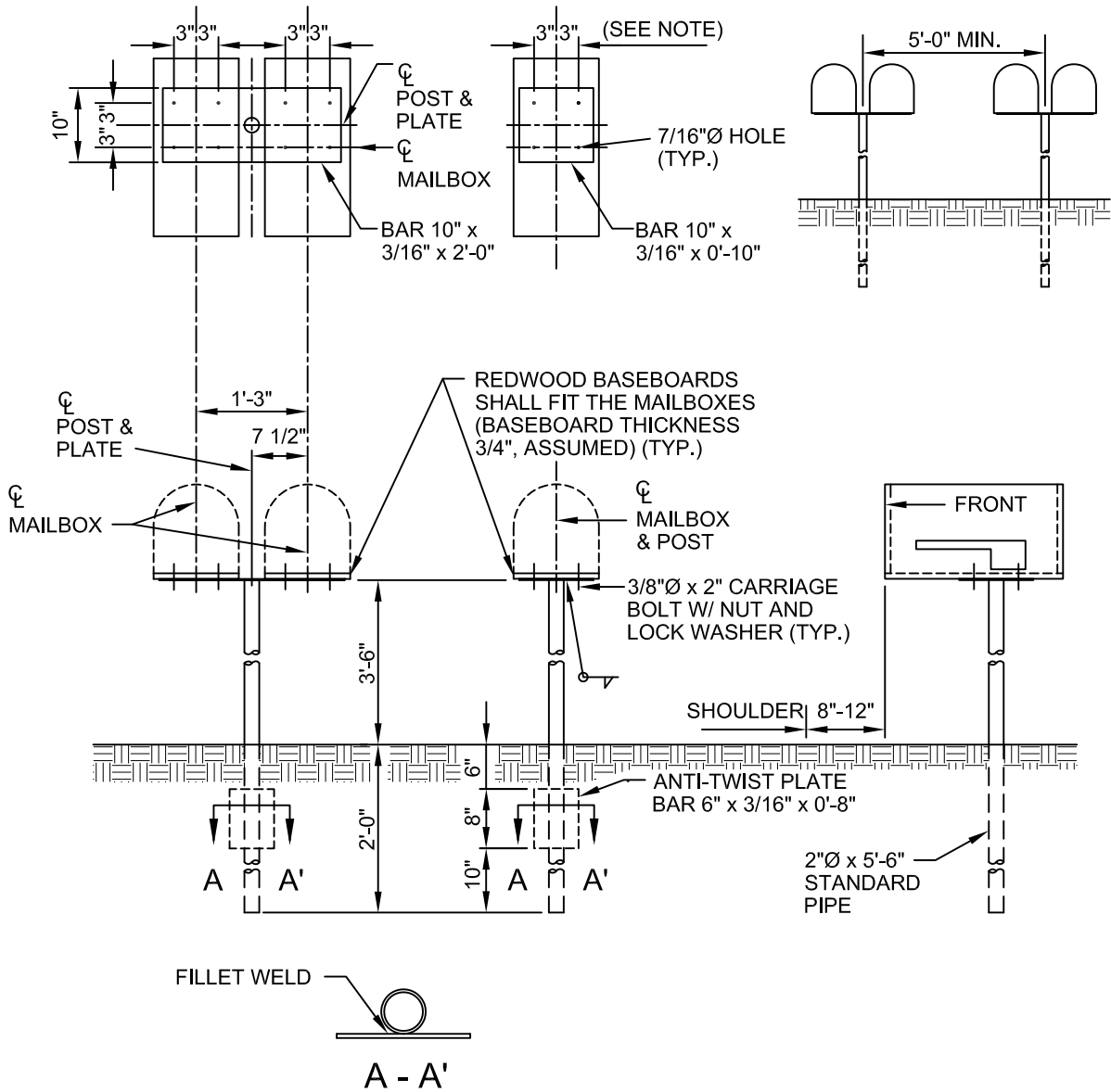
CITY of SHERIDAN

NOVEMBER 2015

DOUBLE INSTALLATION

SINGLE INSTALLATION

MULTIPLE INSTALLATION



NOTES:

1. CONTACT POSTMASTER GENERAL TO DETERMINE MAILBOX LOCATION AND SIZING.
2. DIMENSIONS MAY REQUIRE ADJUSTMENT, DEPENDING UPON MAILBOX SIZE USED. DIMENSIONS SHOWN ARE FOR AN 11 1/2" WIDE MAILBOX.

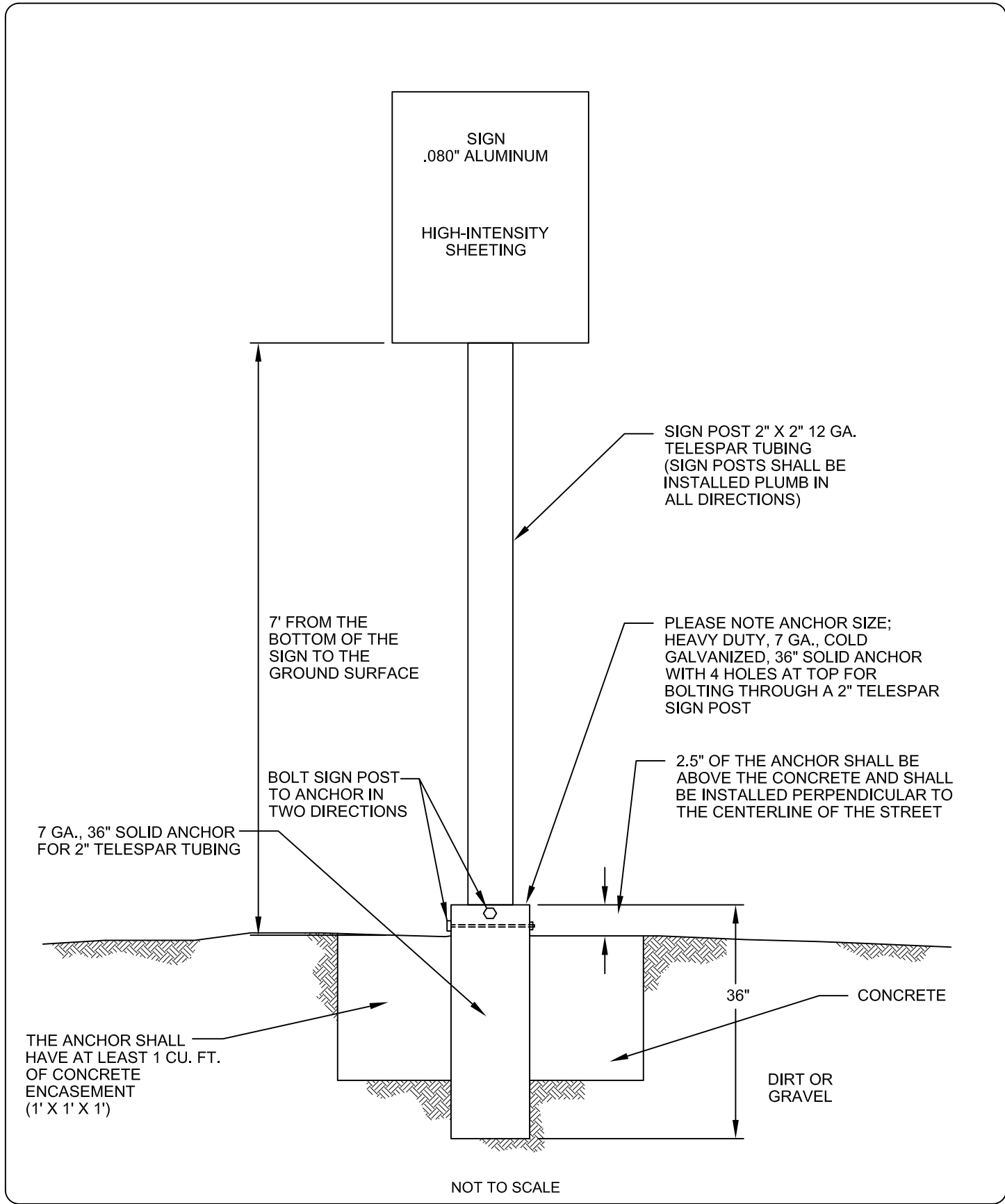
NOT TO SCALE

MAILBOX DETAILS

DWG. NO. 02605-3.01b

CITY of SHERIDAN

NOVEMBER 2015



SIGN INSTALLATION DETAIL

DWG. NO.	02605-3.01c
CITY of SHERIDAN	
NOVEMBER 2015	

SOLAR PANEL, BATTERY AND ELECTRONICS; COLOR=YELLOW (CARMANAH R-829C OR EQUIVALENT) IF CONNECTION TO DIRECT POWER IS NOT AVAILABLE

POLE CAP (PELCO SE-3037 OR EQUIVALENT)

12" YELLOW LED SIGNAL HEAD IN YELLOW HOUSING, SINGLE SIGNAL SECTION W/ TUNNEL VISOR, ALL BLACK TOP & BOTTOM BRACKETS (TYP. x 3)

U-BOLT SIGN CLAMP ASSEMBLY WITH 5/16" SIGN MOUNTING HARDWARE (PELCO SH-0206 OR EQUIVALENT).

SIGN PANEL-S5-1 * (SEE SIGN DETAIL, THIS SHEET) (AS CALLED FOR PER LOCATION) HIGH-INTENSITY SHEETING WITH FLOURESCENT YELLOW/GREEN. SIGNAGE SHALL BE INSTALLED ON BOTH SIDES OF THE FLASHER ASSEMBLY POLE

NEMA 3R ENCLOSURE FOR LIGHTING CONTROLS

12' MINIMUM
15' MAXIMUM

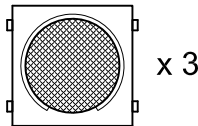
STEEL POLE, TYPE I

7'

IRON SQUARE BASE, GALVANIZED W/ IRON DOOR (PELCO PB-5308 OR EQUIVALENT), COMPLETE WITH CAST-IN-PLACE ANCHOR BOLTS

FINISHED GRADE

SIGNAL HEAD DETAIL (FRONT VIEW)



12" YELLOW LED WITH TUNNEL VISOR

20 LF, 5/8" DIAMETER, COPPER CLAD GROUND ROD, CONTINUOUS OR ARRAY

1" CHAMFER

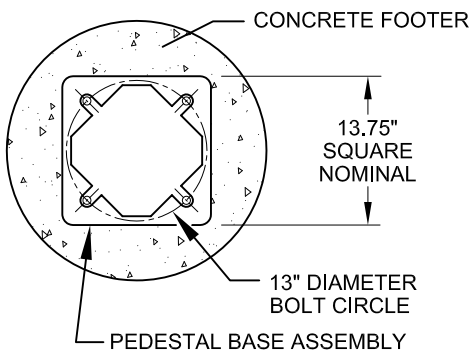
ANCHOR BOLTS, SET OF FOUR, 3/4" DIAMETER BY 18" LENGTH (PELCO PB-5306 OR EQUIVALENT)

SCHEDULE 40 PVC CONDUIT. QUANTITY AND SIZE AS SHOWN ON DETAILS.

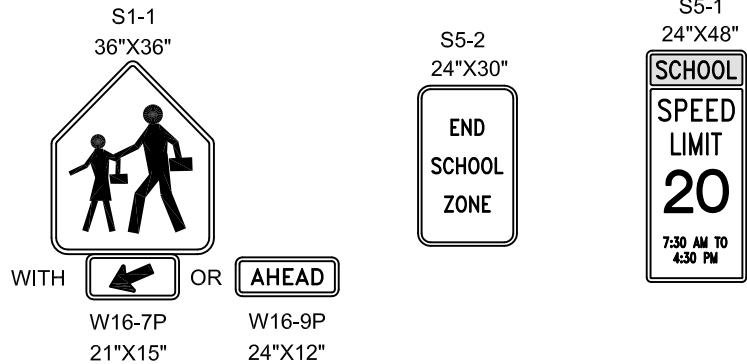
1.5' DIAMETER SONOTUBE REINFORCED CONCRETE BASE, 48" DEPTH, CLASS B CONCRETE

NOT TO SCALE

BASE PLATE DETAIL (PLAN VIEW)



SIGN DETAIL



SCHOOL ZONE ASSEMBLY DETAIL

DWG. NO. 02605-3.01d

CITY of SHERIDAN

NOVEMBER 2015

SOLAR PANEL
(IF CONNECTION
TO DIRECT
POWER IS NOT
AVAILABLE)

RECTANGULAR RAPID FLASHING BEACON;
BEACON SHALL PROVIDE > 1000' DAYLIGHT
DISTANCE VISIBILITY
(TAPCO RRFB-XL OR EQUIVALENT)

SIGNS SHALL BE HIGH INTENSITY
FLUORESCENT YELLOW-GREEN;
SIGNAGE SHALL BE INSTALLED
ON BOTH SIDES OF THE FLASHER /
PEDESTRIAN SIGNAL POLE

NOTE:
ELECTRICAL
CONTRACTOR TO
PROVIDE SIGNAGE.
COORDINATE WITH THE
CITY FOR EXACT SIZES,
TYPES AND COLORS.

NOTE:
FINISHES SHALL BE
BLACK TO MATCH FINISH
OF DECORATIVE LIGHT
POLE.

BATTERY FOR
SOLAR PANEL
(IF CONNECTION
TO DIRECT
POWER IS NOT
AVAILABLE)

COMPONENT
PRODUCTS 4-1/2"
O.D., 12'-0" (17'-0" W/
SOLAR PANEL
OPTION),
SCHEDULE 80
ALUMINUM POLE

7'-0"

PUSHBUTTON
STATION, TAPCO
XAV2-LED

COMPONENT PRODUCTS
SQUARE ALUMINUM BASE
#CPI-BAS-1PX

3'-6"

NOTE:

SIGNAGE SHALL BE INSTALLED ON BOTH SIDES
OF THE PEDESTRIAN SIGNAL POLE.

NOT TO SCALE

FLASHER / PEDESTRIAN SIGNAL POLE DETAIL

DWG. NO. 02605-3.01e

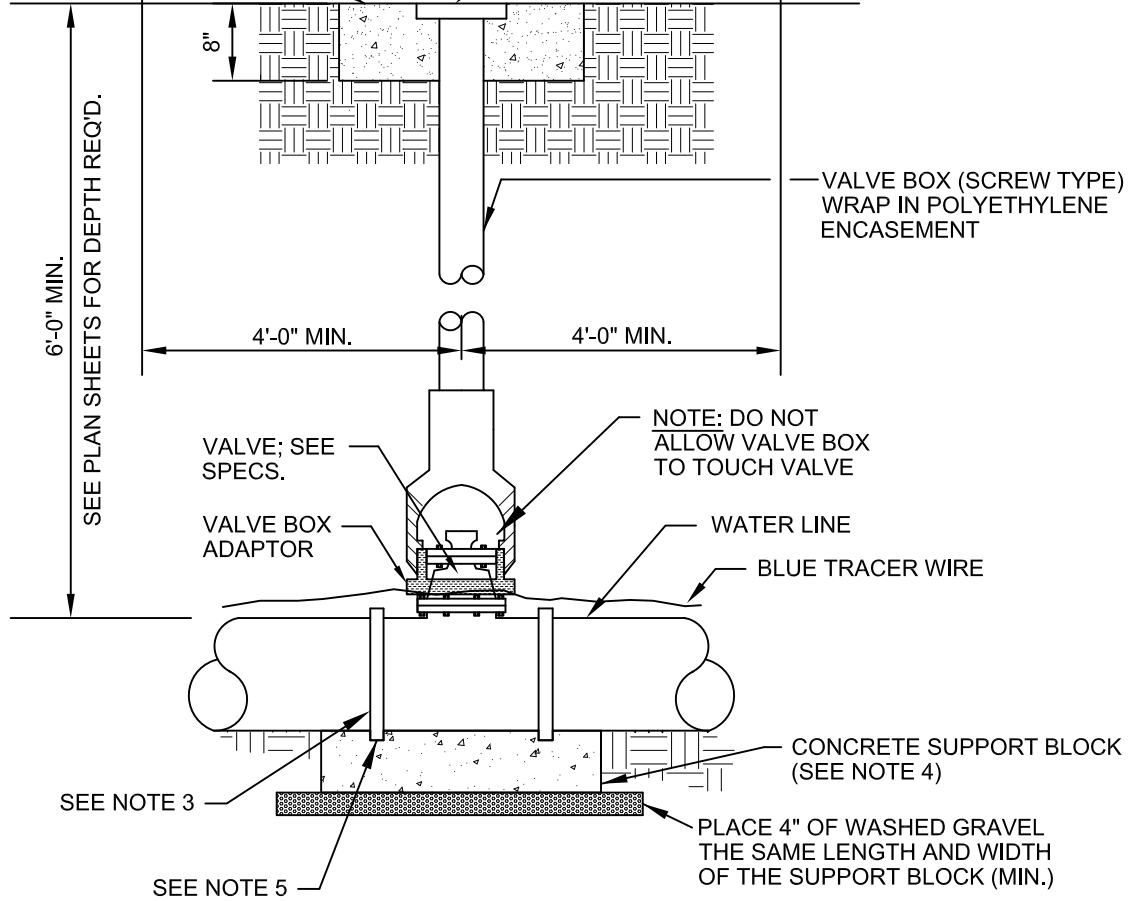
CITY of SHERIDAN

NOVEMBER 2015

REINFORCED CONCRETE COLLAR AROUND VALVE BOX (WHERE REQUIRED--SEE DWG NO. 02722-3.02)

BACKFILL TO BE HAND-PLACED & HAND-COMPACTED

WORD "WATER" ON TOP



NOTES:

1. ALL BOLTS, NUTS & WASHERS ARE TO BE SERIES 300 STAINLESS STEEL.
2. ON GRAVELLED OR DIRT ROADS, OR WHERE REQUIRED AS A CORRECTIVE MEASURE, TOP OF VALVE BOX SHALL BE PLACED IN REINFORCED CONCRETE COLLAR. SEE DRAWINGS NO. 02570-3.01a AND 02722-3.02 FOR DETAILS.
3. ALL VALVES ARE TO BE RESTRAINED TO PIPE.
4. CONCRETE SUPPORT BLOCKS MAY BE PRE-CAST OR Poured IN PLACE; SUPPORT BLOCKS SHALL BE CONSTRUCTED OF 4000 PSI CONCRETE (MIN.); FOR VALVES 12" AND SMALLER, SUPPORT BLOCKS SHALL BE 18" X 18" X 6" IN SIZE; FOR VALVES LARGER THAN 12", SUPPORT BLOCK DIMENSIONS SHALL BE DETERMINED BY THE ENGINEER.
5. IF CONCRETE SUPPORT BLOCKS ARE Poured IN PLACE, THEY SHALL BE FORMED; USE POLYETHYLENE TO SEPARATE FITTING FROM THE CONCRETE.

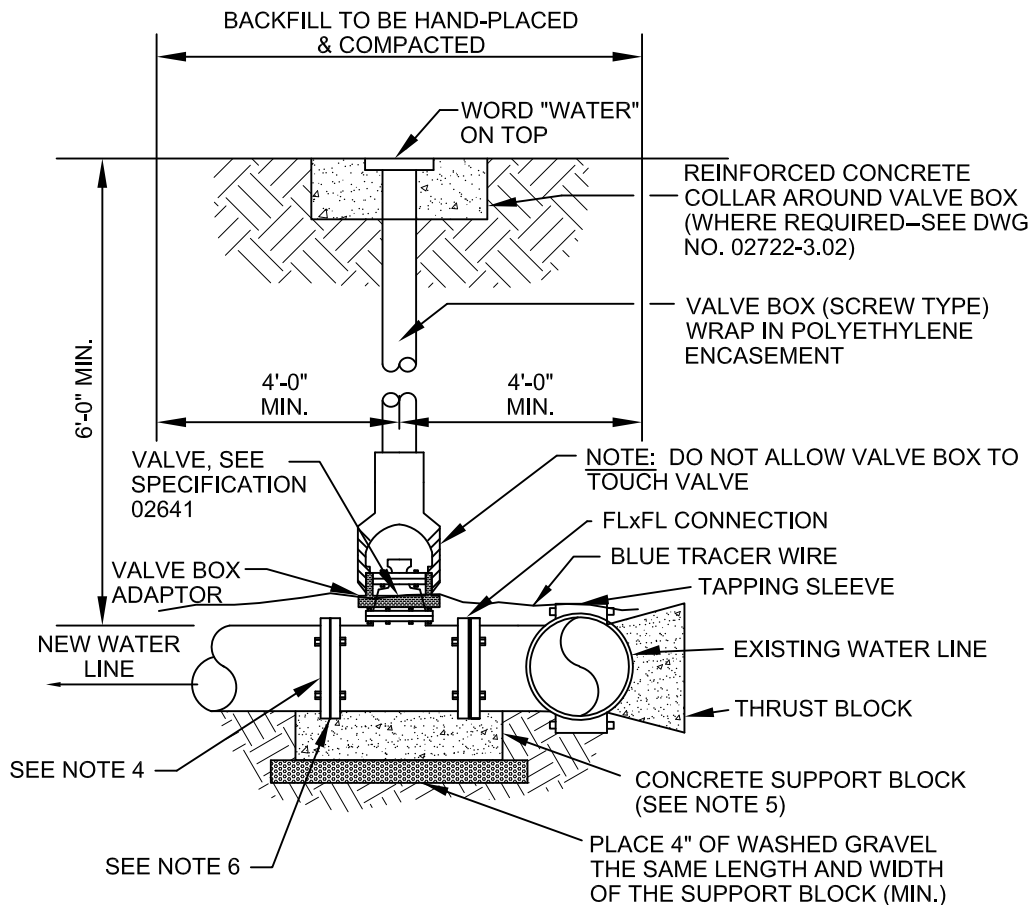
NOT TO SCALE

WATER LINE VALVE AND BOX DETAIL

DWG. NO. 02641-2.01B

CITY of SHERIDAN

NOVEMBER 2015



NOTES:

1. ALL BOLTS, NUTS & WASHERS ARE TO BE SERIES 300 STAINLESS STEEL.
2. BEGIN TRACER WIRE BY WRAPPING AROUND EXISTING WATER LINE.
3. ON GRAVELLED OR DIRT ROADS, OR WHERE REQUIRED AS A CORRECTIVE MEASURE, TOP OF VALVE BOX SHALL BE PLACED IN REINFORCED CONCRETE COLLAR. SEE DRAWINGS NO. 02570-3.01a AND 02722-3.02 FOR DETAILS.
4. ALL VALVES ARE TO BE RESTRAINED TO PIPE.
5. CONCRETE SUPPORT BLOCKS MAY BE PRE-CAST OR Poured IN PLACE; SUPPORT BLOCKS SHALL BE CONSTRUCTED OF 4000 PSI CONCRETE (MIN.); FOR VALVES 12" AND SMALLER, SUPPORT BLOCKS SHALL BE 18" X 18" X 6" IN SIZE; FOR VALVES LARGER THAN 12", SUPPORT BLOCK DIMENSIONS SHALL BE DETERMINED BY THE ENGINEER.
6. IF CONCRETE SUPPORT BLOCKS ARE Poured IN PLACE, THEY SHALL BE FORMED; USE POLYETHYLENE TO SEPARATE FITTING FROM THE CONCRETE.

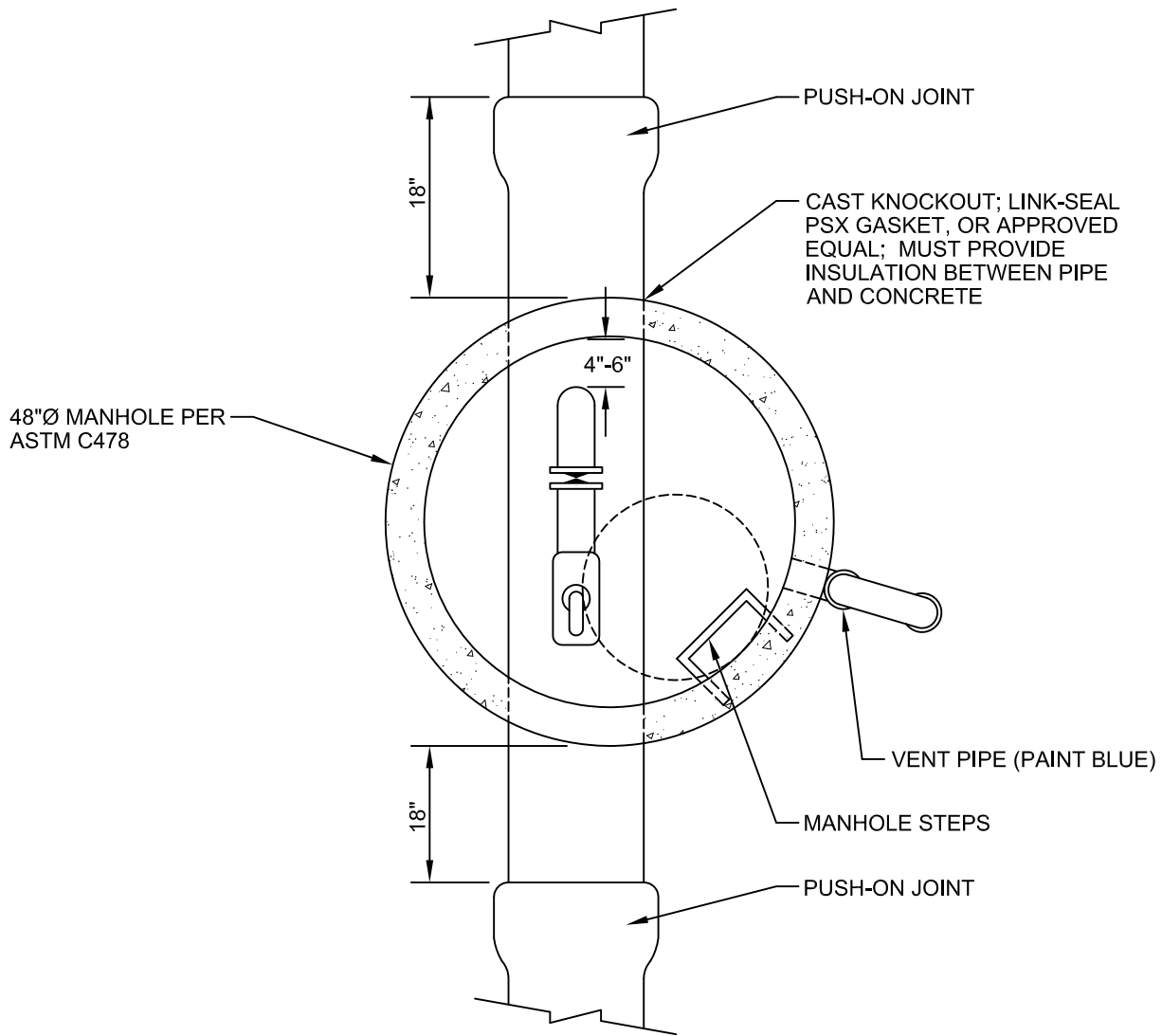
NOT TO SCALE

**TAPPING SLEEVE AND VALVE CONNECTION
TO EXISTING WATER LINE DETAIL**

DWG. NO. 02641-2.01D

CITY of SHERIDAN

NOVEMBER 2015



NOTES:

1. PROVIDE A 6' x 6' (3/4" THICK) INSULATION BLANKET FOR EACH AIR RELEASE / VACUUM RELIEF VALVE.
2. GUARD POSTS REQUIRED ON AIR RELEASE / VACUUM RELIEF VALVES AS SHOWN IN PLAN DRAWINGS.
3. FOR IDENTIFICATION OF INTERNAL PIPING AND VALVES, SEE DETAILS 02641-2.02B, C, D AND E.

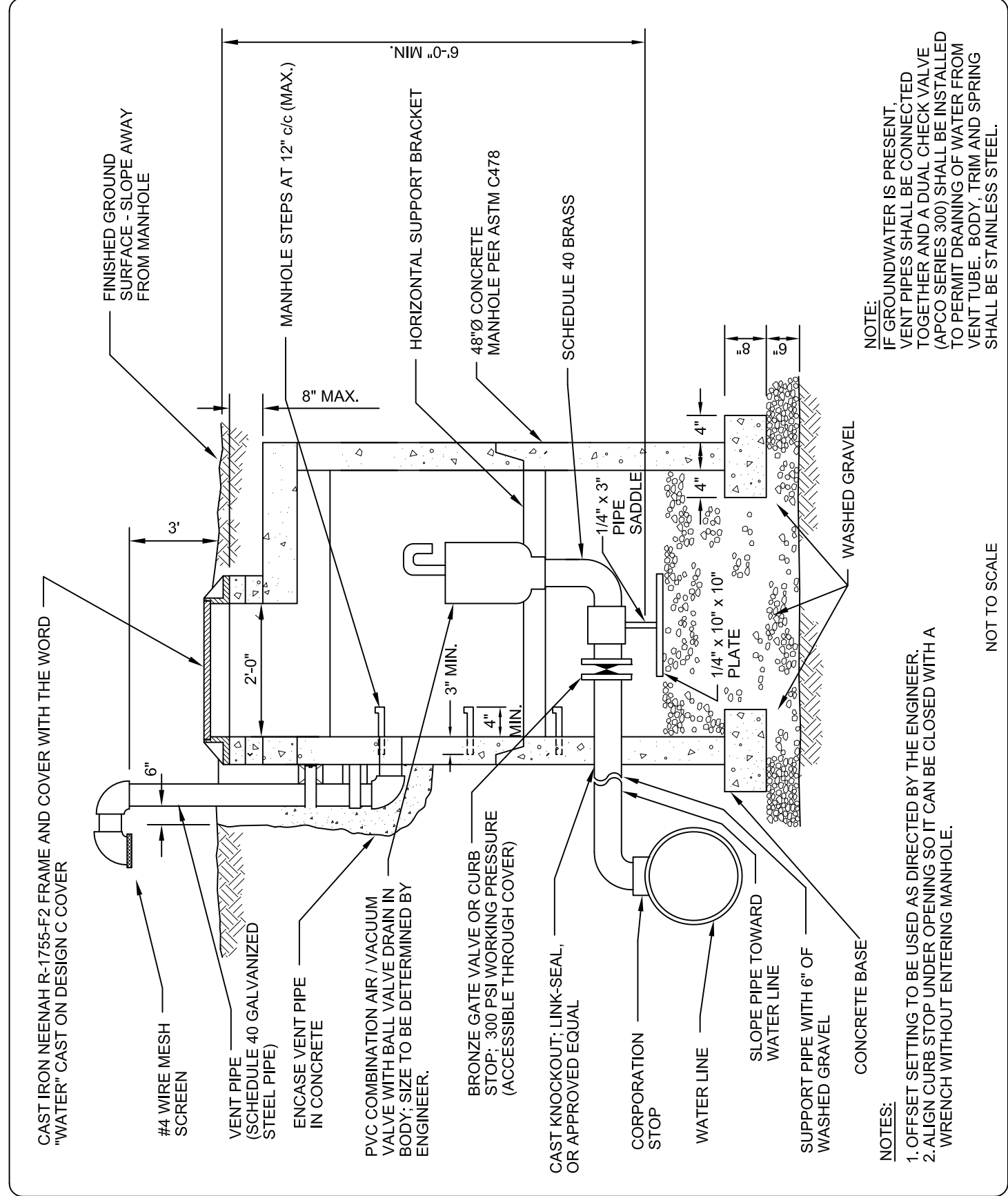
NOT TO SCALE

**AIR RELEASE / VACUUM RELIEF VALVE
AND MANHOLE DETAIL - PLAN**

DWG. NO. 02641-2.02a

CITY of SHERIDAN

NOVEMBER 2015



NOTE:
 IF GROUNDWATER IS PRESENT,
 VENT PIPES SHALL BE CONNECTED
 TOGETHER AND A DUAL CHECK VALVE
 (APCO SERIES 300) SHALL BE INSTALLED
 TO PERMIT DRAINING OF WATER FROM
 VENT TUBE. BODY, TRIM AND SPRING
 SHALL BE STAINLESS STEEL.

NOTES:
 1. OFFSET SETTING TO BE USED AS DIRECTED BY THE ENGINEER.
 2. ALIGN CURB STOP UNDER OPENING SO IT CAN BE CLOSED WITH A
 WRENCH WITHOUT ENTERING MANHOLE.

NOT TO SCALE

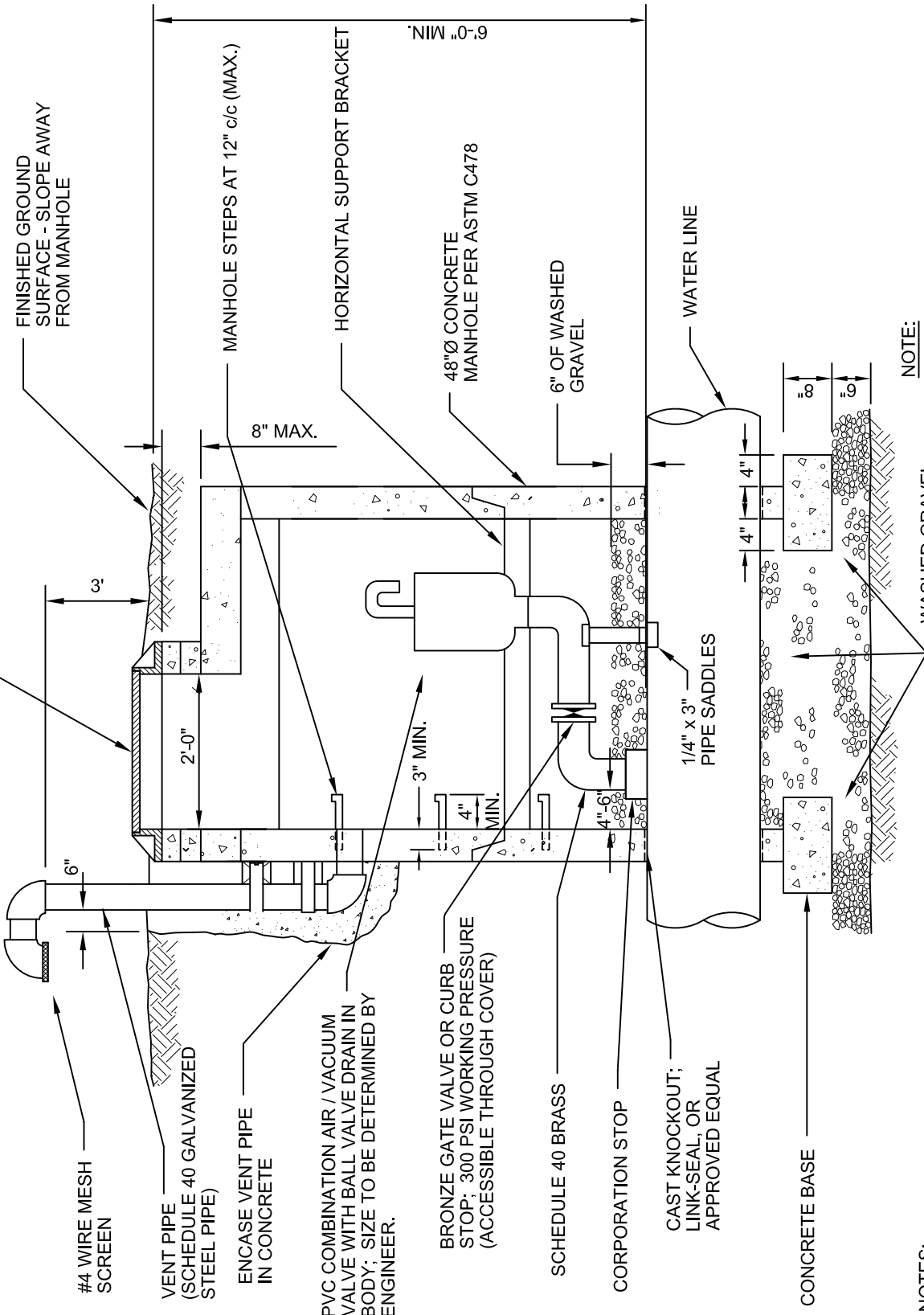
**AIR RELEASE / VACUUM RELIEF VALVE
 AND MANHOLE DETAIL - W/ OFFSET SETTING**

DWG. NO. 02641-2.02b

CITY of SHERIDAN

NOVEMBER 2015

CAST IRON NEENAH R-1755-F2 FRAME AND COVER WITH THE WORD "WATER" CAST ON DESIGN C COVER



FINISHED GROUND SURFACE - SLOPE AWAY FROM MANHOLE

MANHOLE STEPS AT 12" c/c (MAX.)

HORIZONTAL SUPPORT BRACKET

1/4" = 3'

48"Ø CONCRETE MANHOLE PER ASTM C478

6" OF WASHED GRAVEL

WATER LINE

8" MAX.

VENT PIPE (SCHEDULE 40 GALVANIZED STEEL PIPE)

ENCASE VENT PIPE IN CONCRETE

PVC COMBINATION AIR / VACUUM VALVE WITH BALL VALVE DRAIN IN BODY; SIZE TO BE DETERMINED BY ENGINEER.

BRONZE GATE VALVE OR CURB STOP; 300 PSI WORKING PRESSURE (ACCESSIBLE THROUGH COVER)

SCHEDULE 40 BRASS

CORPORATION STOP

CAST KNOCKOUT; LINK-SEAL OR APPROVED EQUAL

1/4" x 3" PIPE SADDLES

CONCRETE BASE

WASHED GRAVEL

NOTE:

IF GROUNDWATER IS PRESENT, VENT PIPES SHALL BE CONNECTED TOGETHER AND A DUAL CHECK VALVE (APCO SERIES 300) SHALL BE INSTALLED TO PERMIT DRAINING OF WATER FROM VENT TUBE. BODY, TRIM AND SPRING SHALL BE STAINLESS STEEL.

NOTES:

1. CONVENTIONAL SETTING TO BE AS DIRECTED BY THE ENGINEER.
2. ALIGN CURB STOP UNDER OPENING SO IT CAN BE CLOSED WITH A WRENCH WITHOUT ENTERING MANHOLE.

NOT TO SCALE

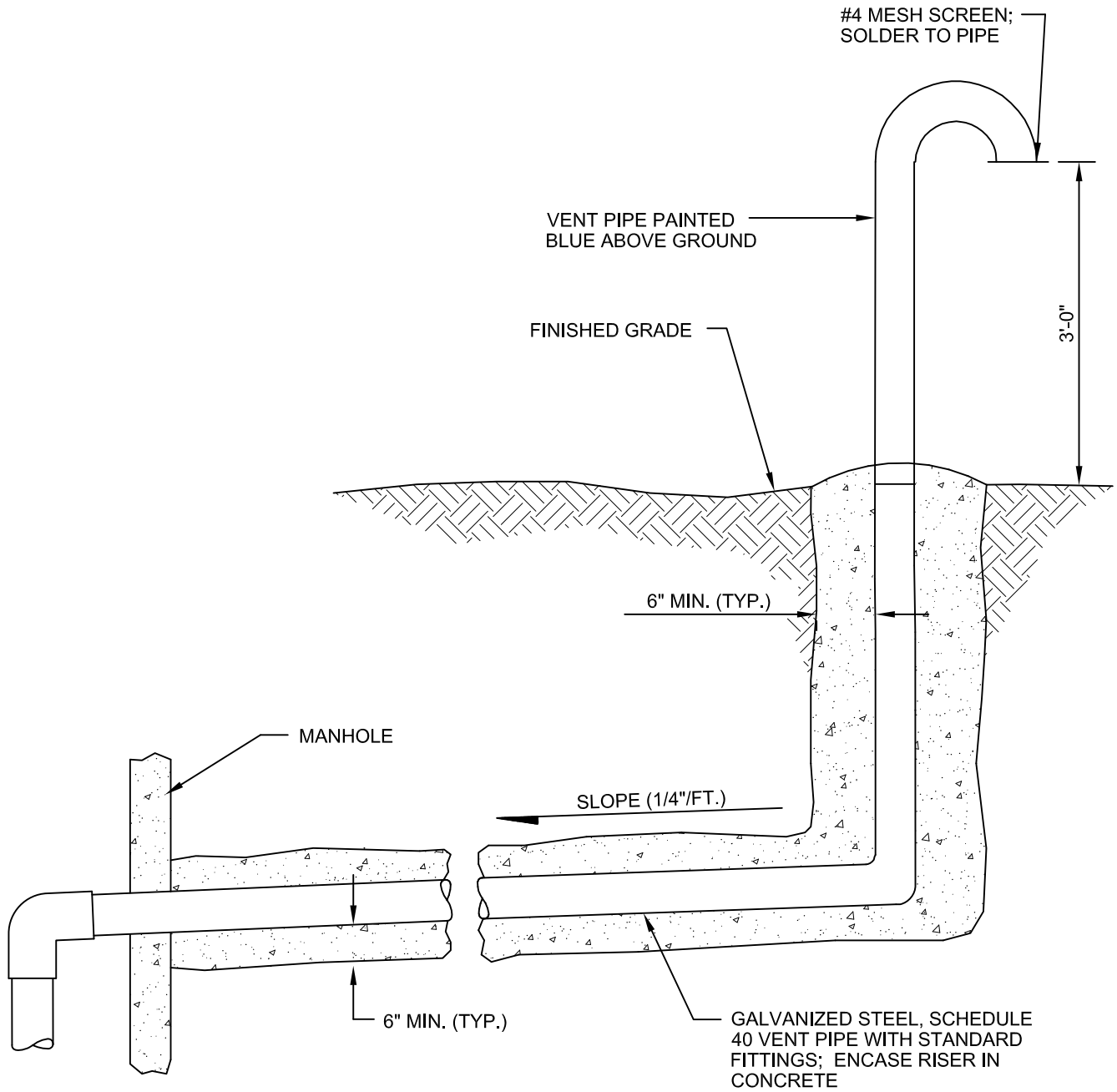
AIR RELEASE / VACUUM RELIEF VALVE AND MANHOLE DETAIL - W/ CONVENTIONAL SETTING

DWG. NO.

02641-2.02c

CITY of SHERIDAN

NOVEMBER 2015



NOT TO SCALE

VENT PIPE DETAIL FOR LOCATIONS
WHERE OFFSET VENT PIPE IS REQUIRED

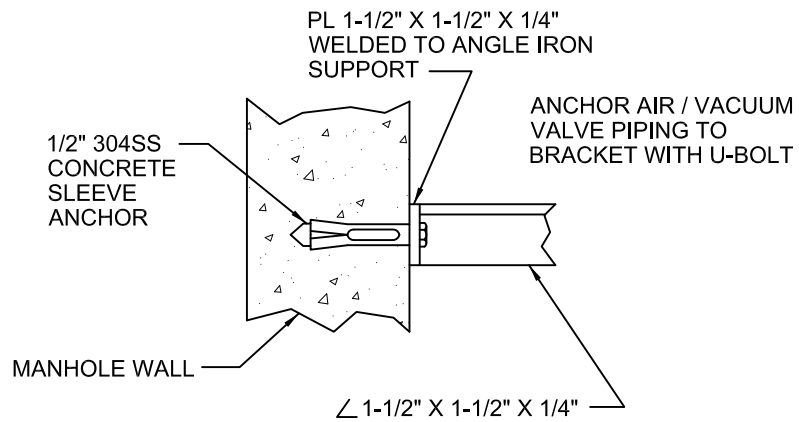
DWG. NO. 02641-2.02d

CITY of SHERIDAN

NOVEMBER 2015

**SCHEDULE FOR
AIR VALVE, VENTING AND TAPPING PIPE SIZE**

DIAMETER OF WATER LINE (IN)	DIAMETER OF AIR VALVE (IN)	DIAMETER OF VENT PIPE (IN)	BRONZE GATE VALVE OR CURB STOP (IN)	DIAMETER OF TAPPING PIPE (IN)
6	1	2	1	1
8 & 10	2	3	2	2
12 & 16	3	3	3	3



HORIZONTAL SUPPORT BRACKET

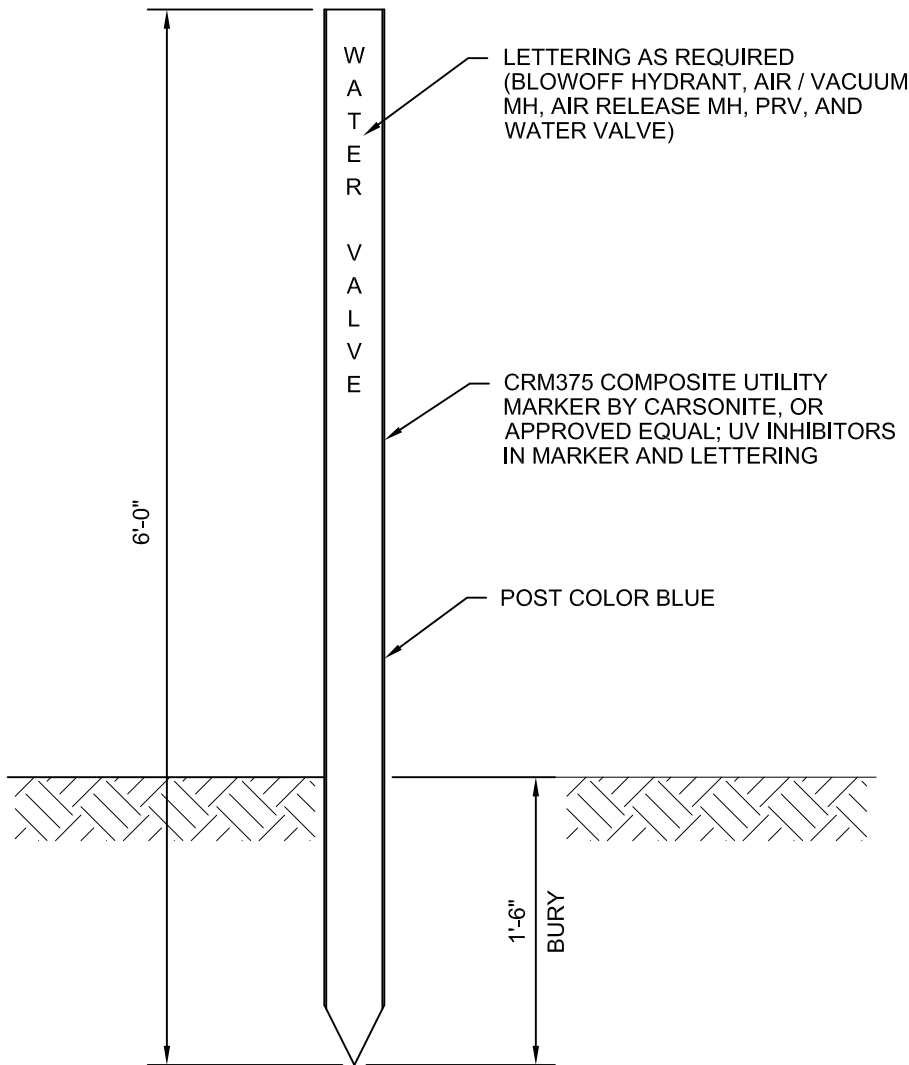
NOT TO SCALE

**AIR RELEASE / VACUUM RELIEF VALVE
VENT SCHEDULE AND SUPPORT BRACKET DETAIL**

DWG. NO. **02641-2.02e**

CITY of SHERIDAN

NOVEMBER 2015



NOTES:

1. INSTALL PER PLAN.

NOT TO SCALE

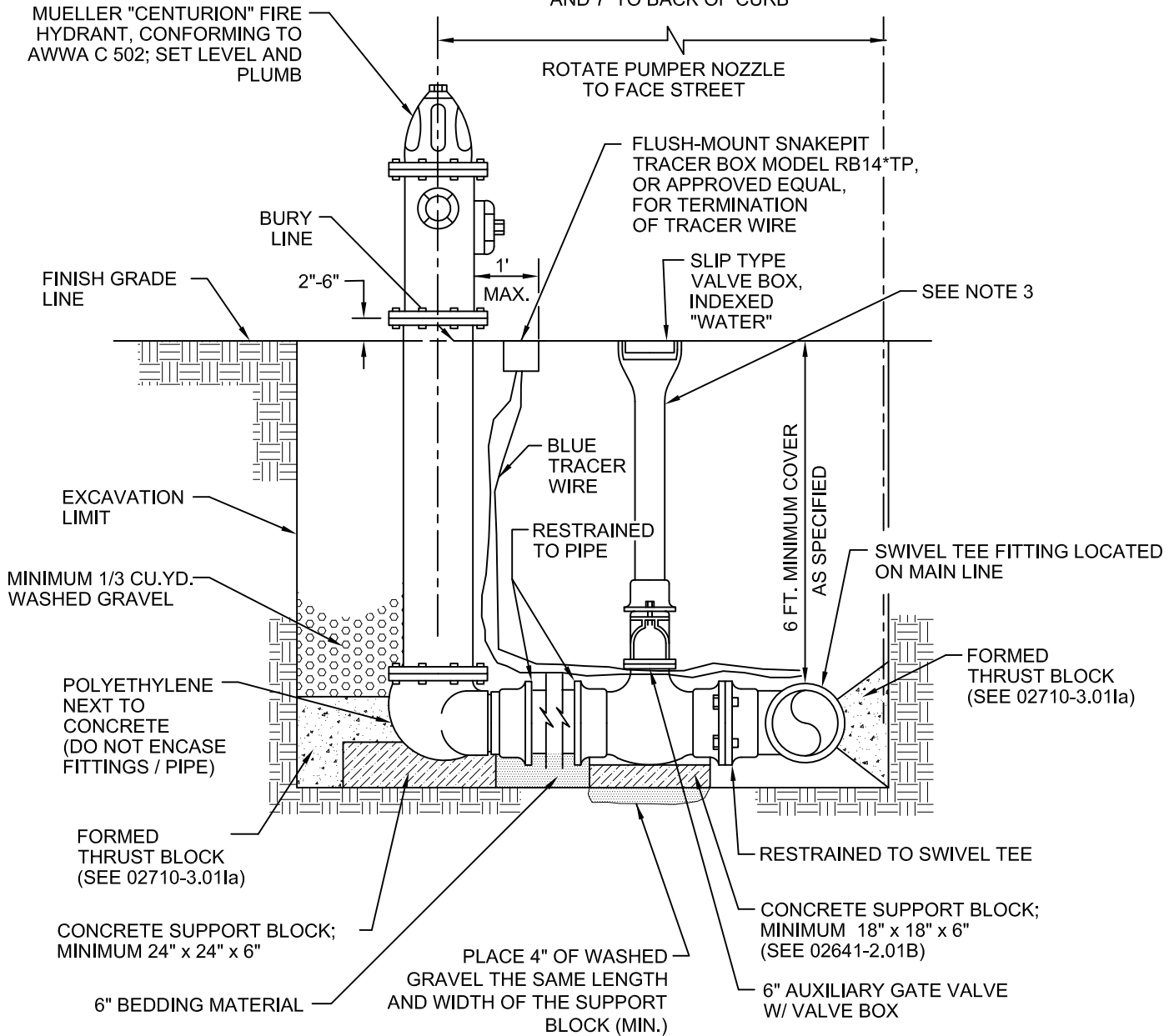
MARKER POST DETAIL

DWG. NO. 02641-2.05

CITY of SHERIDAN

NOVEMBER 2015

SEE PLAN SHEETS FOR OFFSET;
TYPICALLY 2' TO BACK OF SIDEWALK
AND 7' TO BACK OF CURB



NOTES:

1. 6 FT. COVER IS A MINIMUM. THIS MAY BE GREATER IN SOME AREAS. SEE PLANS.
2. PIPE USED ON HYDRANT ASSEMBLY PER 02710. THRUST BLOCKING SHALL BE PER SPECIFICATIONS AND DETAILS. HYDRANT WEEP HOLES SHALL REMAIN UNOBSTRUCTED.
3. WRAP VALVE BOX IN POLYETHYLENE ENCASMENT PER DETAIL 13944D.

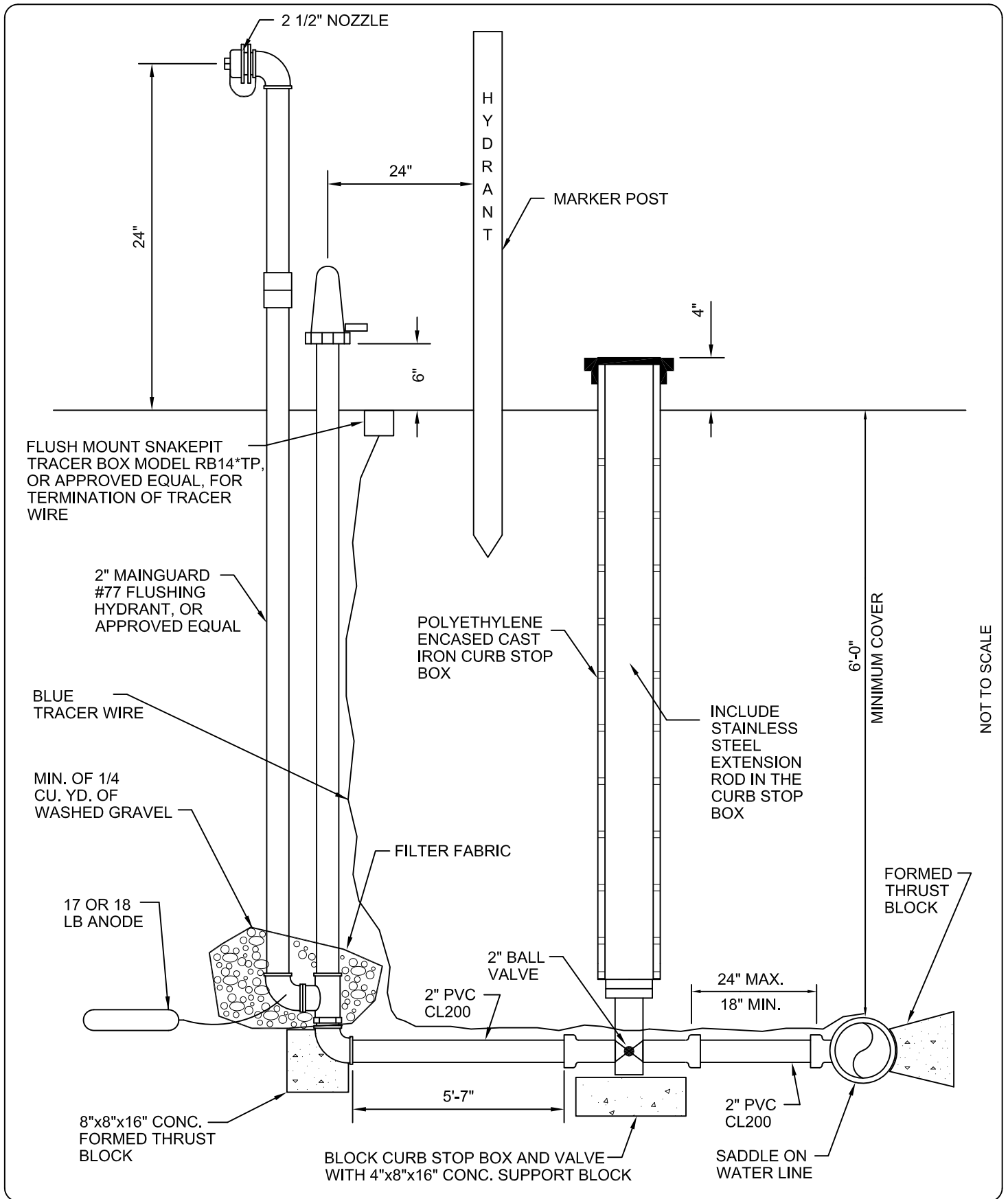
NOT TO SCALE

**FIRE HYDRANT INSTALLATION
DETAIL**

DWG. NO. 02644-2.01

CITY of SHERIDAN

NOVEMBER 2015

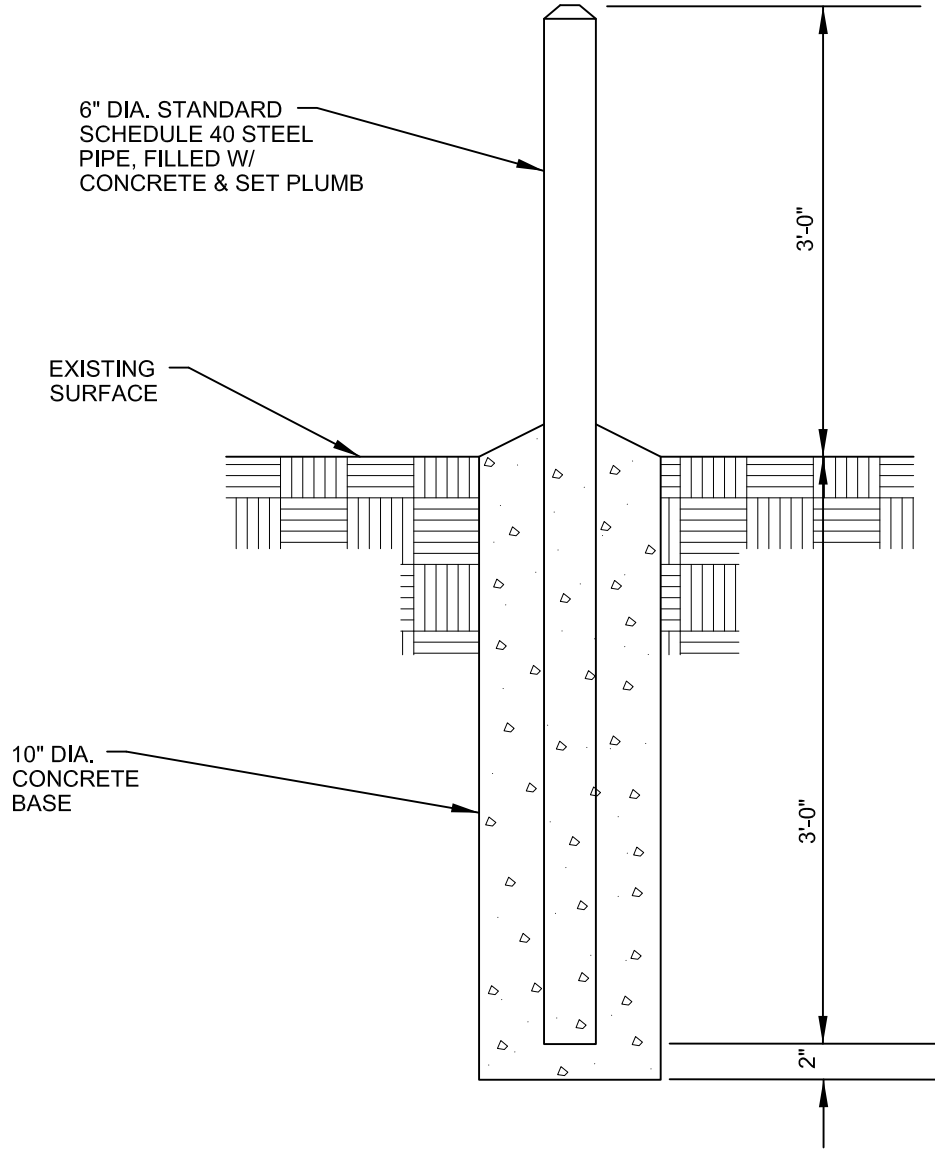


FLUSHING HYDRANT ASSEMBLY DETAIL

DWG. NO. 02644-2.02

CITY of SHERIDAN

NOVEMBER 2015



COLOR CODE GUARD POST YELLOW WITH REFLECTIVE PAINT

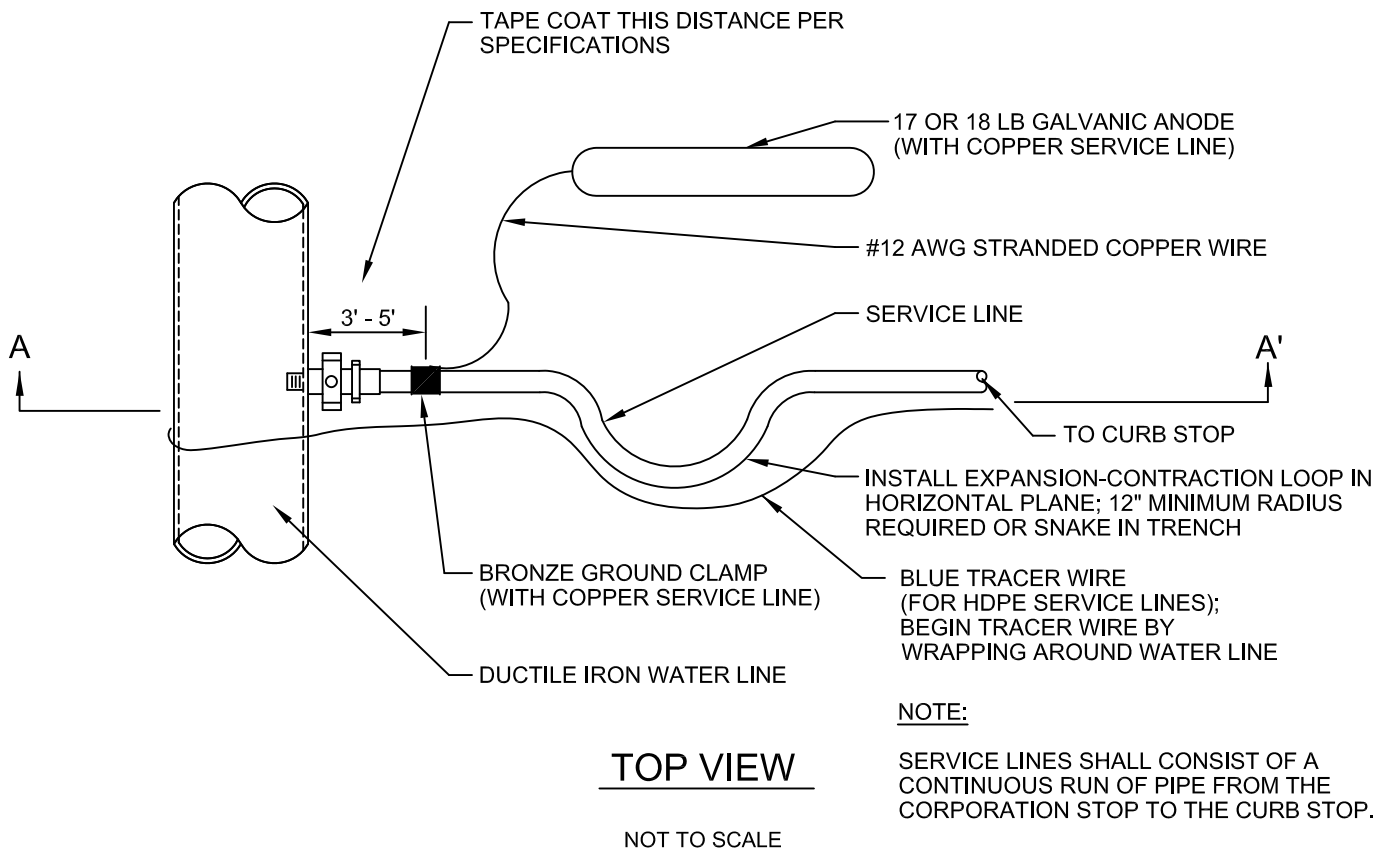
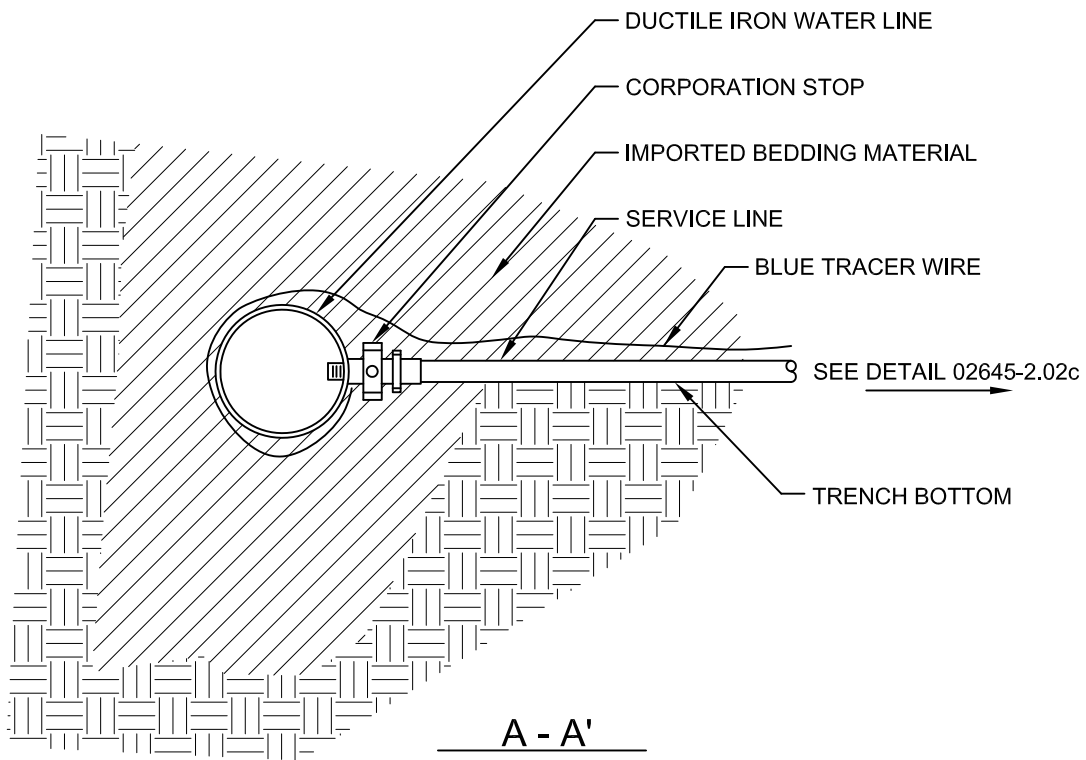
NOT TO SCALE

GUARD POST DETAIL

DWG. NO. 02644-2.03G

CITY of SHERIDAN

NOVEMBER 2015

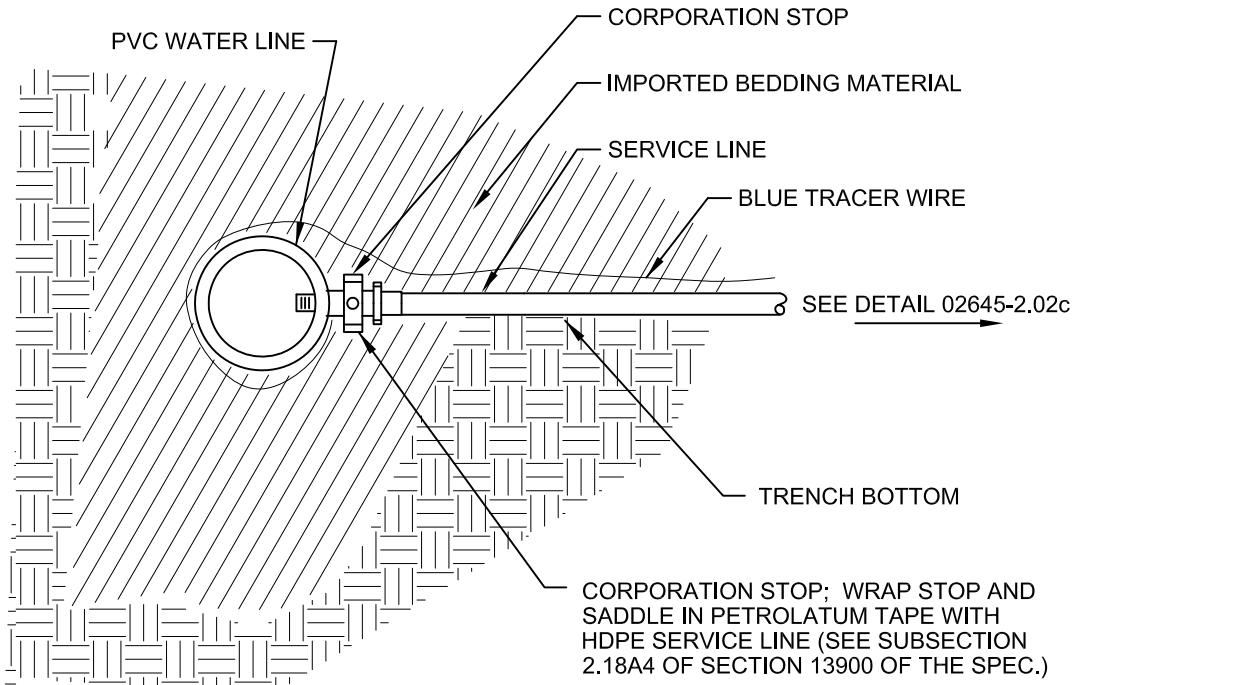


**DUCTILE IRON WATER LINE
SERVICE DETAIL**

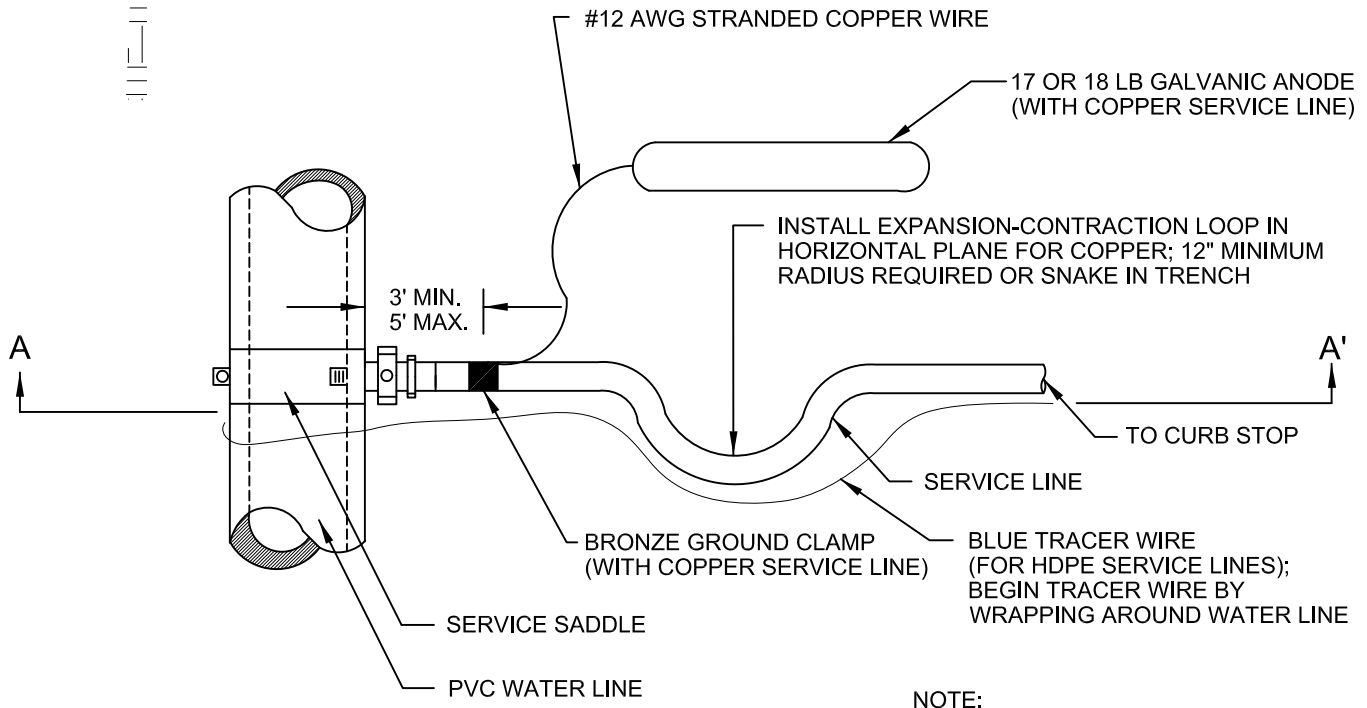
DWG. NO. **02645-2.02a**

CITY of SHERIDAN

NOVEMBER 2015



A - A'



TOP VIEW

NOTE:
SERVICE LINES SHALL CONSIST OF A CONTINUOUS RUN OF PIPE FROM THE CORPORATION STOP TO THE CURB STOP.

NOT TO SCALE

**PVC WATER LINE
SERVICE DETAIL**

DWG. NO. **02645-2.02b**

CITY of SHERIDAN

NOVEMBER 2015

NOT TO SCALE

ELEVATION AS PER DRAWING, OR
LEVEL WITH SIDEWALK GRADE

WORD "WATER" ON LID

1'-0"

PROPERTY
LINE

IN CONCRETE OR ASPHALT, INSTALL A CURB
BOX SLEEVE AROUND THE TOP OF THE CURB
STOP BOX. CURB BOX SLEEVES SHALL BE
MUELLER TYPE H-10342, OR APPROVED EQUAL.
TOP OF SLEEVE TO BE FLUSH WITH THE SURFACE;
LID ON CURB STOP BOX TO BE RECESSED 1/4"

2'-0" MAX.
(TYP.)

BLUE TRACER
WIRE (FOR HDPE
SERVICE LINES)

INSTALL PLUMB

NOTES:

1. WITH HDPE SERVICE LINE, WRAP BLUE TRACER WIRE AROUND THE WATER MAIN FOR A TERMINATION POINT, THEN RUN TRACER WIRE ALONG SERVICE TO THE CURB STOP; EXTEND TRACER WIRE TO GROUND SURFACE AT LID ON CURB STOP BOX WITH MINIMUM OF 6" EXCESS WIRE COILED UP UNDER LID. TRACER WIRE SHALL NOT BE EXPOSED TO ELEMENTS.
2. SERVICE LINES SHALL CONSIST OF A CONTINUOUS RUN OF PIPE FROM THE CORPORATION STOP TO THE CURB STOP.

SERIES 300 STAINLESS
STEEL STATIONARY ROD
AND CONNECTING BOLT
(ALL RODS SHALL BE 4'
IN LENGTH)

6'-0" MIN. COVER

CURB STOP BOX
(WRAP IN
POLYETHYLENE
ENCASEMENT)

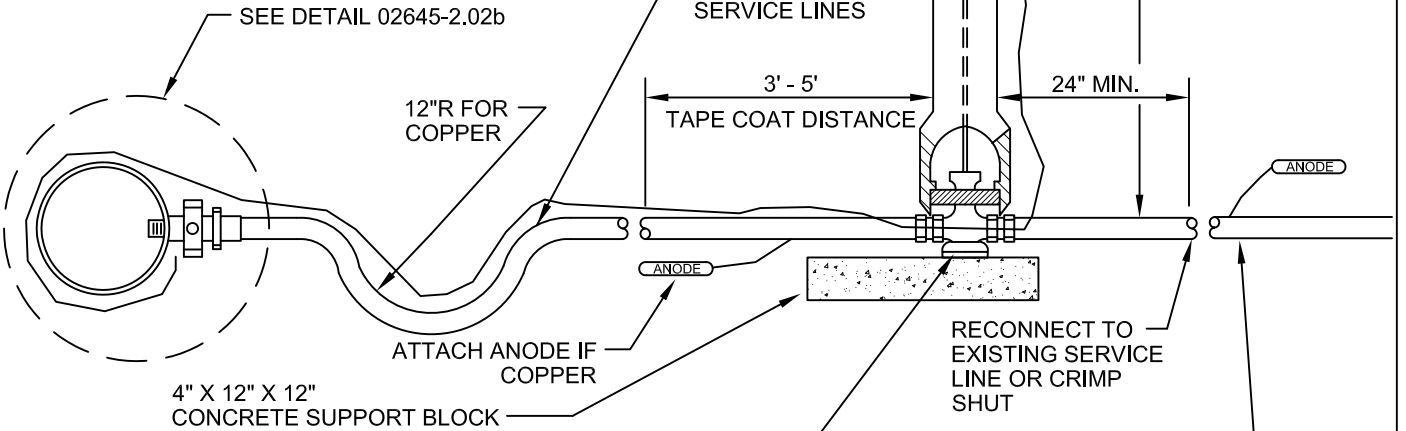
1" ON ALL
SERVICE LINES

SEE DETAIL 02645-2.02b

12"R FOR
COPPER

3' - 5'
TAPE COAT DISTANCE

24" MIN.



INSULATED CURB STOP (SEE SPECIFICATION 02645); WRAP IN
PETROLATUM TAPE WITH HDPE SERVICE (SEE SUBSECTION 2.18A4 OF
SECTION 13900 OF THE SPEC.)

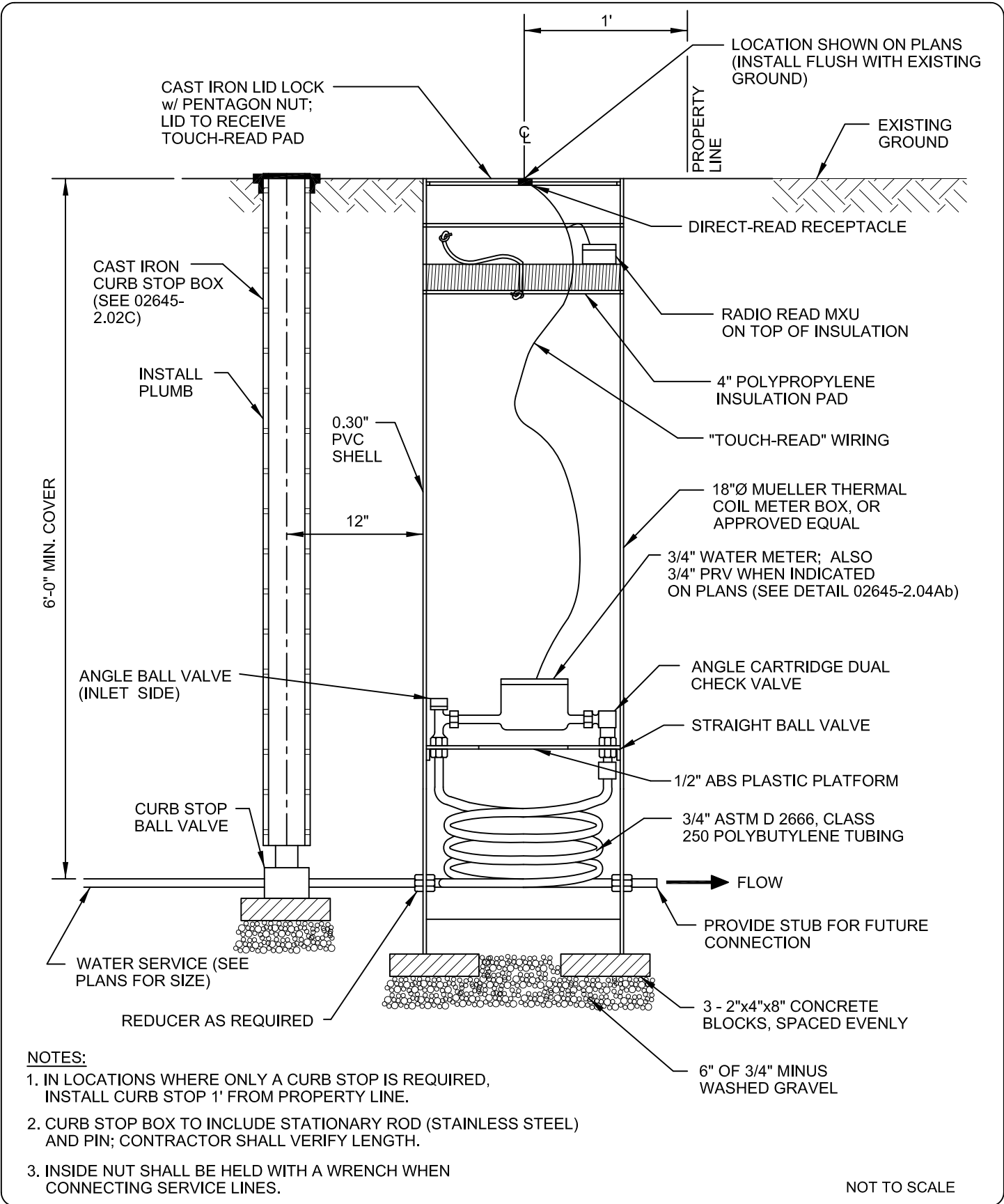
CONNECT NEW ANODE
BAG TO EXISTING SERVICE
LINE IF METALLIC

WATER LINE SERVICE CONNECTION DETAIL

DWG. NO. 02645-2.02c

CITY of SHERIDAN

NOVEMBER 2015

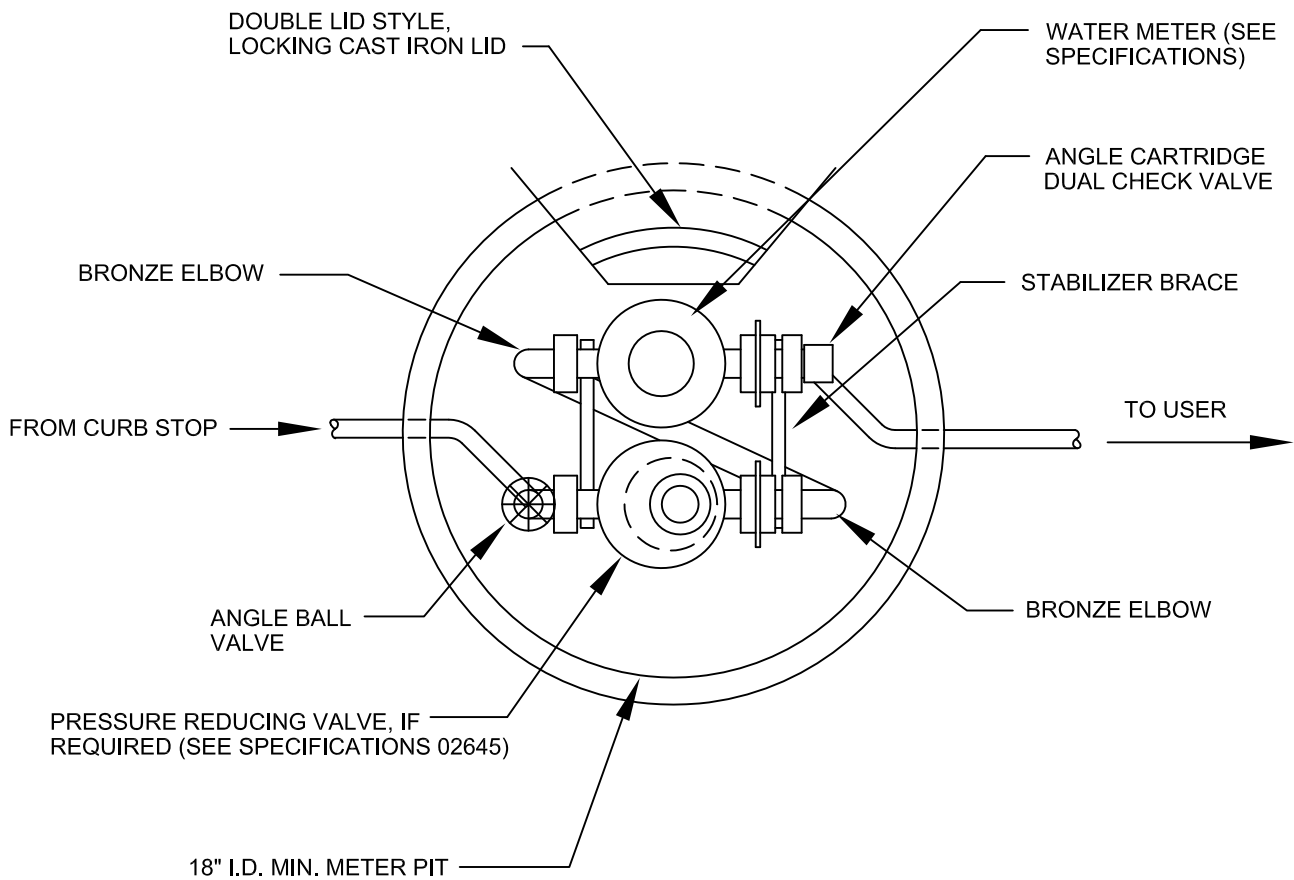


CURB STOP / METER PIT / PRV DETAIL

DWG. NO. **02645-2.04Aa**

CITY of SHERIDAN

NOVEMBER 2015



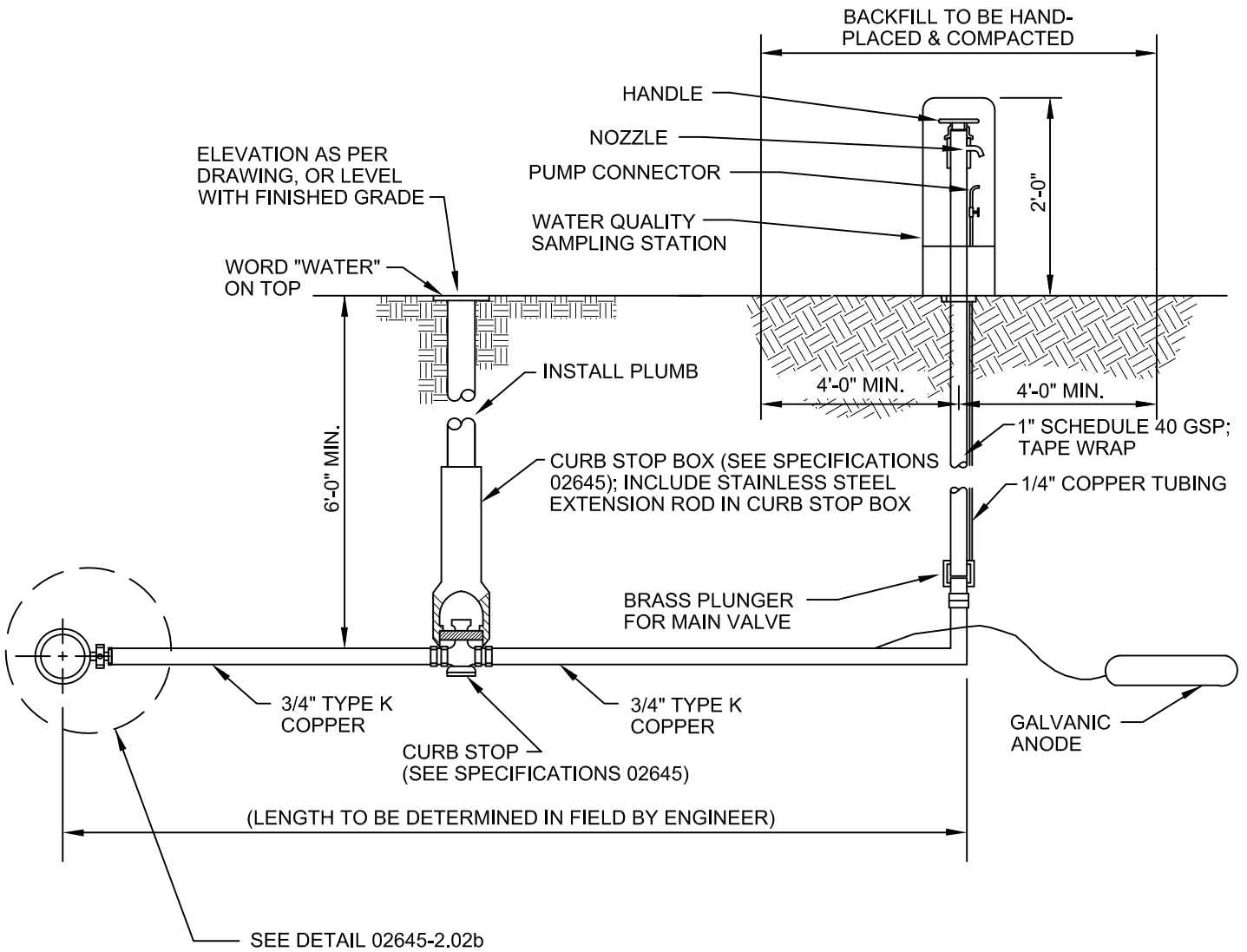
NOTE:
 A TYPE II METER PIT CONTAINS A PRV FOR THE SERVICE. A TYPE I PIT IS SIMILAR, BUT IT CONTAINS A SINGLE YOKE FOR THE METER ONLY.

**METER PIT WITH PRV
 (TYPE II) DETAIL**

DWG. NO. 02645-2.04Ab

CITY of SHERIDAN

NOVEMBER 2015



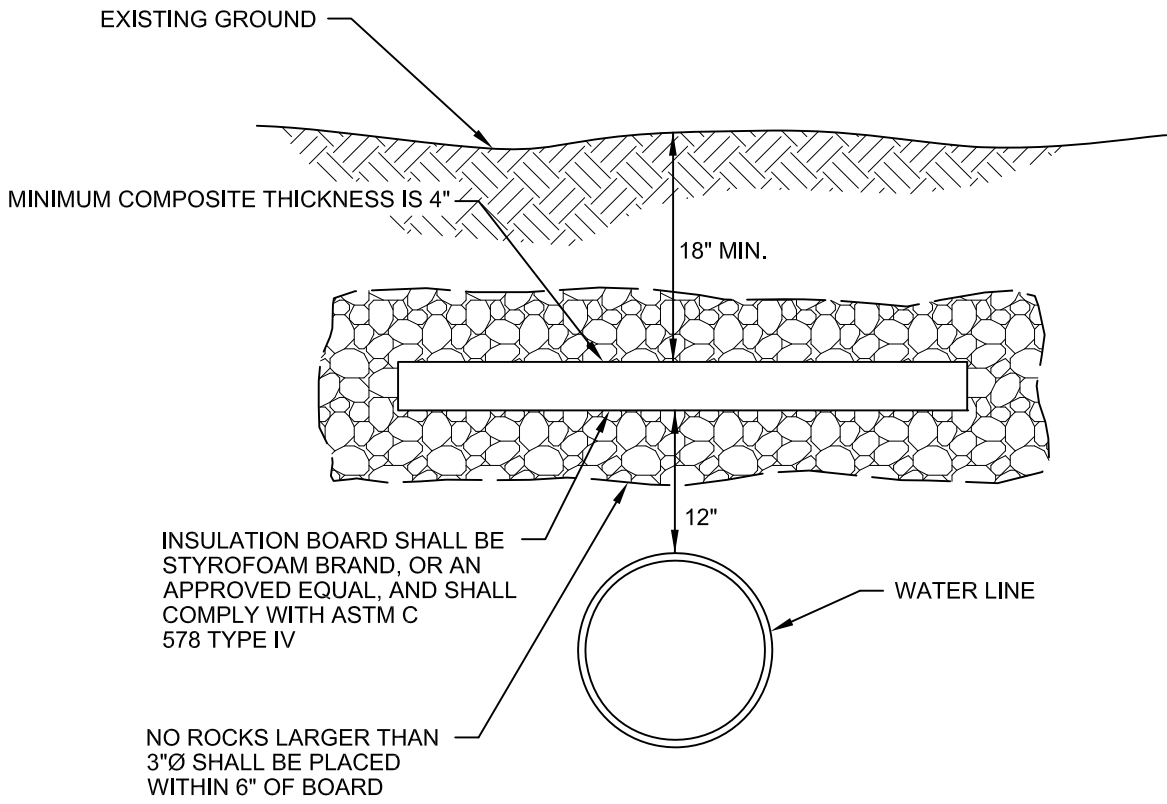
NOT TO SCALE

WATER QUALITY SAMPLING STATION DETAIL

DWG. NO. 02645-2.05

CITY of SHERIDAN

NOVEMBER 2015



NOTES:

1. IF DEPTH OF COVER IS LESS THAN 3.5 FEET, BOARD SHALL EXTEND A MINIMUM OF FOUR FEET EITHER SIDE OF CENTER OF PIPE.
2. IF DEPTH OF COVER IS BETWEEN 3.5 AND 5.5 FEET, BOARD SHALL EXTEND A MINIMUM OF THREE FEET EITHER SIDE OF CENTER OF PIPE.

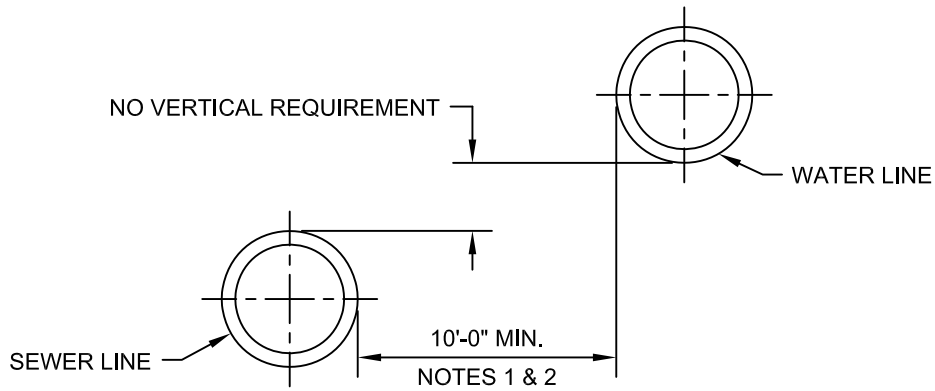
NOT TO SCALE

**INSULATION BOARD
INSTALLATION DETAIL**

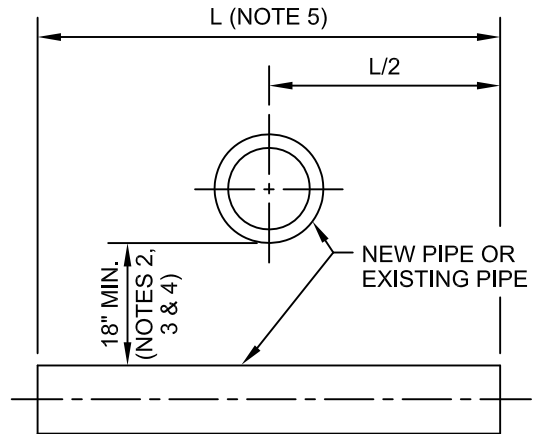
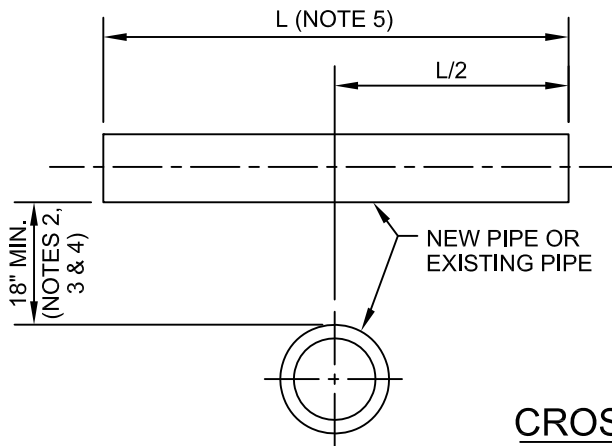
DWG. NO. 02710-2.08

CITY of SHERIDAN

NOVEMBER 2015



PARALLEL ARRANGEMENT



CROSSINGS

(NOTE 5)

NOTES:

1. WHERE THE 10 FOOT HORIZONTAL SEPARATION CANNOT BE MAINTAINED, THIS SEPARATION MAY BE REDUCED TO 5 FEET, PROVIDED THE BOTTOM OF THE WATER LINE IS AT LEAST 18 INCHES HIGHER THAN THE TOP OF THE SEWER LINE. WHERE THE REQUIREMENTS FOR THE BOTTOM OF THE WATER LINE TO BE AT LEAST 18 INCHES HIGHER THAN THE TOP OF THE SEWER LINE CANNOT BE MET, SEE THE SPECIFICATIONS.
2. NO EXCEPTION TO THE MINIMUM HORIZONTAL OR VERTICAL SEPARATION REQUIREMENTS ARE PERMITTED WHEN THE SEWAGE-CARRYING PIPE IS A FORCE MAIN.
3. AT CROSSINGS, ONE FULL LENGTH OF WATER LINE PIPE SHALL BE LOCATED SO THAT BOTH JOINTS WILL BE AS FAR FROM THE SEWER LINE AS POSSIBLE.
4. LESS THAN 18 INCHES OF SEPARATION IS PERMITTED WHEN THE GRAVITY SEWER LINE AT THE CROSSING IS MADE FROM A SINGLE 20-FOOT LENGTH OF PIPE, THE CROSSING ANGLE IS 90 DEGREES, AND THE SEWER PIPE PASSES A PRESSURE TEST (SEE SPECIFICATIONS).
5. "L" IS A STANDARD LENGTH OF PIPE AS SUPPLIED BY A PIPE MANUFACTURER.
6. ADEQUATE STRUCTURAL SUPPORT (FLOWABLE FILL) FOR PIPES AT CROSSINGS SHALL BE PROVIDED.
7. WHEN THE REQUIRED HORIZONTAL AND / OR VERTICAL SEPARATIONS BETWEEN WATER LINES AND SEWER LINES CANNOT BE MET, THE SEWER MAY BE ENCASED IN ONE FOOT OF FLOWABLE FILL (SEE SPECIFICATIONS).

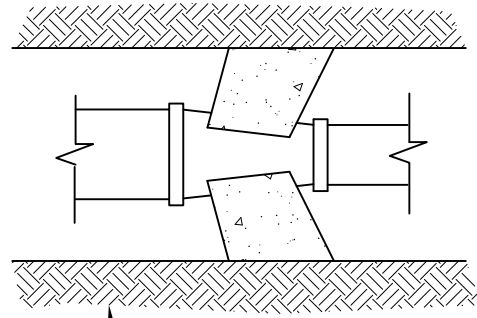
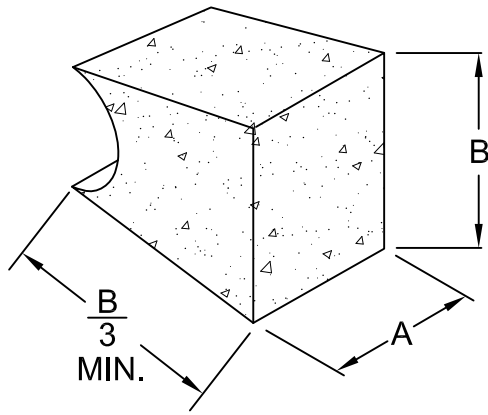
NOT TO SCALE

WATER AND SEWER LINE SEPARATION DETAIL

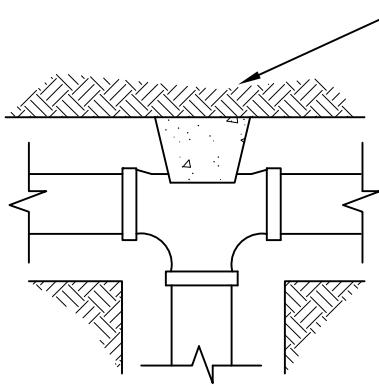
DWG. NO. 02710-3.01H

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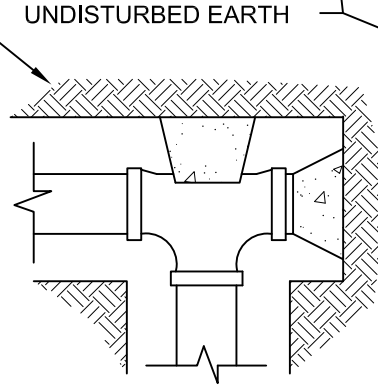
NOVEMBER 2015



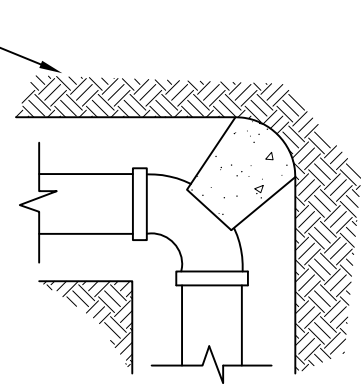
REDUCER



TEE



TEE (Plugged)



BEND

DIMENSIONS FOR THRUST BLOCKING

FITTING SIZES	TEES & PLUGS		90° BENDS		45° BENDS & WYES		REDUCERS & 22 1/2° BENDS	
	A	B	A	B	A	B	A	B
4"	1'-7"	1'-2"	1'-9"	1'-6"	1'-8"	0'-10"	1'-7"	0'-6"
6"	2'-0"	1'-11"	2'-5"	2'-2"	1'-10"	1'-7"	1'-9"	0'-10"
8"	2'-8"	2'-6"	3'-2"	3'-0"	2'-5"	2'-1"	1'-9"	1'-6"
10"	3'-4"	3'-3"	4'-0"	3'-10"	3'-0"	2'-9"	2'-2"	1'-11"
12"	4'-0"	3'-10"	4'-8"	4'-8"	3'-8"	3'-3"	2'-7"	2'-3"
14"	5'-5"	3'-10"	6'-6"	4'-11"	4'-9"	3'-5"	3'-5"	2'-5"
16"	6'-0"	5'-0"	6'-0"	5'-0"	6'-0"	4'-0"	4'-6"	3'-0"

NOTES:

1. THIS TABLE IS BASED ON 150 PSI WATER MAIN PRESSURE AND 2000 PSF SOIL BEARING PRESSURE.
2. USE POLYETHYLENE TO SEPARATE FITTINGS FROM THE CONCRETE.
3. FOR PLUGS, PLACE A HEAVY, METAL RING ON TOP OF PLUG FOR FUTURE REMOVAL OF THE THRUST BLOCK.
4. ALL THRUST BLOCKS SHALL BE FORMED AND POURED AGAINST UNDISTURBED SOIL; CONCRETE SHALL BE CLASS "B".

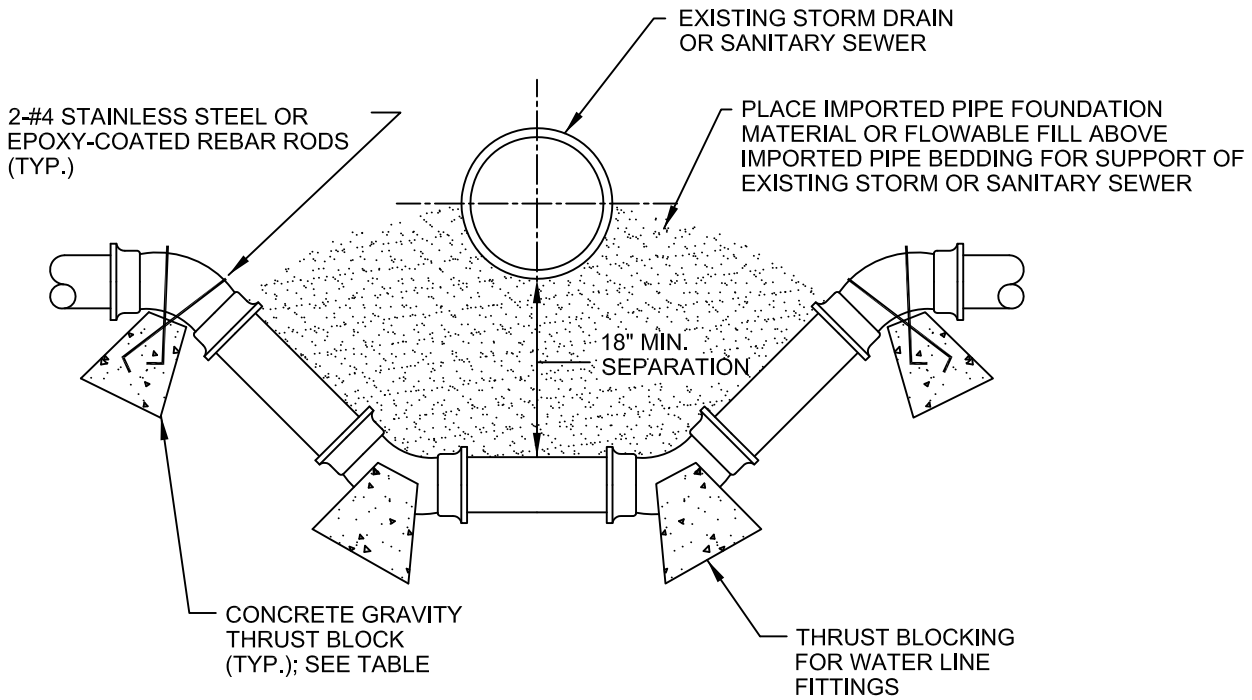
NOT TO SCALE

**THRUST BLOCKING
FOR WATER LINE FITTINGS DETAIL**

DWG. NO. 02710-3.011a

CITY of SHERIDAN

NOVEMBER 2015



GRAVITY THRUST BLOCK - CY
BASED ON 150 PSI MAIN PRESSURE

PIPE SIZE	45° BEND	22 1/2° BEND
6"	1.0	0.5
8"	1.5	0.6
10"	2.0	0.8
12"	3.0	1.0

NOTE: USE POLYETHYLENE TO SEPARATE FITTINGS FROM THE CONCRETE.

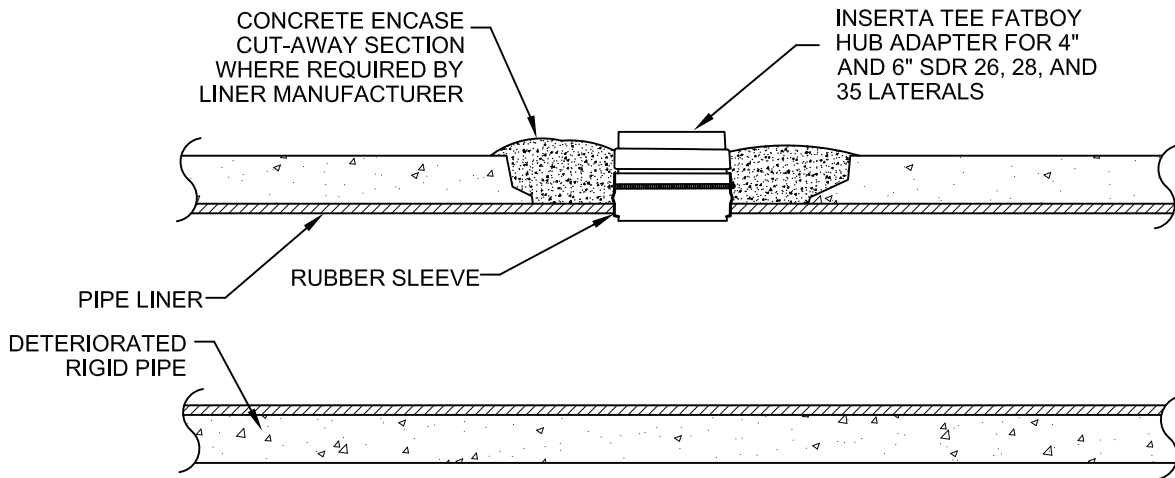
NOT TO SCALE

**THRUST BLOCKING
 FOR WATER LINE FITTINGS DETAIL**

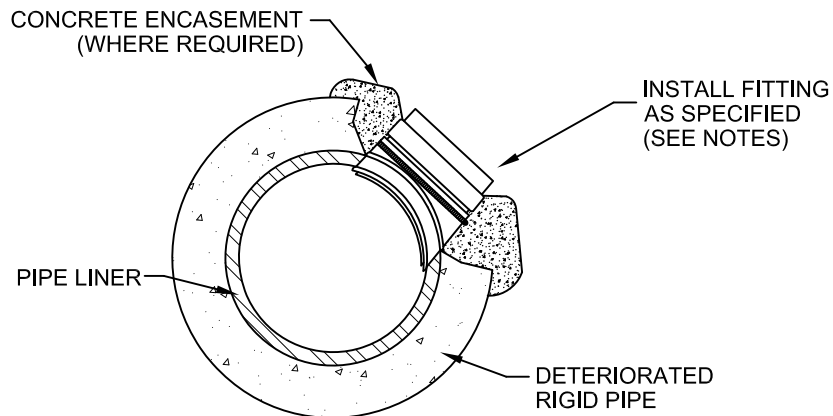
DWG. NO. **02710-3.01b**

CITY of SHERIDAN

NOVEMBER 2015



PLAN



SECTION

NOTES:

1. AREA TO BE TAPPED SHALL BE MARKED ON RIGID PIPE, 2 INCHES LARGER THAN DIAMETER OF INSERTA TEE FITTING.
2. RIGID PIPE AT TAPPING AREA SHALL BE REMOVED BY HAND WITH CHISEL, EXPOSING LINER SECTION.
3. LINER SURFACE SHALL BE BRUSHED AND CLEANED, WITH ALL DAMAGED SECTIONS OF RIGID PIPE IN THE AREA REMOVED.
4. HOLE SHALL BE CORED INTO LINER USING AN APPROPRIATE INSERTA TEE HOLE SAW.
5. INSERTA TEE FITTING SHALL BE INSTALLED IN ACCORDANCE WITH INSTALLATION INSTRUCTIONS PROVIDED BY MANUFACTURER.
6. CUT-OUT SECTION OF RIGID PIPE SHALL BE ENCASED IN CONCRETE WHERE REQUIRED BY LINER MANUFACTURER.
7. INSTALL ALL OTHER COMPONENTS OF SANITARY SEWER SERVICE LINE IN ACCORDANCE WITH DWG. NO. 02712-2.01Db.

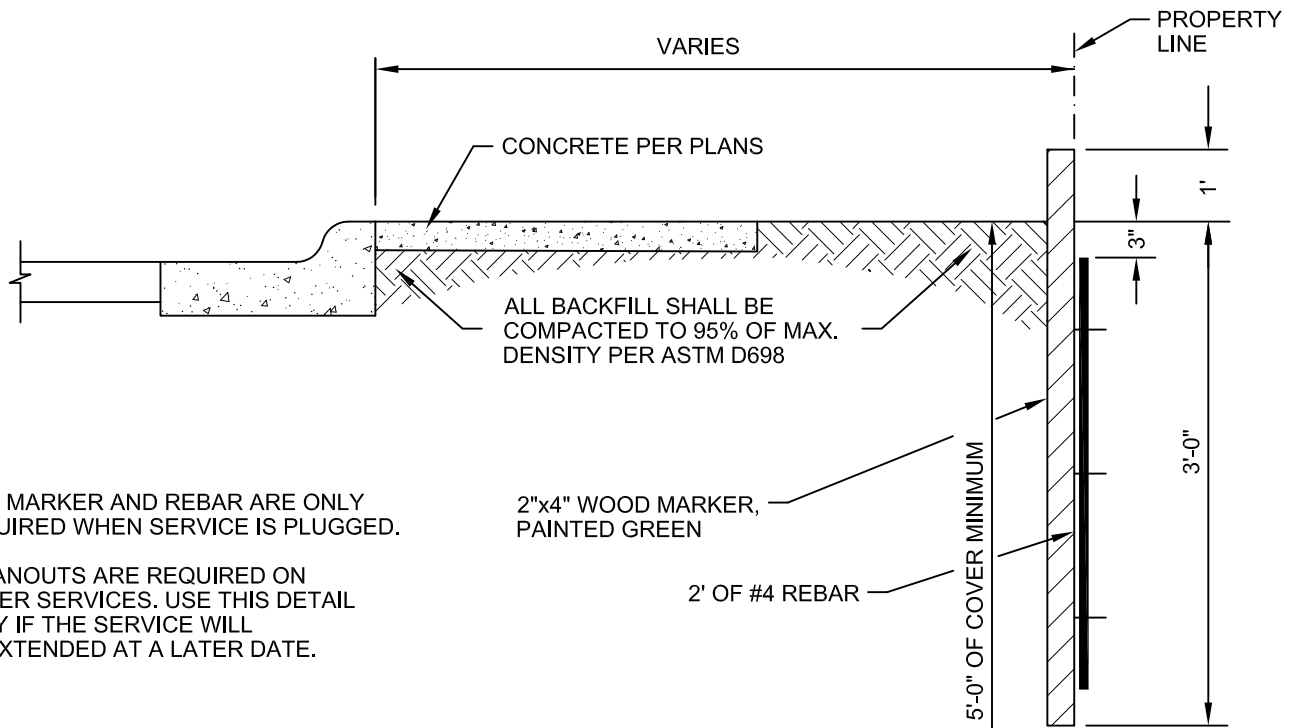
NOT TO SCALE

**SANITARY SEWER SERVICE LINE
TAPPING LINED MAIN USING INSERTA TEE®
DETAIL**

DWG. NO. 02712-2.01C

CITY of SHERIDAN

NOVEMBER 2015



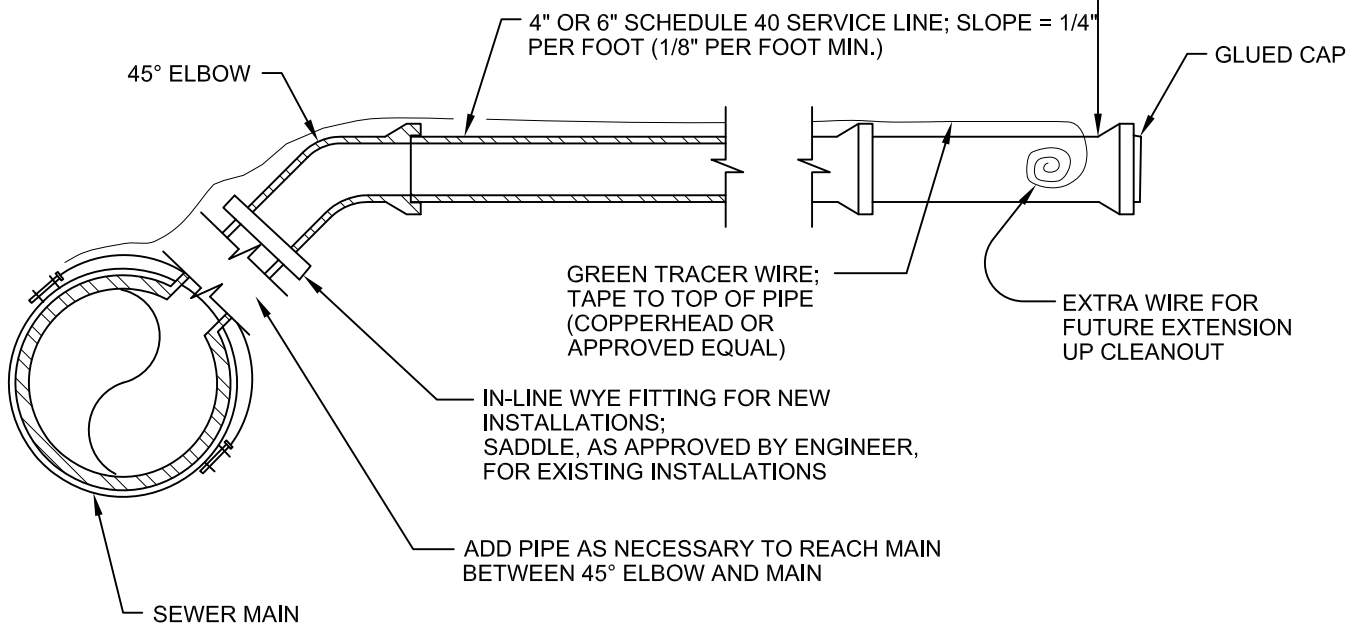
NOTES:

1. 2"x4" MARKER AND REBAR ARE ONLY REQUIRED WHEN SERVICE IS PLUGGED.
2. CLEANOUTS ARE REQUIRED ON SEWER SERVICES. USE THIS DETAIL ONLY IF THE SERVICE WILL BE EXTENDED AT A LATER DATE.

2"x4" WOOD MARKER,
PAINTED GREEN

2' OF #4 REBAR

5'-0" OF COVER MINIMUM



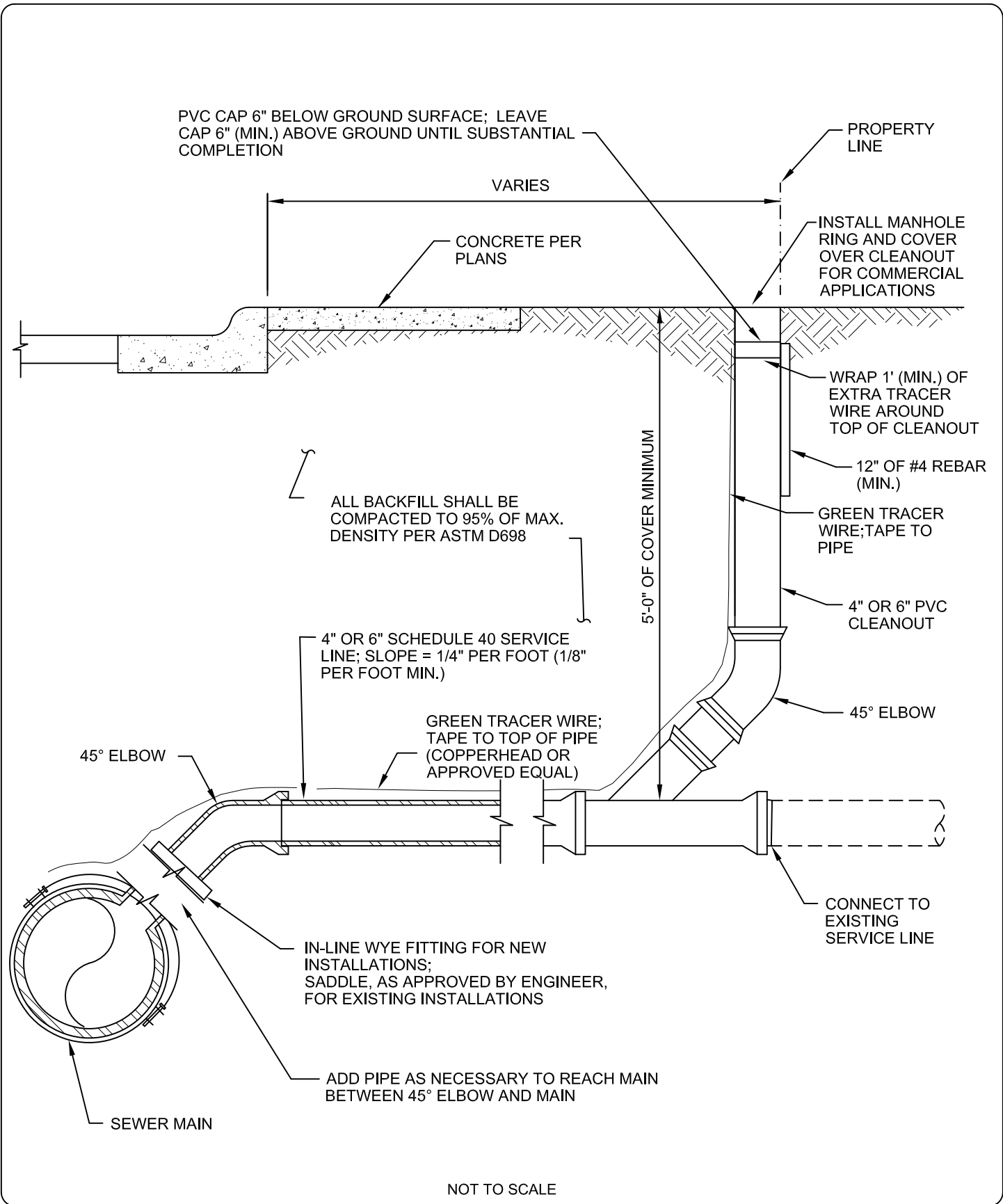
NOT TO SCALE

**SANITARY SEWER SERVICE
LINE DETAIL
(NEW CONSTRUCTION ONLY)**

DWG. NO. 02712-2.01Da

CITY of SHERIDAN

NOVEMBER 2015

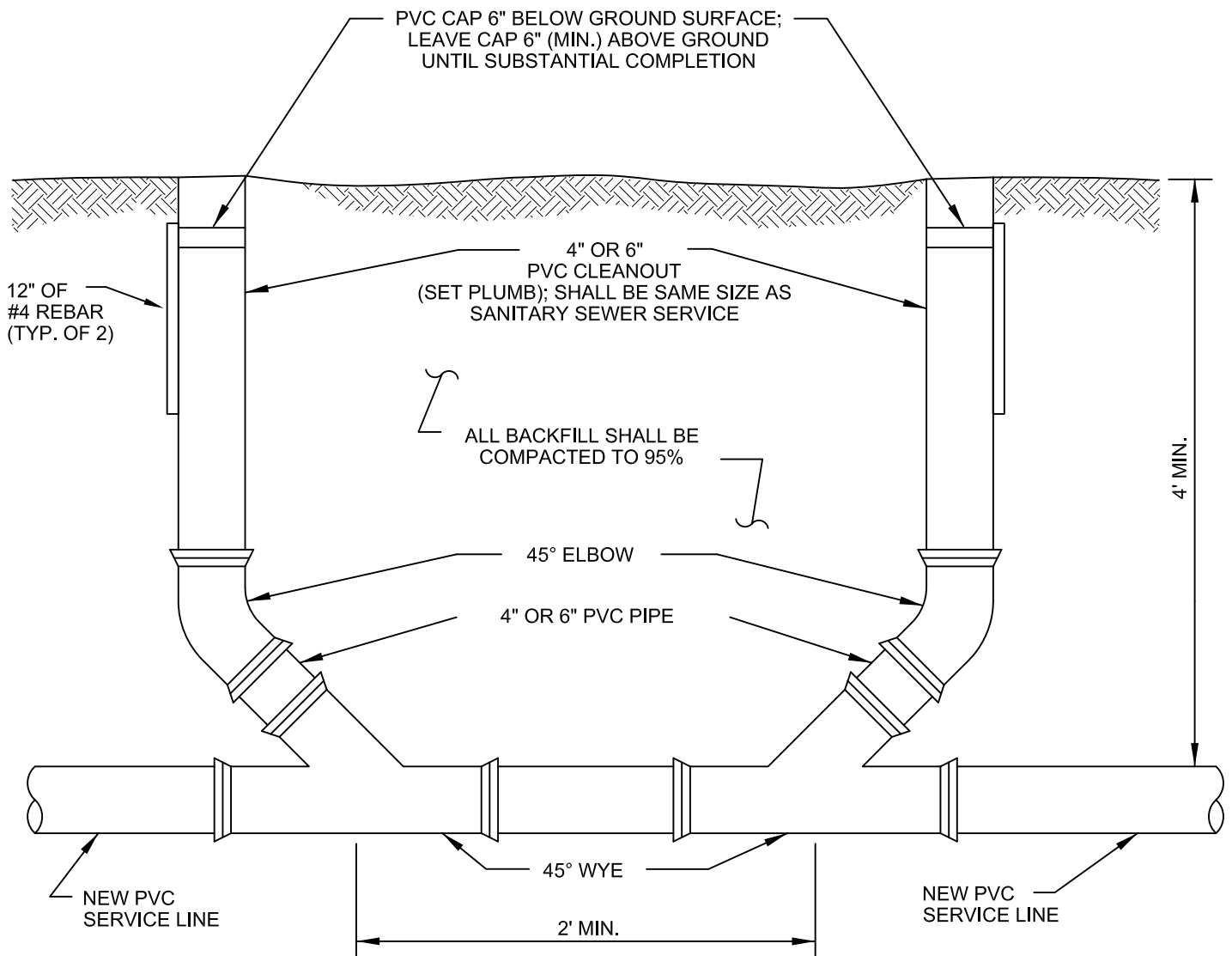


**SANITARY SEWER SERVICE LINE
WITH CLEANOUT DETAIL
(RECONSTRUCTION PROJECTS)**

DWG. NO. 02712-2.01Db

CITY of SHERIDAN

NOVEMBER 2015



NOTES:

1. LOCATIONS SHALL BE DETERMINED IN THE FIELD BY THE ENGINEER.
2. FOR CLEANOUTS IN A DRIVEWAY OR ROAD, INSTALL A 2' SQ. CONCRETE COLLAR WITH A RECESSED METAL CAP FOR CLEANOUT.
3. ALL SANITARY SEWER PIPES & FITTINGS SHALL BE SCHEDULE 40 PVC.

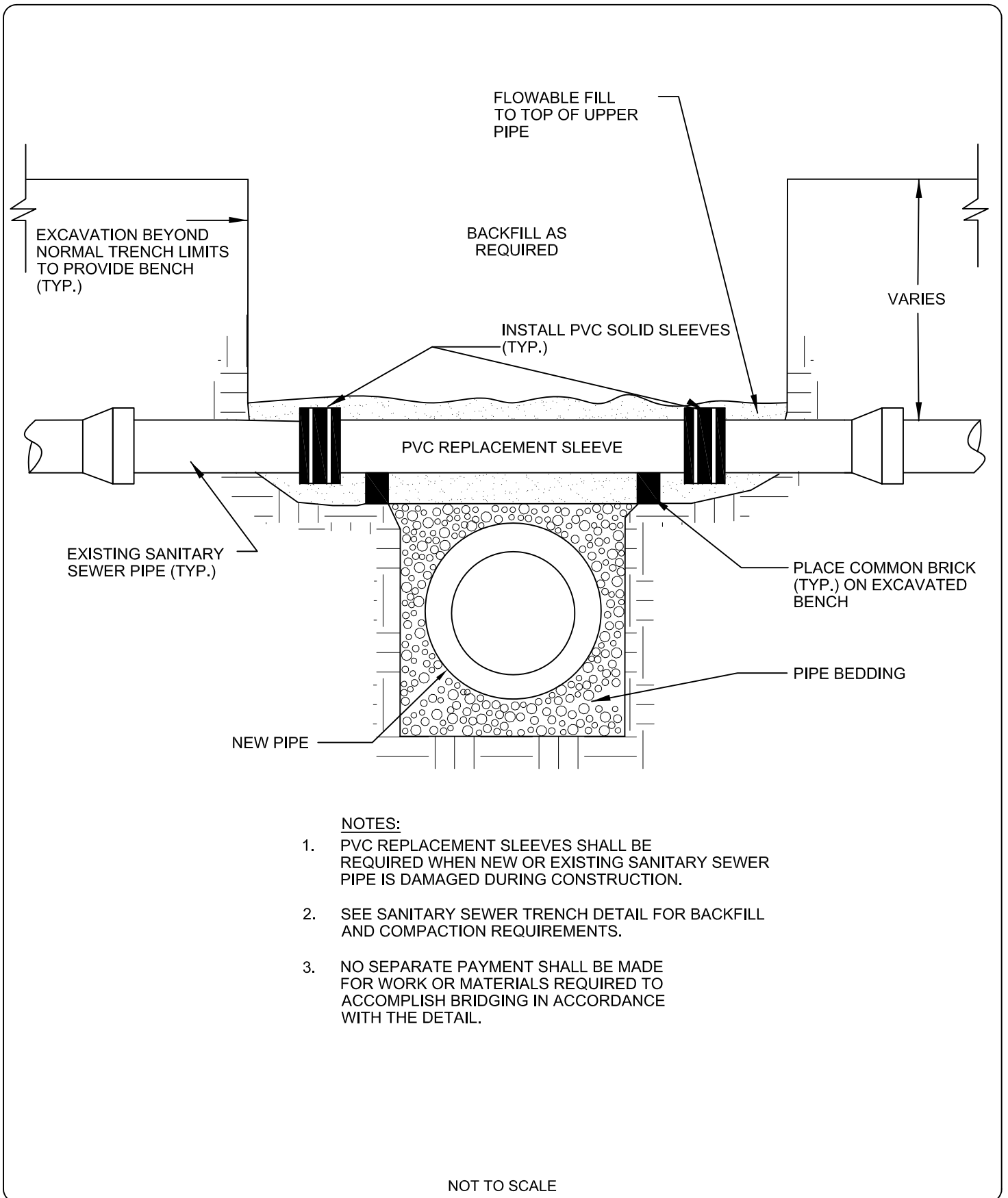
NOT TO SCALE

**TWO-WAY SANITARY
SEWER CLEANOUT DETAIL**

DWG. NO. 02712-2.01Dc

CITY of SHERIDAN

NOVEMBER 2015

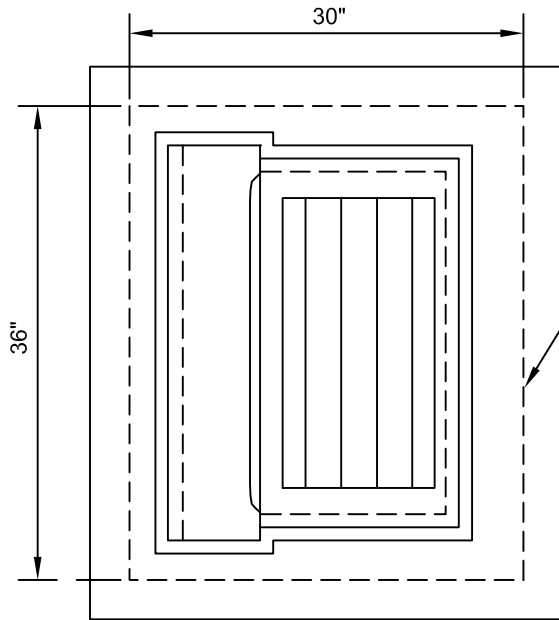


**BRIDGING AT SANITARY
SEWER CROSSING DETAIL**

DWG. NO. 02712-3.01 I

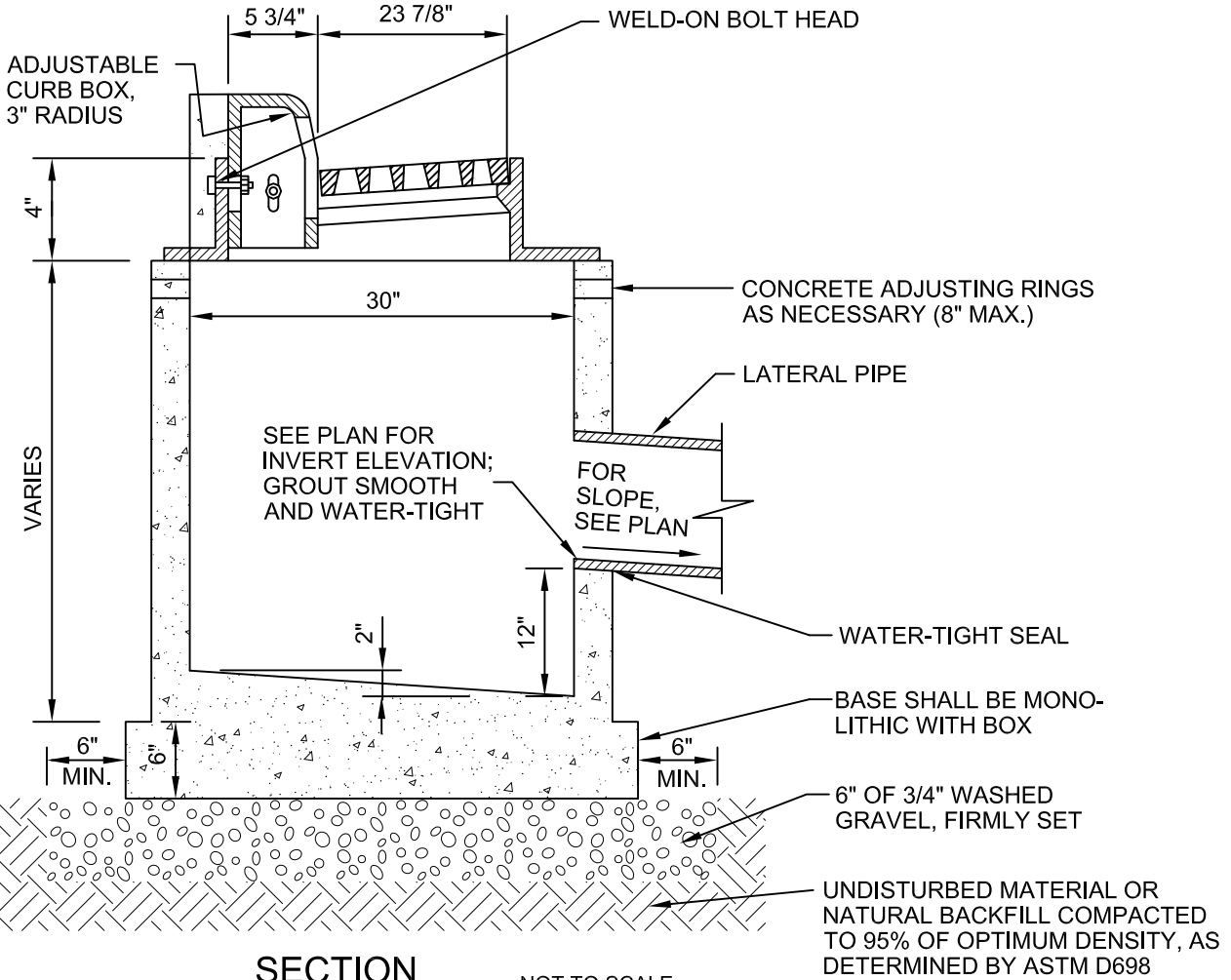
CITY of SHERIDAN

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NEENAH No. 3246-A, OR APPROVED EQUAL, WITH FISH LOGO CAST INTO CURB BOX

PLAN



SECTION

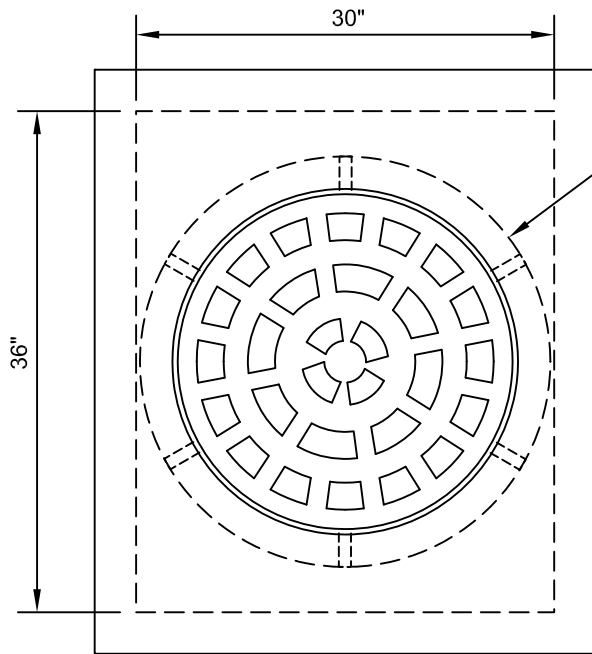
NOT TO SCALE

**TYPE A STORM DRAIN
INLET / CATCH BASIN DETAIL**

DWG. NO. 02720-2.01a

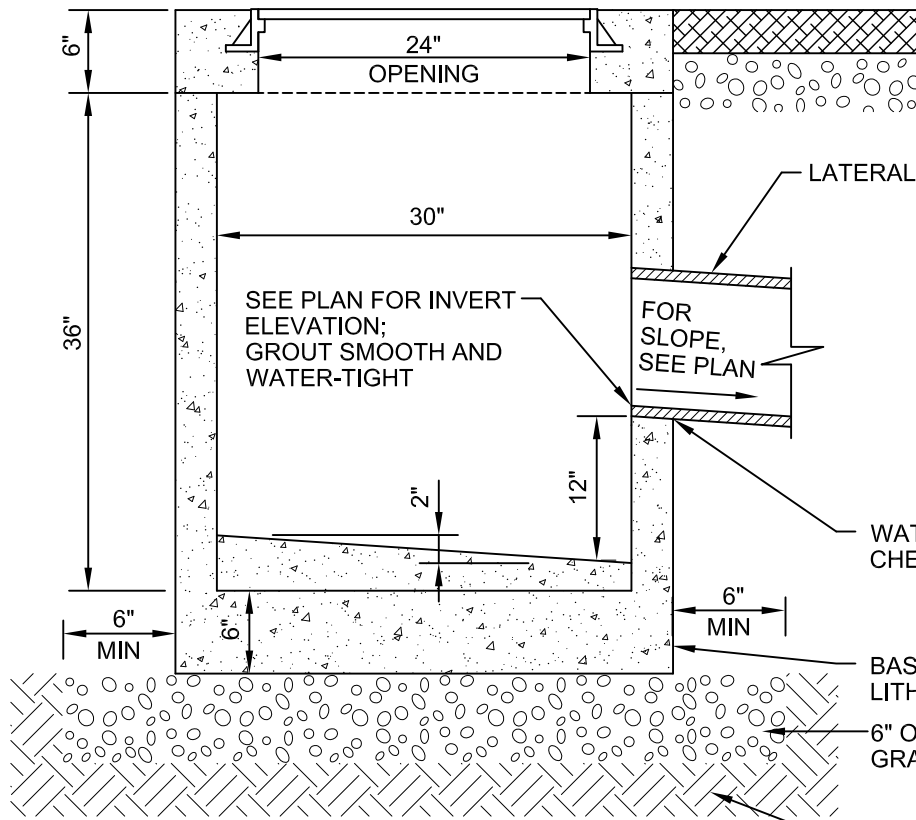
CITY of SHERIDAN

NOVEMBER 2015



FRAME AND GRATE SHALL BE A DEETER 1258 W/ TYPE B GRATE, OR APPROVED EQUAL

PLAN



WATER-TIGHT SEAL TO BE CHECKED WITH INSPECTION

BASE SHALL BE MONOLITHIC WITH BOX
6" OF 3/4" WASHED GRAVEL, FIRMLY SET

UNDISTURBED MATERIAL OR NATURAL BACKFILL COMPACTED TO 95% OF OPTIMUM DENSITY, AS DETERMINED BY ASTM D698

SECTION

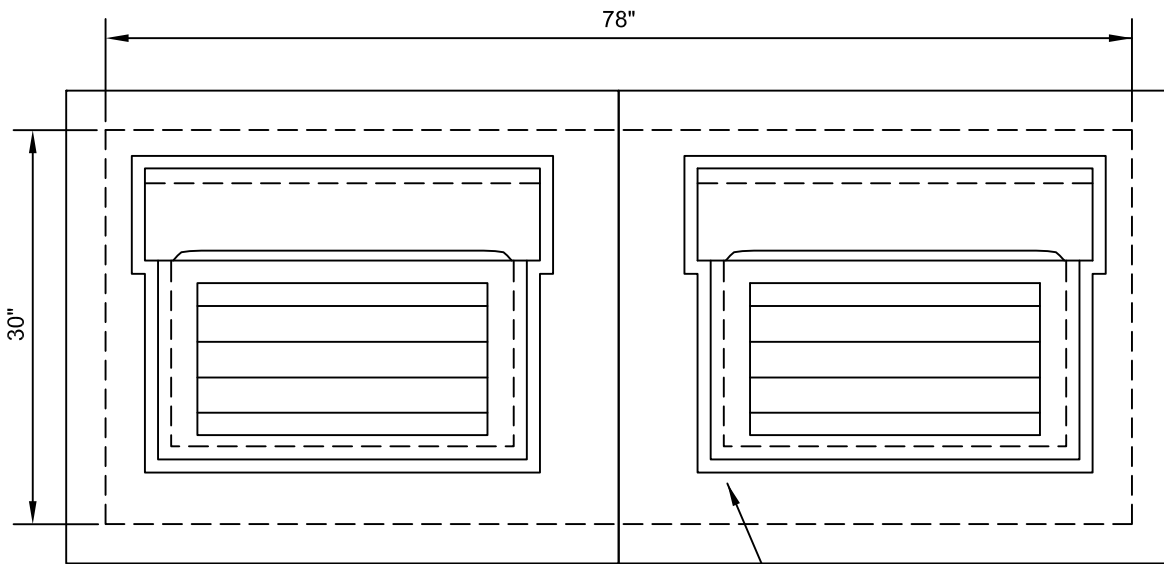
NOT TO SCALE

**TYPE B STORM DRAIN
INLET / CATCH BASIN DETAIL**

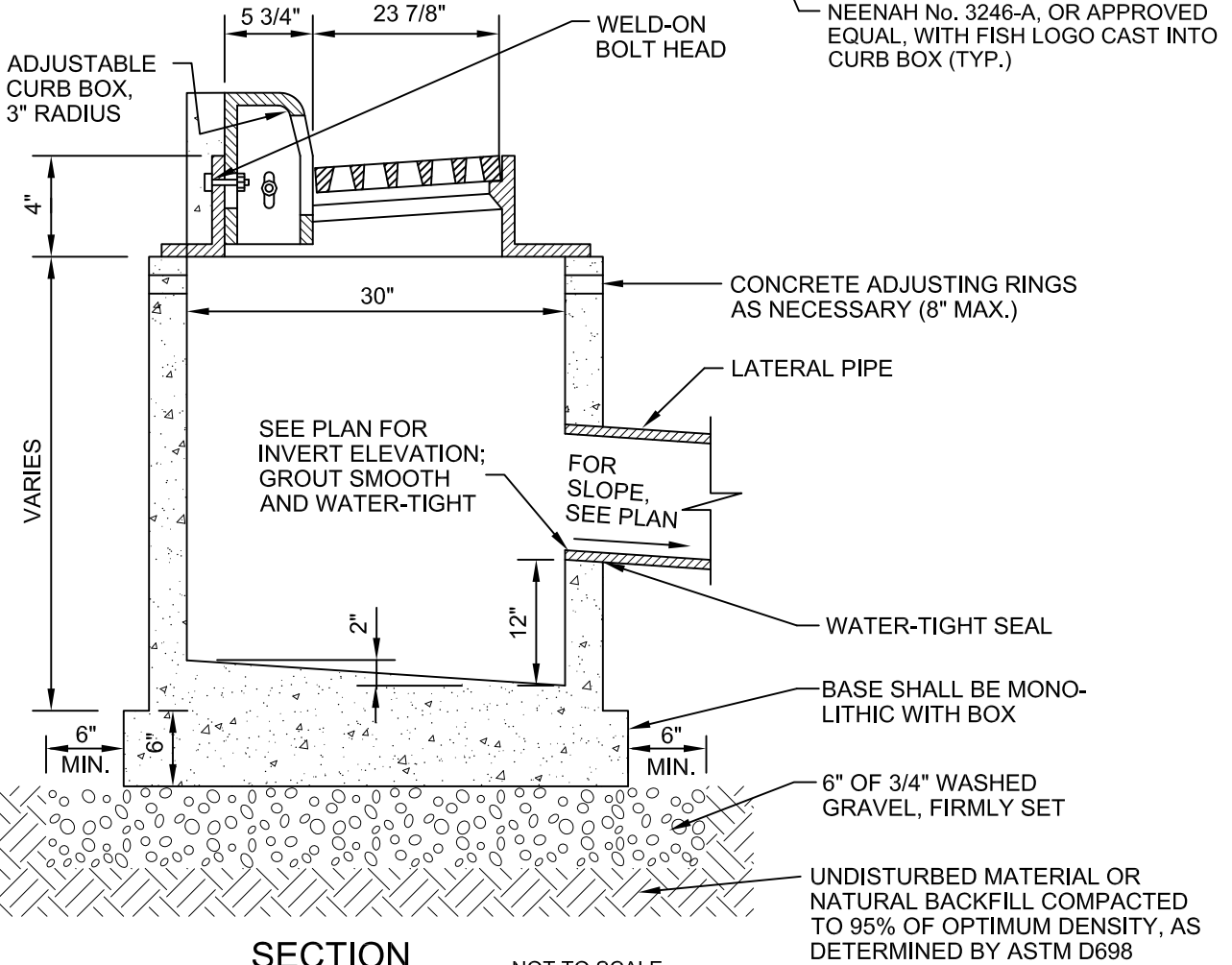
DWG. NO. 02720-2.01b

CITY of SHERIDAN

NOVEMBER 2015



PLAN



SECTION

NOT TO SCALE

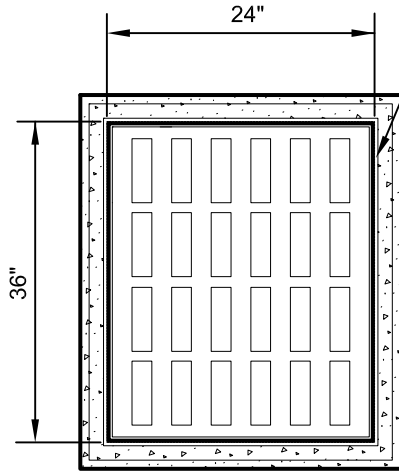
**TYPE C STORM DRAIN
INLET / CATCH BASIN DETAIL**

DWG. NO. **02720-2.01c**

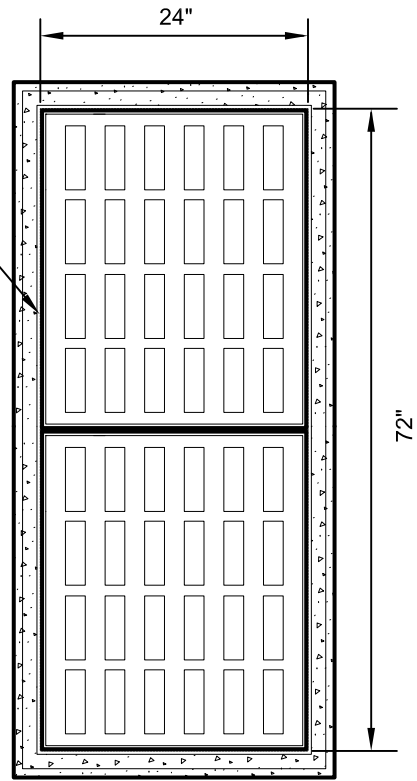
CITY of SHERIDAN

NOVEMBER 2015

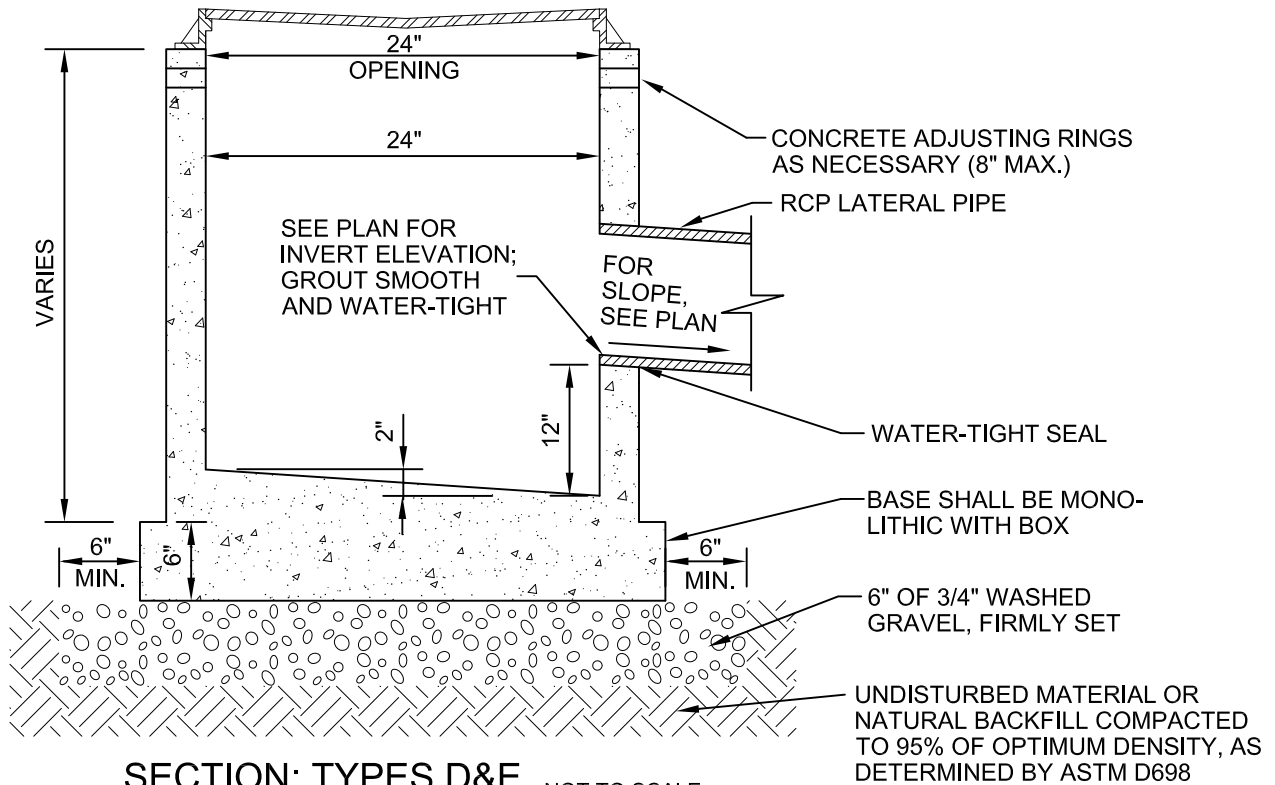
FRAME AND GRATE SHALL BE
A D&L I-3386 WITH "A" GRATE
OR APPROVED EQUAL



PLAN: TYPE D



PLAN: TYPE E



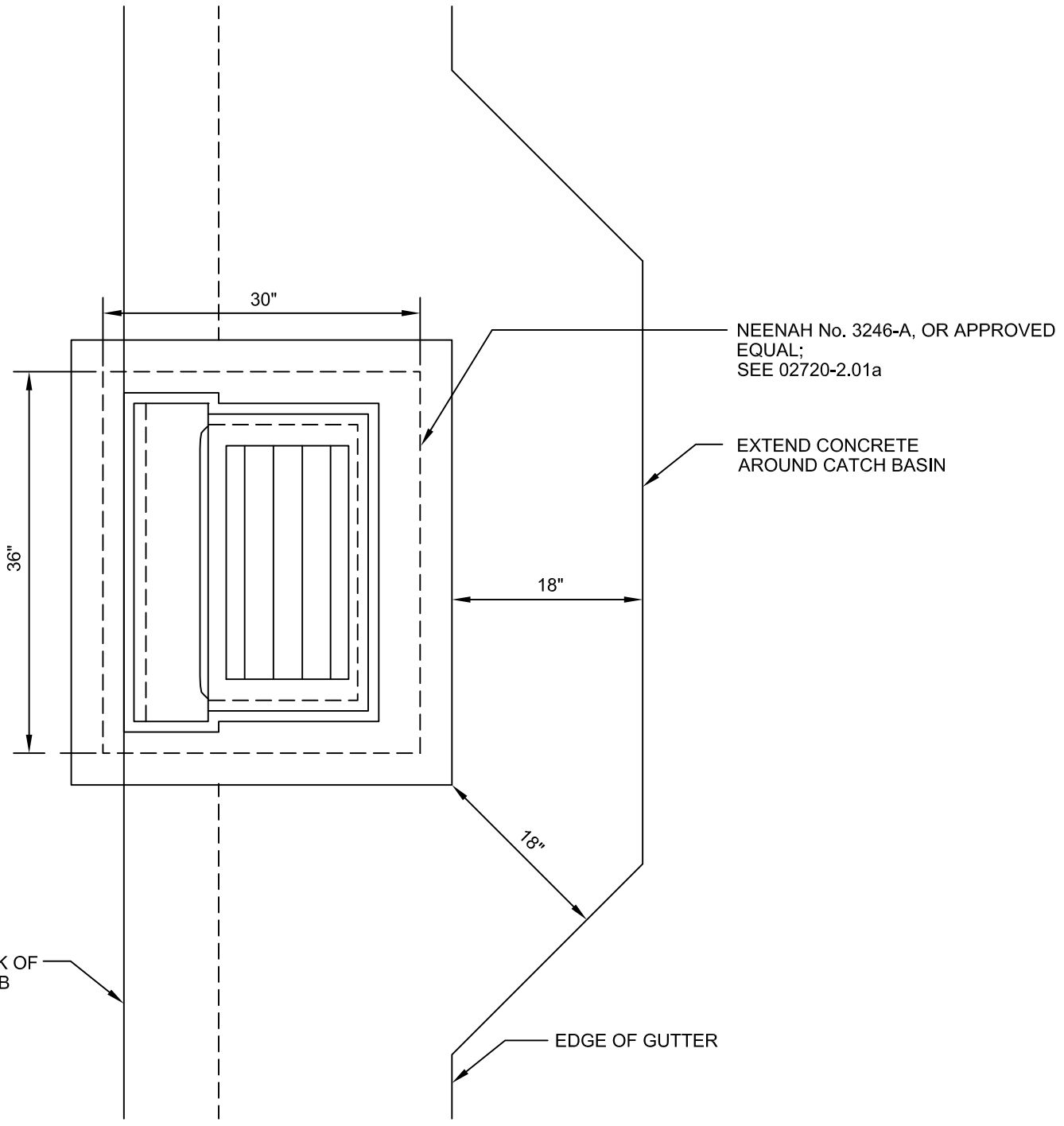
SECTION: TYPES D&E NOT TO SCALE

**TYPE D & TYPE E STORM DRAIN
INLET / CATCH BASIN DETAIL**

DWG. NO. 02720-2.01d

CITY of SHERIDAN

NOVEMBER 2015



NOT TO SCALE

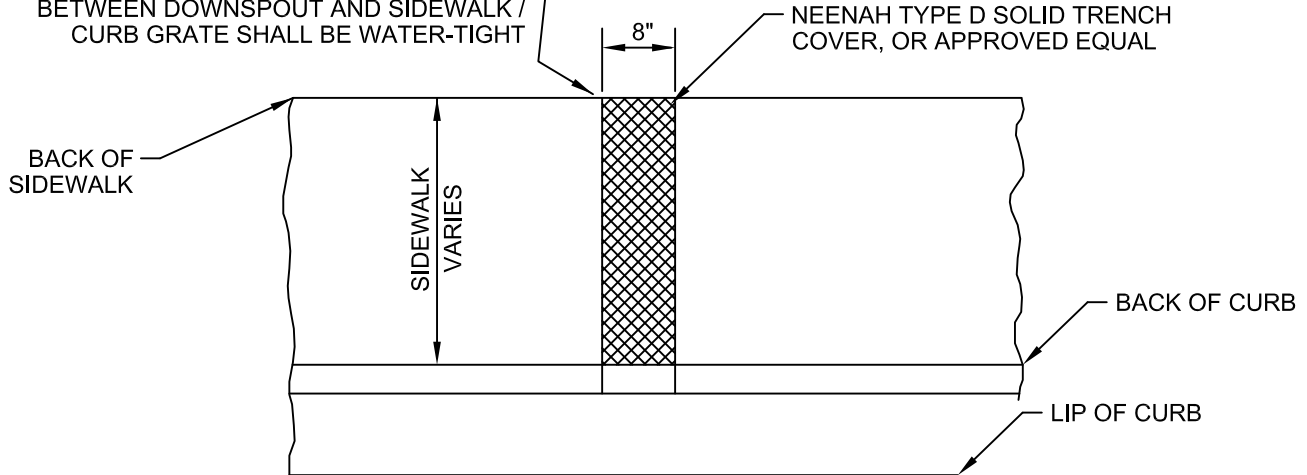
**CURB & GUTTER BOX-OUT FOR
TYPE A STORM DRAIN INLET / CATCH BASIN DETAIL**

DWG. NO. **02720-2.01e**

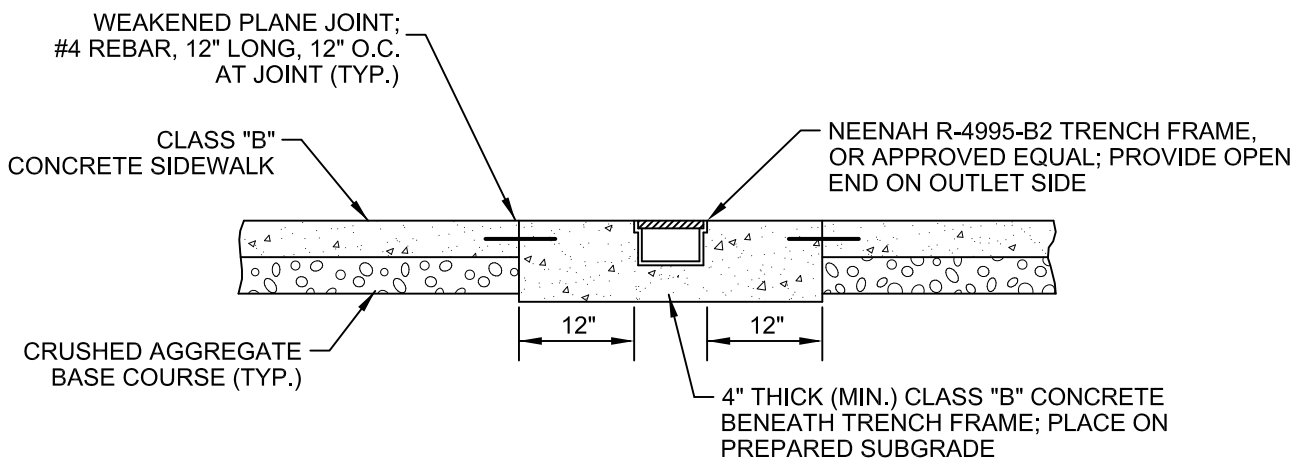
CITY of SHERIDAN

NOVEMBER 2015

WHERE APPLICABLE, CONNECT SIDEWALK / CURB GRATE TO EXISTING ROOF DRAIN DOWNSPOUT WITH PROPER FITTINGS (PVC OFFSET DOWNSPOUT ADAPTERS, ETC.), AS APPROVED BY THE ENGINEER; CONNECTION BETWEEN DOWNSPOUT AND SIDEWALK / CURB GRATE SHALL BE WATER-TIGHT



PLAN



SECTION

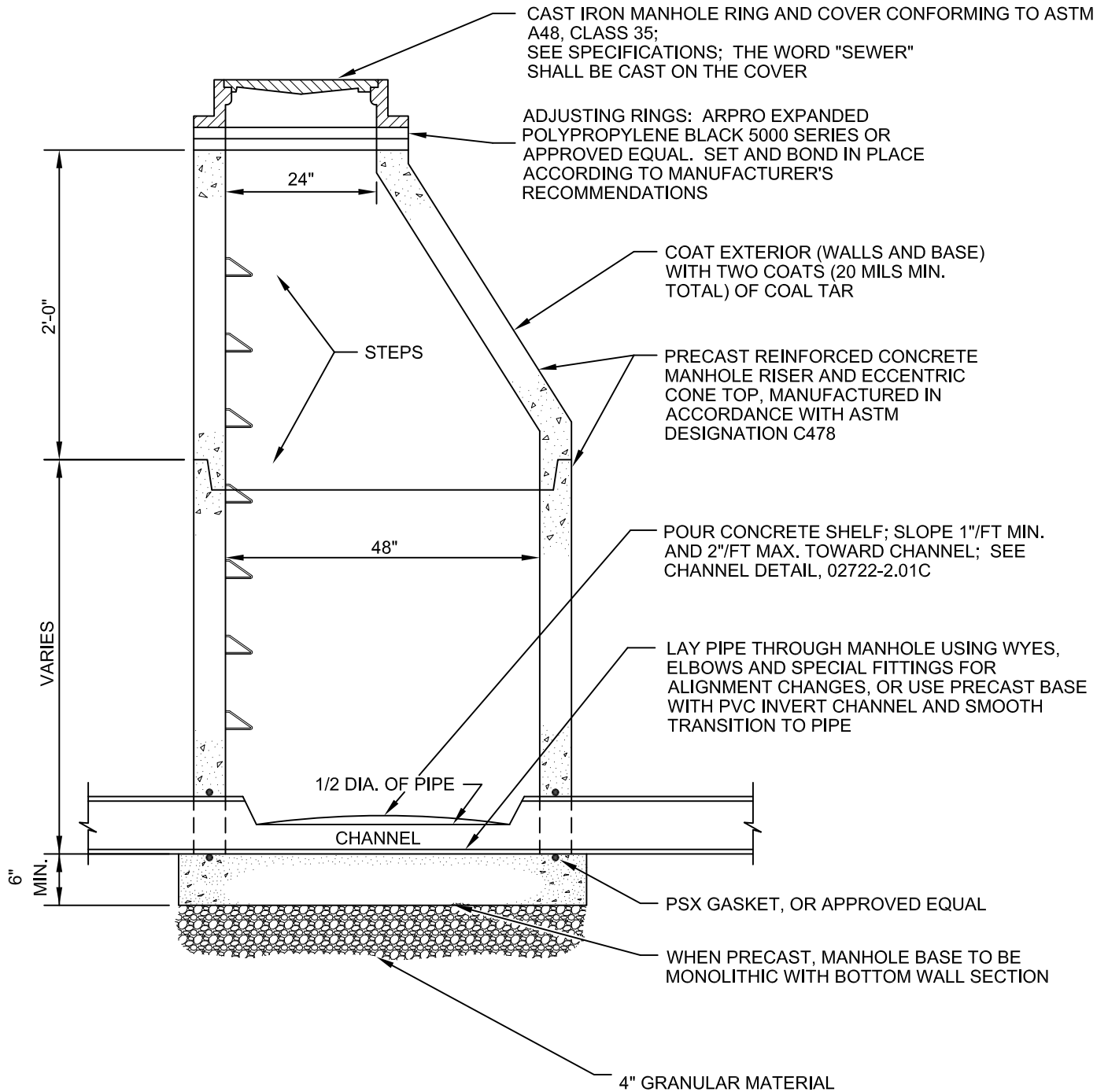
NOT TO SCALE

**SIDEWALK / CURB GRATE
DETAIL**

DWG. NO. **02720-2.01f**

CITY of SHERIDAN

NOVEMBER 2015



NOTES:

1. PROVIDE AND INSTALL NOT MORE THAN 8" OF ADJUSTING RINGS FOR EACH MANHOLE. ADJUST RINGS AND COVER TO GRADE ACCORDING TO MANUFACTURER'S INSTRUCTIONS.
2. ALL JOINTS BETWEEN MANHOLE SECTIONS SHALL BE RUBBER-NEK OR EQUAL.
3. HAND-COMPACT AROUND MANHOLE FOR FULL DEPTH OF BACKFILL. COMPACTION TESTING SHALL BE IN COMPLIANCE WITH SECTION 02221 - 1.03.
4. ALL PENETRATIONS TO BE WATER-TIGHT.

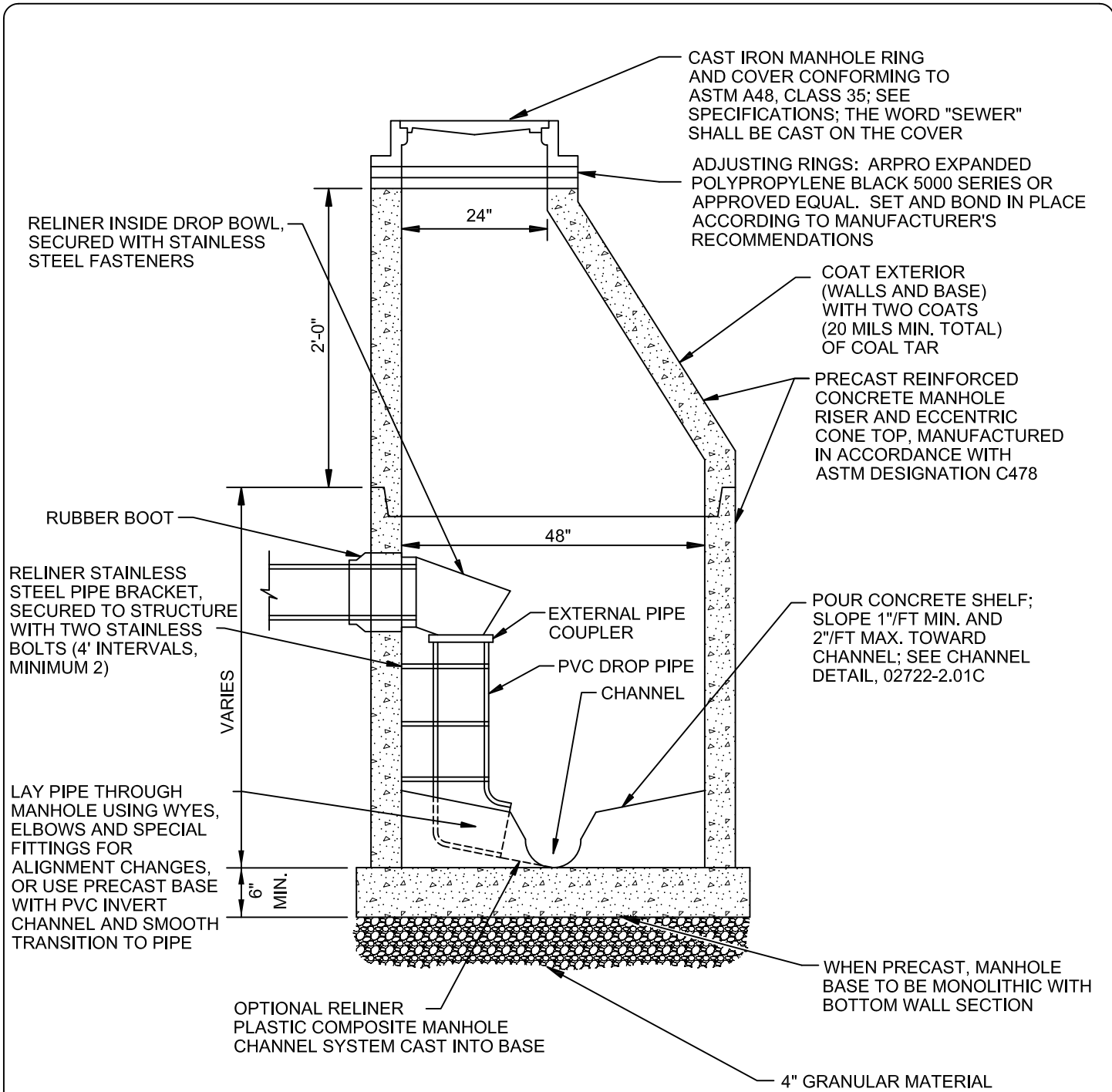
NOT TO SCALE

**ECCENTRIC CONE SANITARY
SEWER MANHOLE DETAIL**

DWG. NO. 02722-2.01a

CITY of SHERIDAN

NOVEMBER 2015



NOTES:

1. PROVIDE AND INSTALL NOT MORE THAN 8" OF ADJUSTING RINGS FOR EACH MANHOLE. ADJUST RINGS AND COVER TO GRADE ACCORDING TO MANUFACTURER'S INSTRUCTIONS.
2. ALL JOINTS BETWEEN MANHOLE SECTIONS SHALL BE RUBBER-NEK OR EQUAL.
3. HAND-COMPACT AROUND MANHOLE FOR FULL DEPTH OF BACKFILL. COMPACTION TESTING SHALL BE IN COMPLIANCE WITH SECTION 02221 - 1.03.
4. ALL PENETRATIONS TO BE WATER-TIGHT.
5. SUPPLY DESIGN AND REINFORCING STEEL FOR HS-20 LOADING.

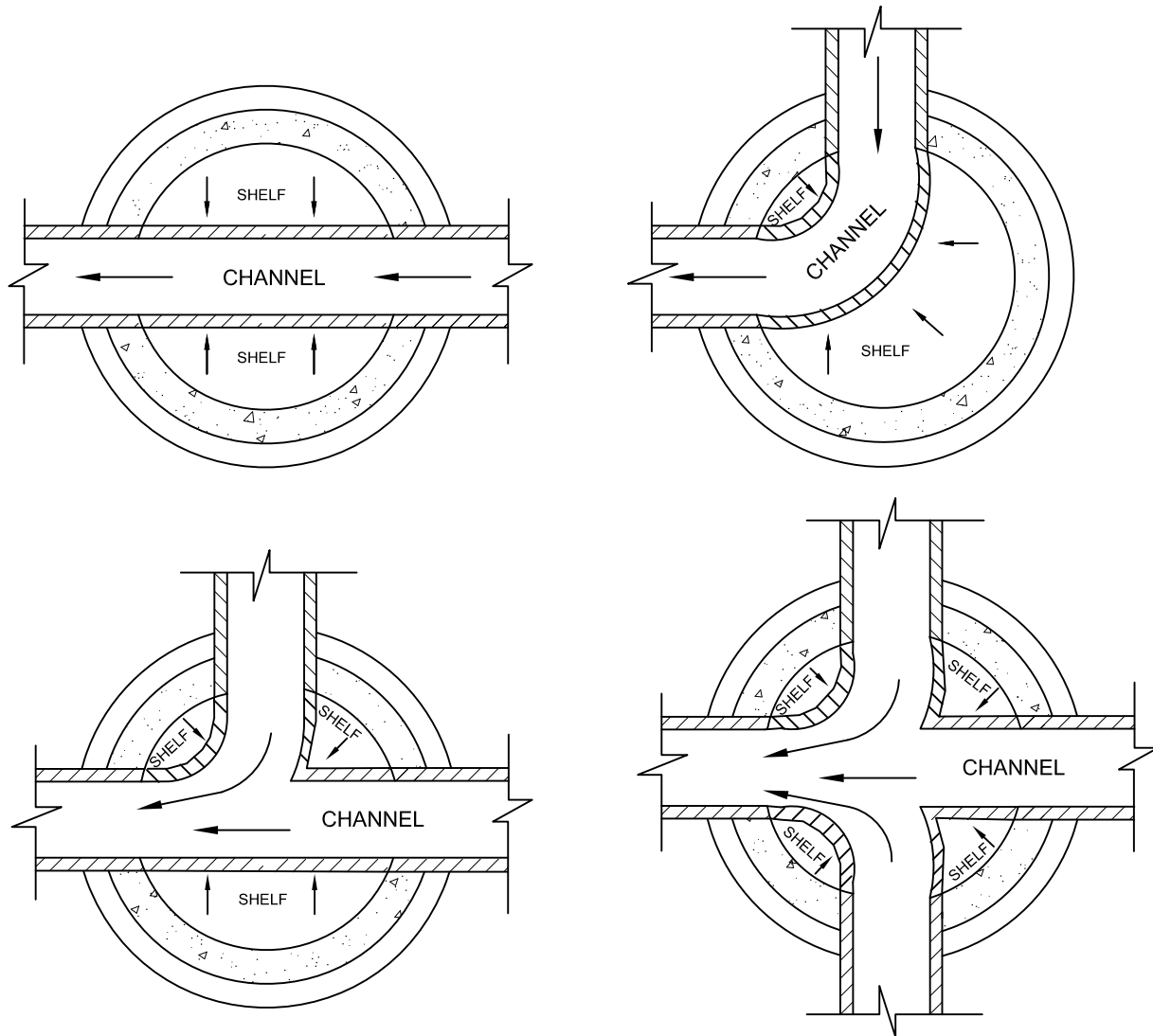
NOT TO SCALE

**TYPICAL DROP
MANHOLE DETAIL**

DWG. NO. 02722-2.01b

CITY of SHERIDAN

NOVEMBER 2015



NOTES:

1. SLOPE ALL SHELVES TO CHANNEL AT 1" PER FOOT, MINIMUM, AND 2" PER FOOT, MAXIMUM.
2. SEE PLAN-PROFILE SHEETS FOR SLOPE OF CHANNEL AND DIRECTION OF FLOW.
3. ENTIRE CHANNEL SHALL BE PVC.
4. WHEN CASTING PVC CHANNEL INTO A CAST-IN-PLACE BASE, PIPE SHALL BE CUT OFF AT SPRINGLINE AFTER PAVING ABOVE MANHOLE IS COMPLETE.

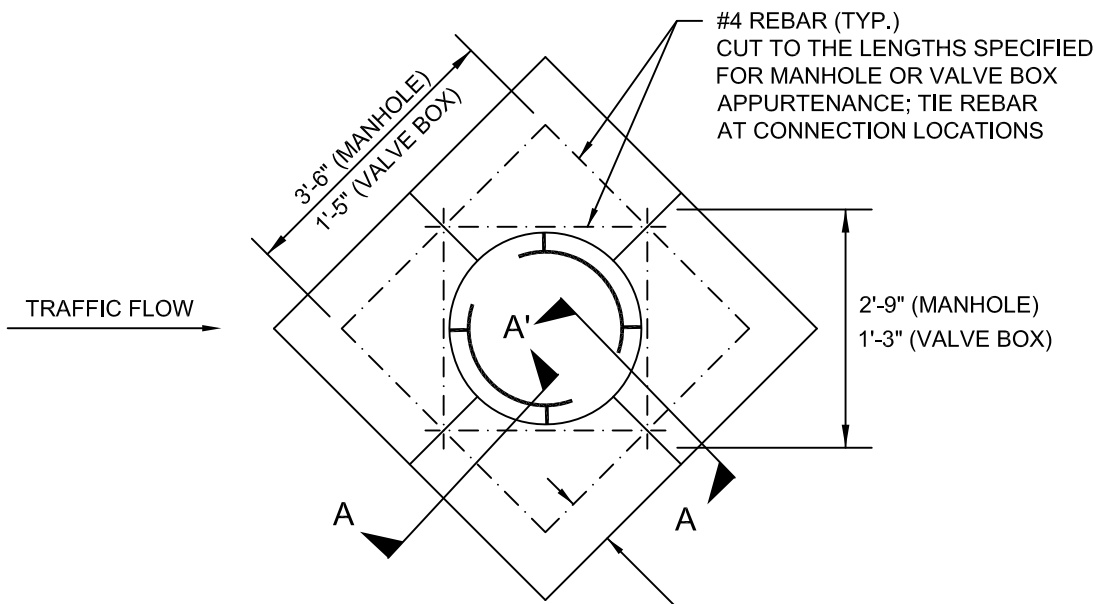
NOT TO SCALE

**TYPICAL MANHOLE
CHANNEL DETAILS**

DWG. NO. 02722-2.01c

CITY of SHERIDAN

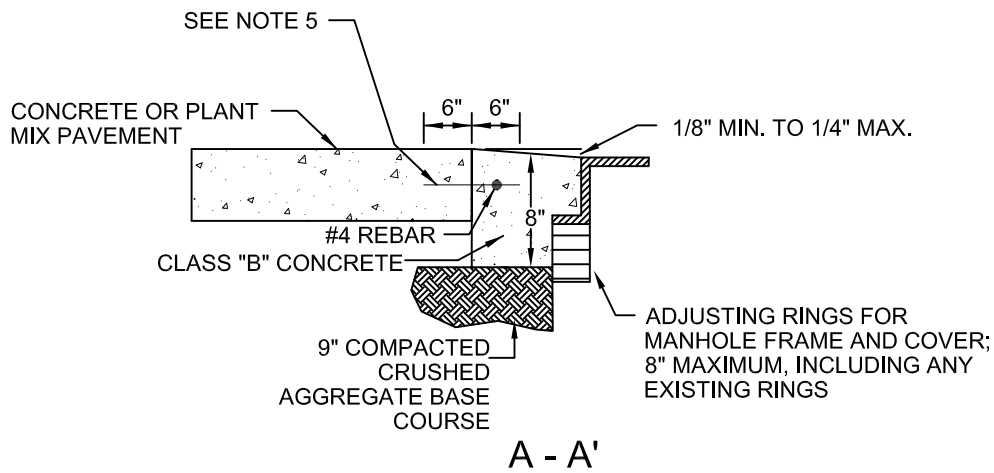
NOVEMBER 2015



NOTES:

1. SEE SPECIFICATION SECTIONS 02570 AND 02722 FOR GUIDANCE ON WHERE CONCRETE COLLARS ARE REQUIRED
2. LOCATE CONCRETE COLLAR AS SHOWN IN RELATION TO TRAFFIC FLOW (IF POSSIBLE).
3. CONCRETE COLLAR FOR MANHOLES SHALL BE 4' X 4'.
4. CONCRETE COLLAR FOR VALVE BOXES SHALL BE SIZED TO ALLOW A MINIMUM 1' FROM THE EDGE OF VALVE BOX TO THE EDGE OF COLLAR. E.G. A COLLAR FOR A 6" DIAMETER VALVE BOX SHALL BE 2.5' X 2.5'.
5. IF PLACED IN CONCRETE PAVEMENT (AS A CORRECTIVE MEASURE), COLLARS SHALL BE TIED TO THE PAVEMENT USING 1' LENGTH #4 REBAR SPACED AT 1' CENTERS; REBAR SHALL BE CENTERED WITHIN THE ADJACENT PAVEMENT SLAB AND EMBEDDED TO A DEPTH OF 6"; ANCHOR REBAR WITHIN ADJACENT PAVEMENT USING EPOXY ADHESIVE, AS APPROVED BY THE ENGINEER.

MANHOLE / VALVE BOX COLLAR



NOT TO SCALE

**MANHOLE / VALVE BOX
CONCRETE COLLAR DETAIL**

DWG. NO. 02722-3.02

CITY of SHERIDAN

NOVEMBER 2015

CAST IRON MANHOLE RING AND COVER CONFORMING TO ASTM A48, CLASS 35 AND MUNICIPAL CASTINGS 301-7, WITH THE WORD "STORM" CAST ON THE COVER

ADJUSTING RINGS (8" MAX.): ARPRO EXPANDED POLYPROPYLENE BLACK 5000 SERIES OR APPROVED EQUAL. SET AND BOND IN PLACE ACCORDING TO MANUFACTURER'S RECOMMENDATIONS

PRECAST REINFORCED CONCRETE MANHOLE RISER AND ECCENTRIC CONE TOP, MANUFACTURED TO ASTM C478 DESIGNATION

ALL JOINTS BETWEEN MANHOLE SECTIONS SHALL BE RUBBER-NEK OR EQUAL

GROUTED JOINT, WATER-TIGHT SEAL

STORM DRAIN PIPE

NOTE:
PROVIDE AND INSTALL NOT MORE THAN 8" OF ADJUSTING RINGS FOR EACH MANHOLE. ADJUST RINGS AND COVER TO GRADE ACCORDING TO MANUFACTURER'S INSTRUCTIONS.

MANHOLE BASE OF 6" MINIMUM THICKNESS TO BE MONOLITHIC WITH BOTTOM WALL SECTION

4" GRANULAR MATERIAL

NOT TO SCALE

4'-0" CONE
INTERMEDIATE RISERS
VARIES, AS
REQUIRED

STEPS

24"

48"

12"

6"
MIN.

6"
MIN.

ECCENTRIC-CONED STORM DRAIN MANHOLE DETAIL

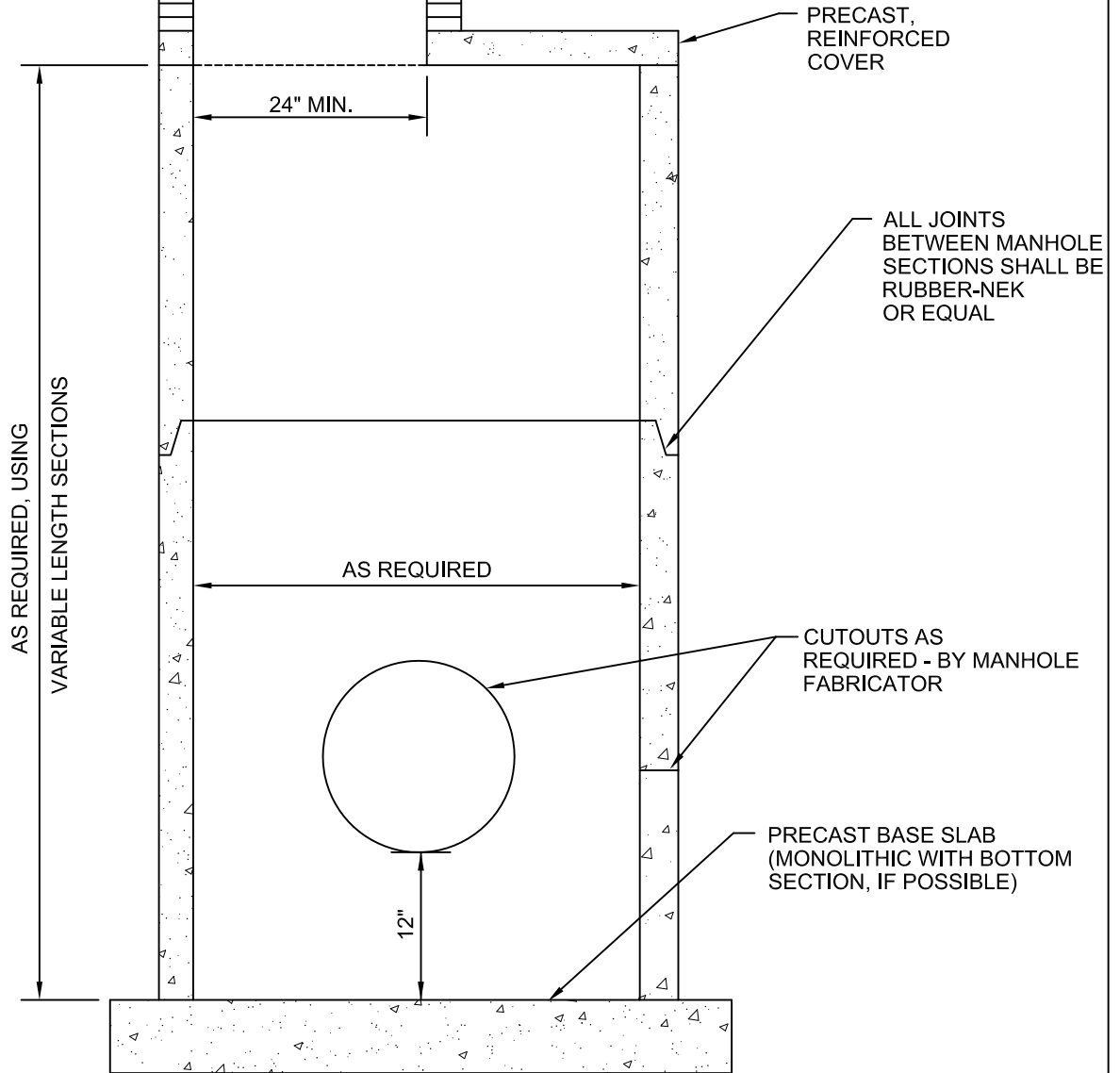
DWG. NO. 02722-STRM-A

CITY of SHERIDAN

NOVEMBER 2015

CAST IRON MANHOLE RING AND COVER CONFORMING TO ASTM A48, CLASS 35 AND MUNICIPAL CASTINGS 301-7, WITH THE WORD "STORM" CAST ON THE COVER

ADJUSTING RINGS (8" MAX.): ARPRO EXPANDED POLYPROPYLENE BLACK 5000 SERIES OR APPROVED EQUAL. SET AND BOND IN PLACE ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.



NOTES:

1. PROVIDE AND INSTALL NOT MORE THAN 8" OF ADJUSTING RINGS FOR EACH MANHOLE. ADJUST RINGS AND COVER TO GRADE ACCORDING TO MANUFACTURER'S INSTRUCTIONS.
2. CONCRETE THICKNESSES AND REINFORCING PER ASTM C478 FOR AASHTO HS-20 LOADING.
3. GROUT SPACE BETWEEN PIPE AND MANHOLE WATER-TIGHT. GROUT FROM BOTH INSIDE AND OUTSIDE.

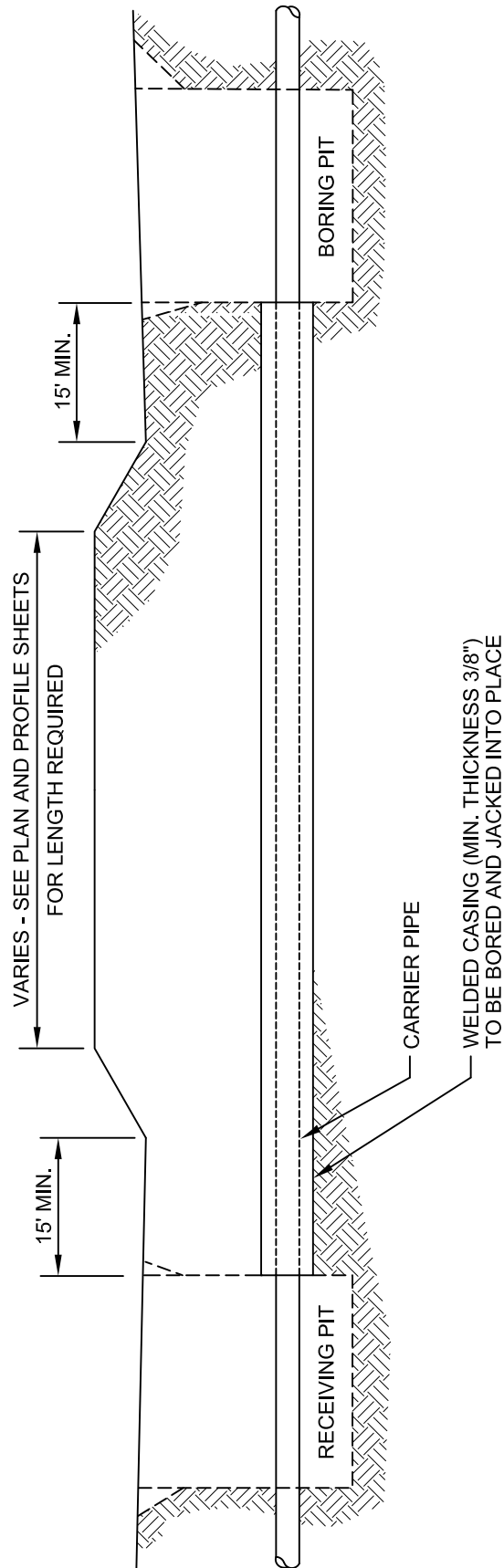
NOT TO SCALE

**STANDARD STRAIGHT STORM
DRAIN MANHOLE DETAIL**

DWG. NO. **02722-STRM-B**

CITY of SHERIDAN

NOVEMBER 2015



NOTES:

1. CASING INSIDE DIA. TO BE AT LEAST 3" GREATER THAN OUTSIDE DIA. OF BELLS.
2. SEE O.S.H.A. SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION, SECTION 1926.652. TRENCH WALLS SHALL BE IN COMPLIANCE WITH THE CURRENT O.S.H.A. REGULATIONS.
3. TRENCH WALLS WITH SHORING TO CONFORM TO O.S.H.A. REGULATIONS.
4. PROVIDE TRAFFIC CONTROL PER SECTION 02060 OF THE SPECIFICATION.

BORING AND CASING FOR RAILROAD AND ROADWAY CROSSING DETAIL

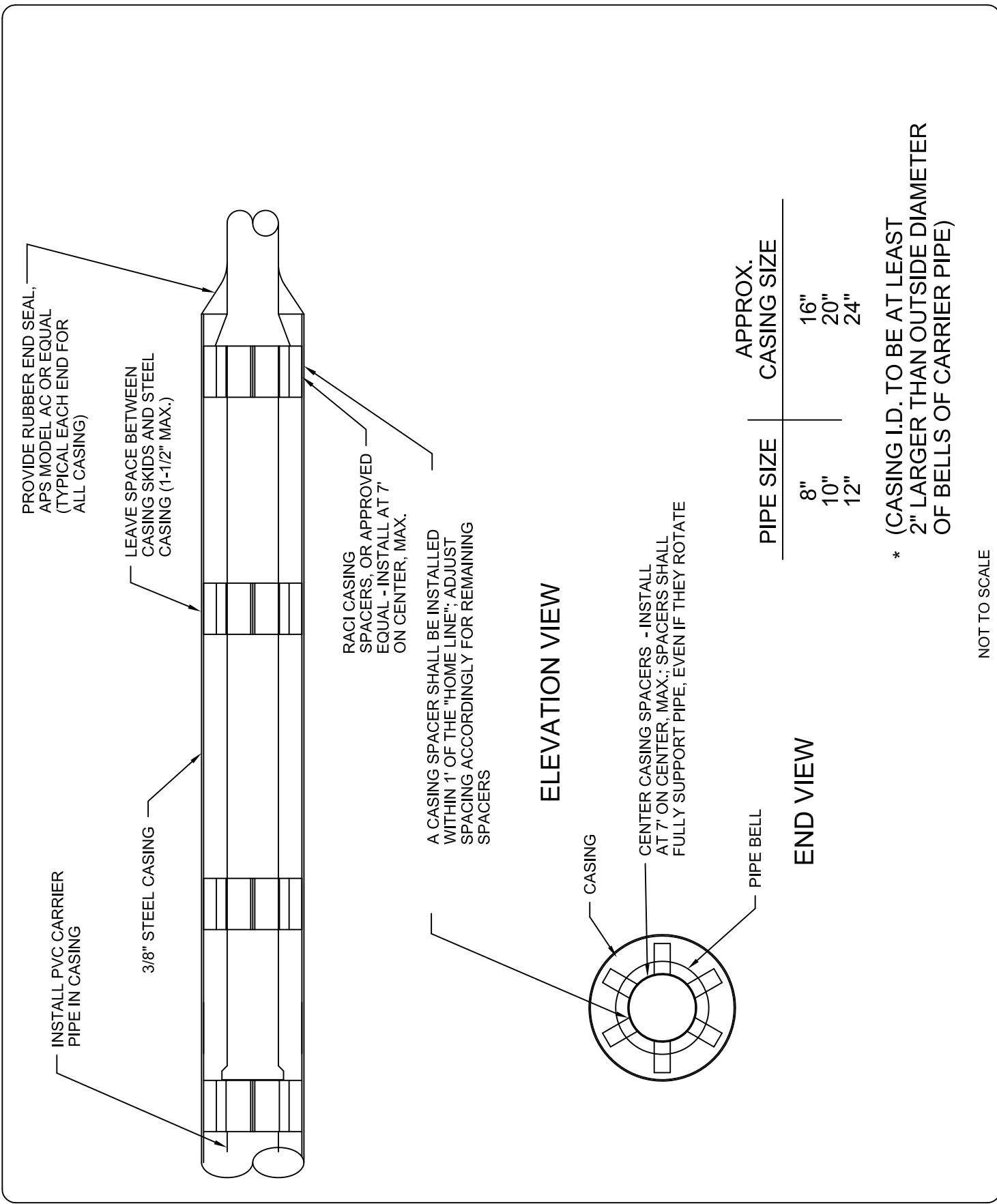
DWG. NO.

02740-2.01

CITY of SHERIDAN

NOVEMBER 2015

NOT TO SCALE

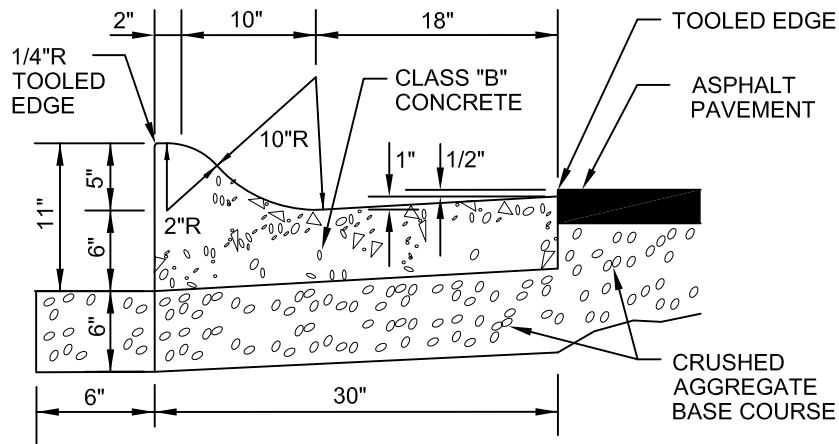


CASING DETAIL FOR PLASTIC PIPE

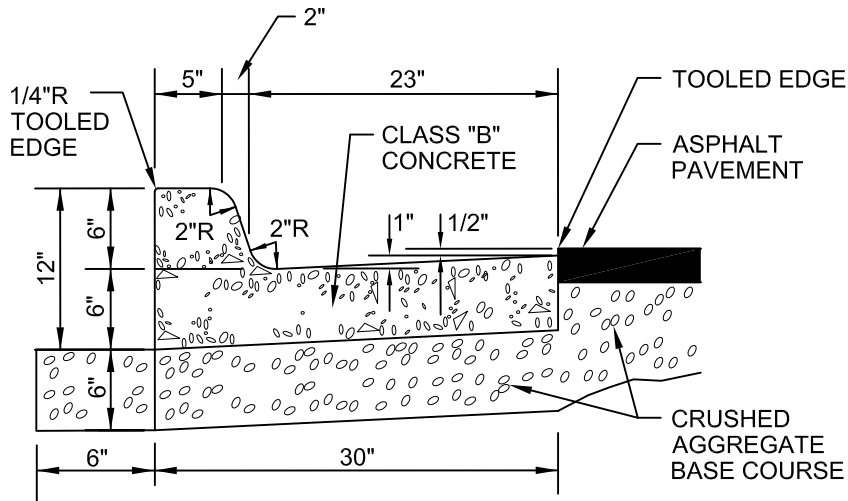
DWG. NO. 02740-2.02

CITY of SHERIDAN

NOVEMBER 2015



TYPE "A"



TYPE "B"

NOTES:

1. PREFORMED EXPANSION JOINT FILLER, CONFORMING TO THE CROSS SECTION OF THE CURB AND GUTTER, SHALL BE INSTALLED AT ALL JOINTS BETWEEN EXISTING CONCRETE, INLETS, MANHOLES AND OPPOSITE TO EXISTING EXPANSION JOINTS, AND AT NOT MORE THAN 150 FOOT INTERVALS.
2. PROVIDE 1" DIA. X 14" SMOOTH DOWEL BAR IN EXPANSION JOINT LOCATIONS; SMOOTH DOWEL BARS ACROSS EXPANSION JOINTS SHALL BE PROVIDED WITH EXPANSION CAPS AND COATED WITH GREASE.
3. SEE DWG. NO. 03020-2.01b FOR CURB & GUTTER WITH CONCRETE PAVEMENT DETAIL.

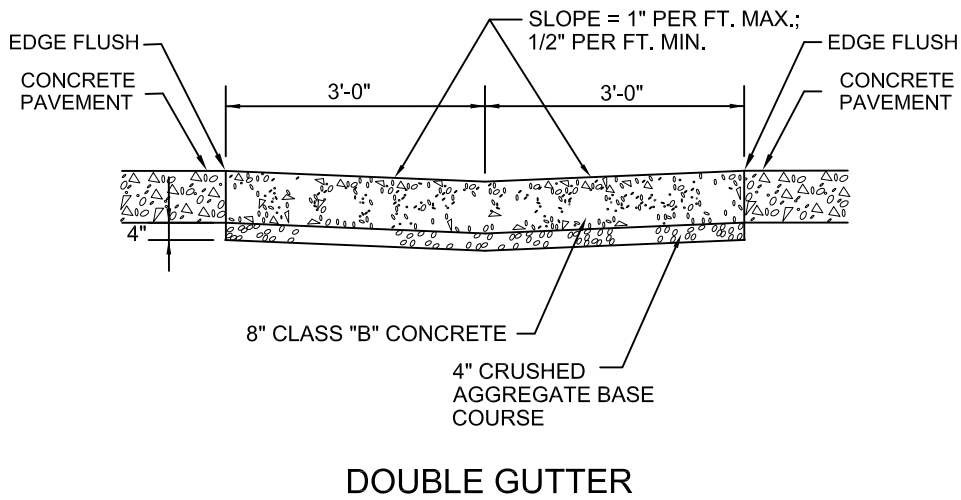
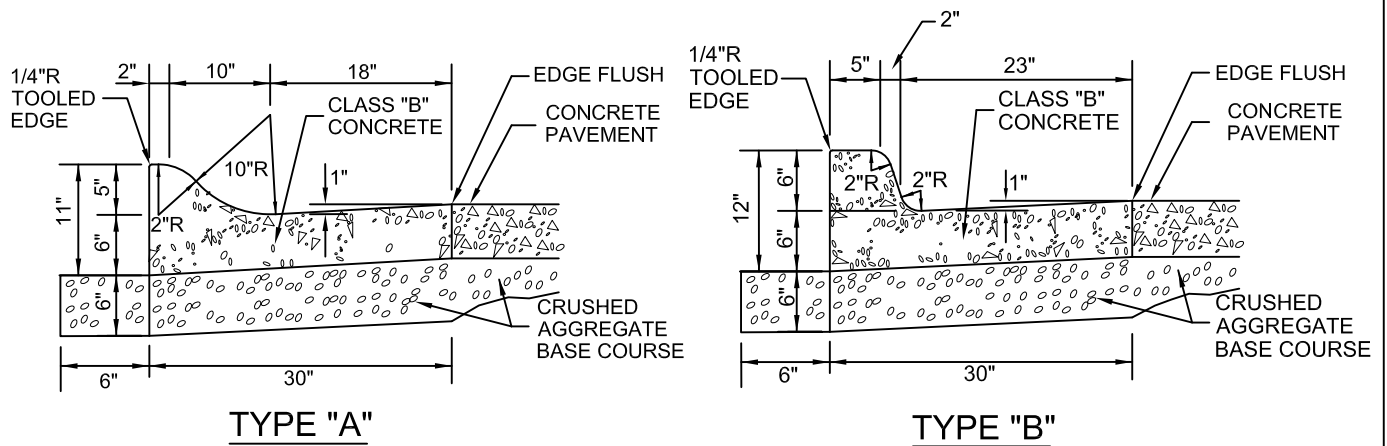
NOT TO SCALE

CURB & GUTTER DETAIL

DWG. NO. 03020-2.01a

CITY of SHERIDAN

NOVEMBER 2015



NOTES:

1. PREFORMED EXPANSION JOINT FILLER, CONFORMING TO THE CROSS SECTION OF THE CURB AND GUTTER, SHALL BE INSTALLED AT ALL JOINTS BETWEEN EXISTING CONCRETE, INLETS, MANHOLES AND OPPOSITE TO EXISTING EXPANSION JOINTS, AND AT NOT MORE THAN 150 FOOT INTERVALS.
2. PROVIDE 1" DIA. X 14" SMOOTH DOWEL BAR IN EXPANSION JOINT LOCATIONS; SMOOTH DOWEL BARS ACROSS EXPANSION JOINTS SHALL BE PROVIDED WITH EXPANSION CAPS AND COATED WITH GREASE.
3. SEE DWG. NO. 03030-3.01i FOR PLAN VIEW OF DOUBLE GUTTER.

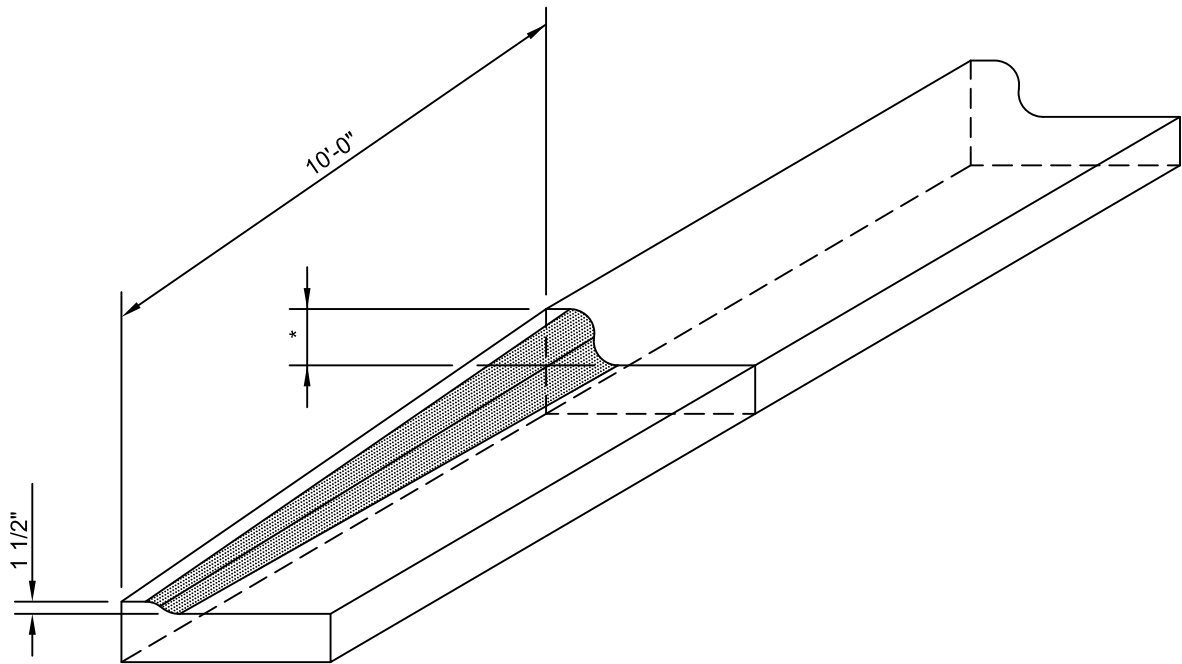
NOT TO SCALE

CURB & GUTTER, DOUBLE GUTTER WITH CONCRETE PAVEMENT DETAIL

DWG. NO. 03020-2.01b

CITY of SHERIDAN

NOVEMBER 2015



* 5" FOR TYPE A CURB;
6" FOR TYPE B CURB

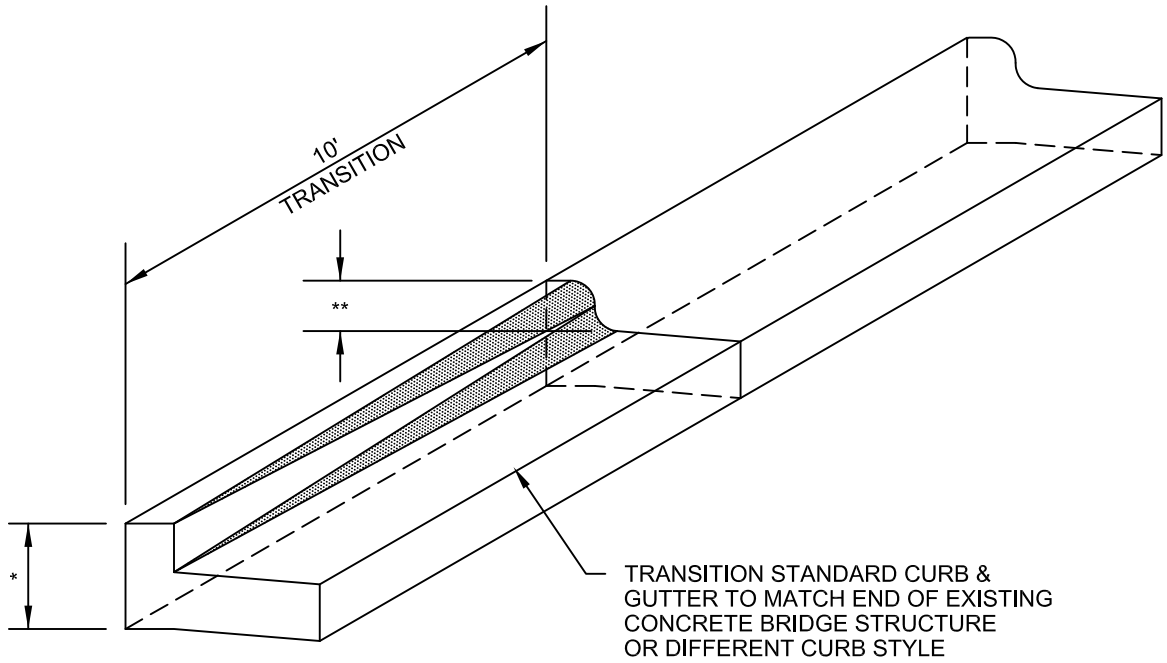
NOT TO SCALE

**CURB & GUTTER
TAPER DETAIL**

DWG. NO. 03020-3.01a

CITY of SHERIDAN

NOVEMBER 2015



* MATCH TOP FACE OF CURB TO TOP FACE OF BRIDGE STRUCTURE OR DIFFERENT CURB STYLE.

** 5" FOR TYPE A CURB;
6" FOR TYPE B CURB

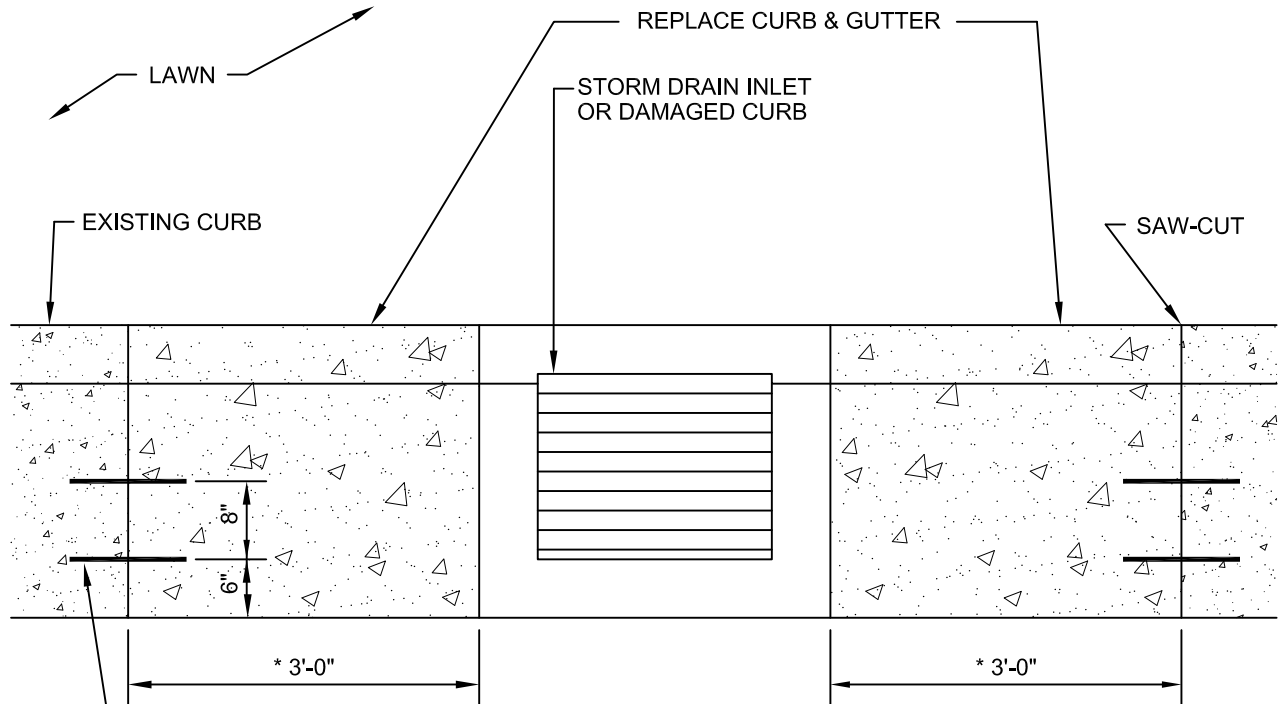
NOT TO SCALE

**CURB END TRANSITION
DETAIL**

DWG. NO. 03020-3.01b

CITY of SHERIDAN

NOVEMBER 2015



#4 REBAR; 12" LONG, CENTERED AT JOINT (TYP.);
 ANCHOR REBAR INTO EXISTING CONCRETE USING EPOXY
 ADHESIVE, AS APPROVED BY THE ENGINEER

* SAW-CUT AT NEAREST CONSTRUCTION
 JOINT IF DISTANCE TO THE CONSTRUCTION
 JOINT IS LESS THAN 5'-0"

NOT TO SCALE

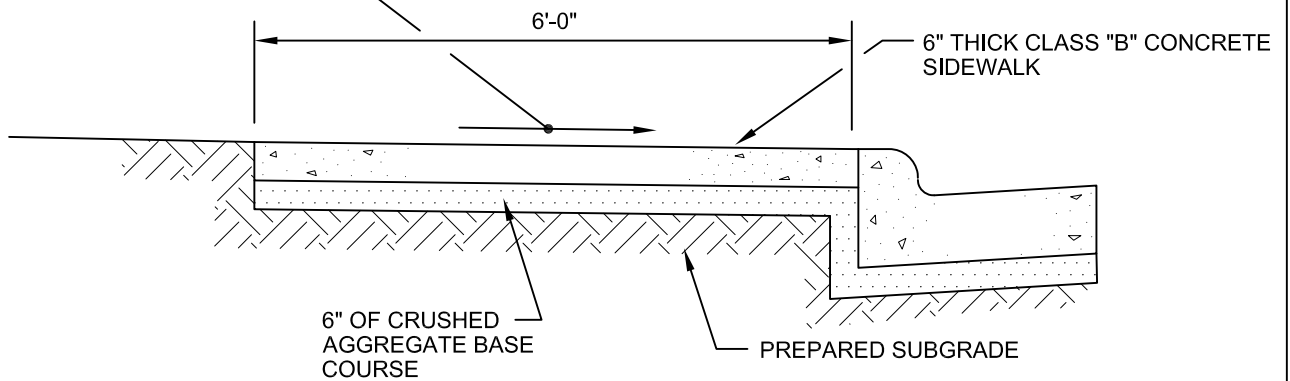
CURB & GUTTER REMOVAL AND REPLACEMENT DETAIL

DWG. NO. 03020-3.01c

CITY of SHERIDAN

NOVEMBER 2015

SLOPE 1.5% MAX. TOWARD STREET



NOTE:

PREFORMED EXPANSION JOINT FILLER SHALL BE INSTALLED FOR THE FULL THICKNESS OF THE SIDEWALK AND SHALL BE USED AT ALL JOINTS BETWEEN EXISTING CONCRETE, INLETS, MANHOLES AND OPPOSITE TO EXISTING EXPANSION JOINTS, AND AT NOT MORE THAN 150 FOOT INTERVALS. CONTRACTION JOINTS SHALL BE SPACED AT INTERVALS NOT EXCEEDING WIDTH OF SIDEWALK PLACED.

ALL SIDEWALK SHALL BE ADA COMPLIANT.

NOT TO SCALE

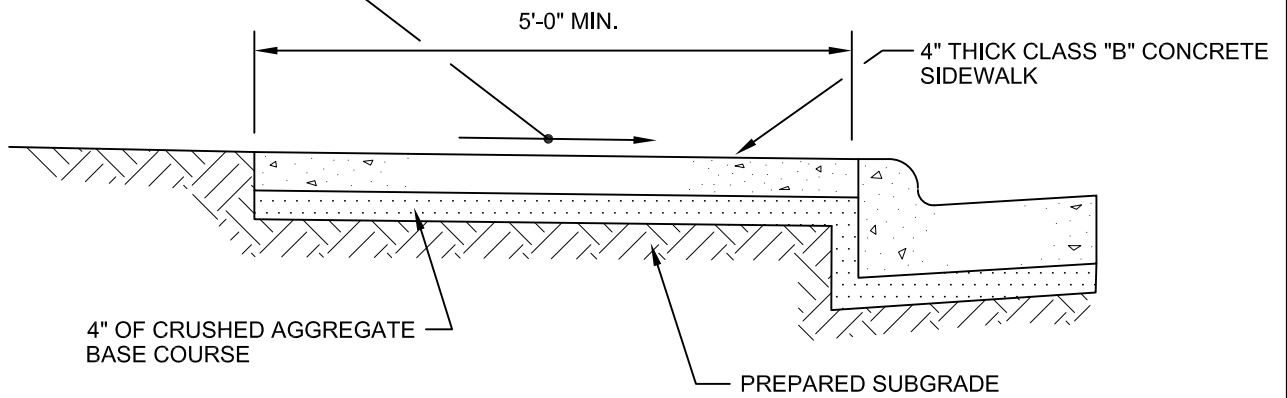
**CONCRETE SIDEWALK - COMMERCIAL
SECTION DETAIL**

DWG. NO. 03030-3.01a

CITY of SHERIDAN

NOVEMBER 2015

SLOPE 1.5% MAX. TOWARD STREET



NOTE:

PREFORMED EXPANSION JOINT FILLER SHALL BE INSTALLED FOR THE FULL THICKNESS OF THE SIDEWALK AND SHALL BE USED AT ALL JOINTS BETWEEN EXISTING CONCRETE, INLETS, MANHOLES AND OPPOSITE TO EXISTING EXPANSION JOINTS, AND AT NOT MORE THAN 150 FOOT INTERVALS. CONTRACTION JOINTS SHALL BE SPACED AT INTERVALS NOT EXCEEDING WIDTH OF SIDEWALK PLACED.

ALL SIDEWALK SHALL BE ADA COMPLIANT.

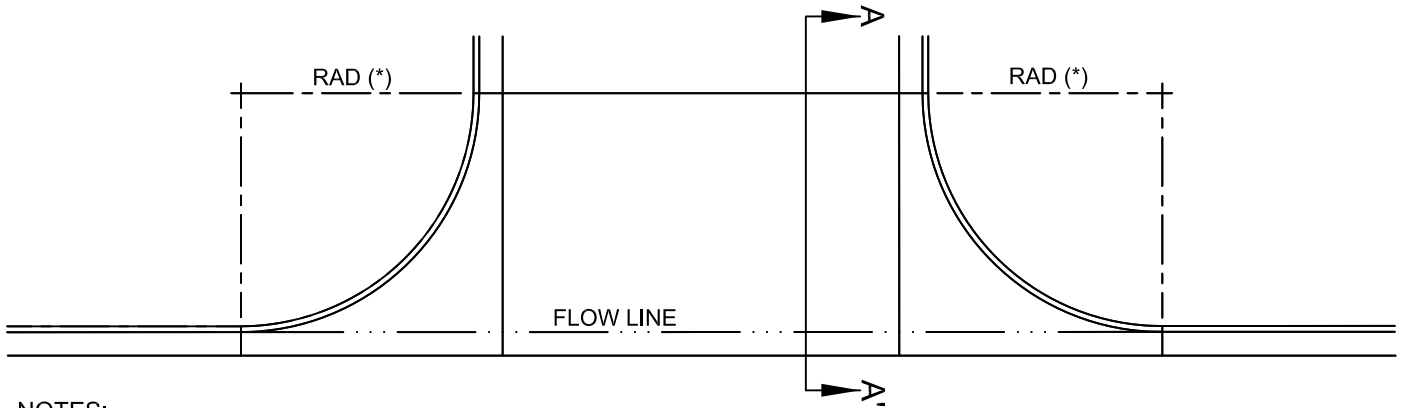
NOT TO SCALE

**CONCRETE SIDEWALK - RESIDENTIAL
SECTION DETAIL**

DWG. NO. 03030-3.01b

CITY of SHERIDAN

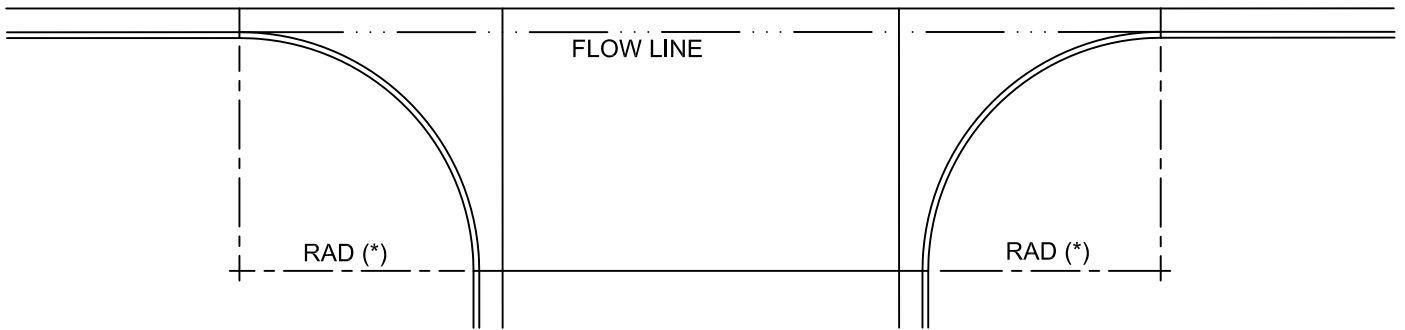
NOVEMBER 2015



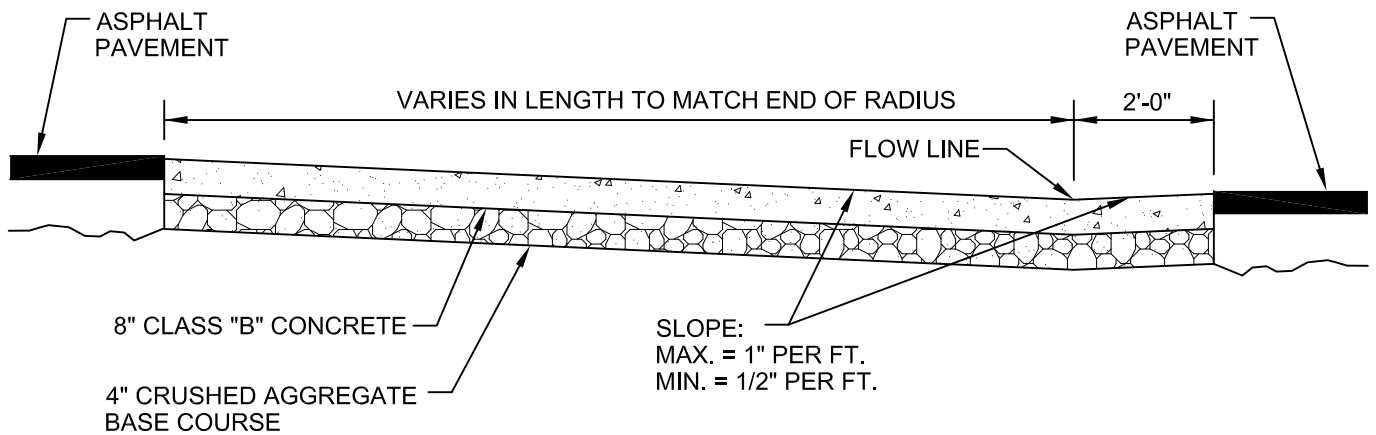
NOTES:

(*) RADIUS SHALL BE 15 FEET FOR RESIDENTIAL STREETS AND 25 FEET FOR COLLECTOR STREETS - MEASURED TO BACK OF CURB.

FLOW LINES OF CURB & GUTTER, DOUBLE GUTTER, AND FILLETS SHALL BE WARPED TO MEET FLOW LINES OF GUTTERS.



PLAN



A - A'

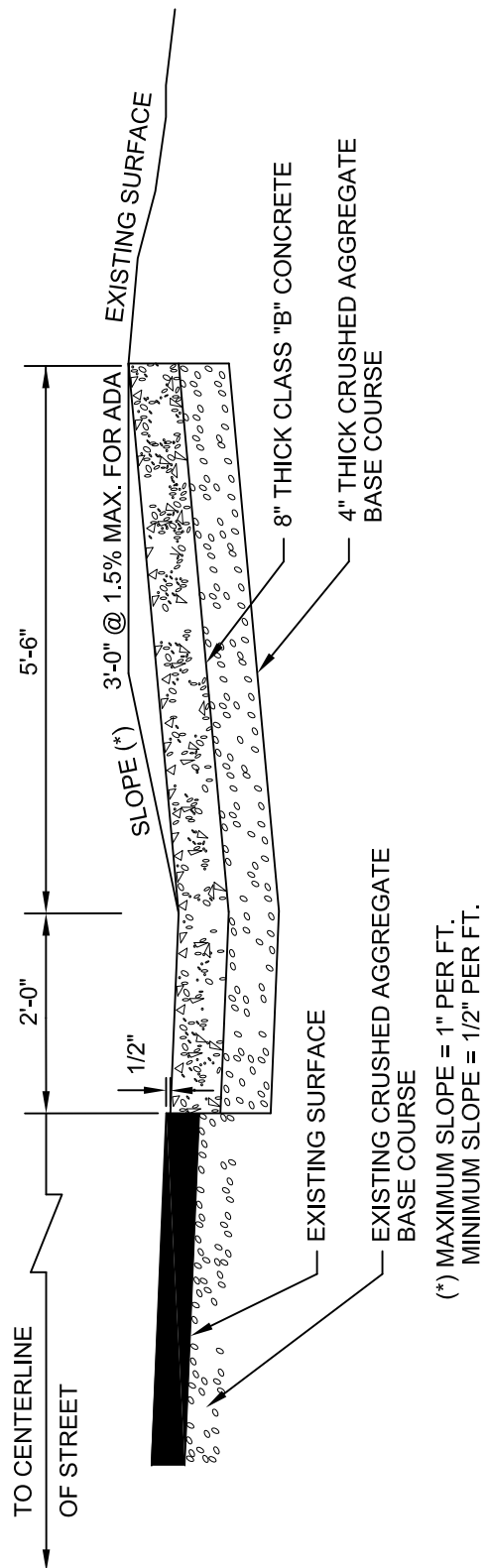
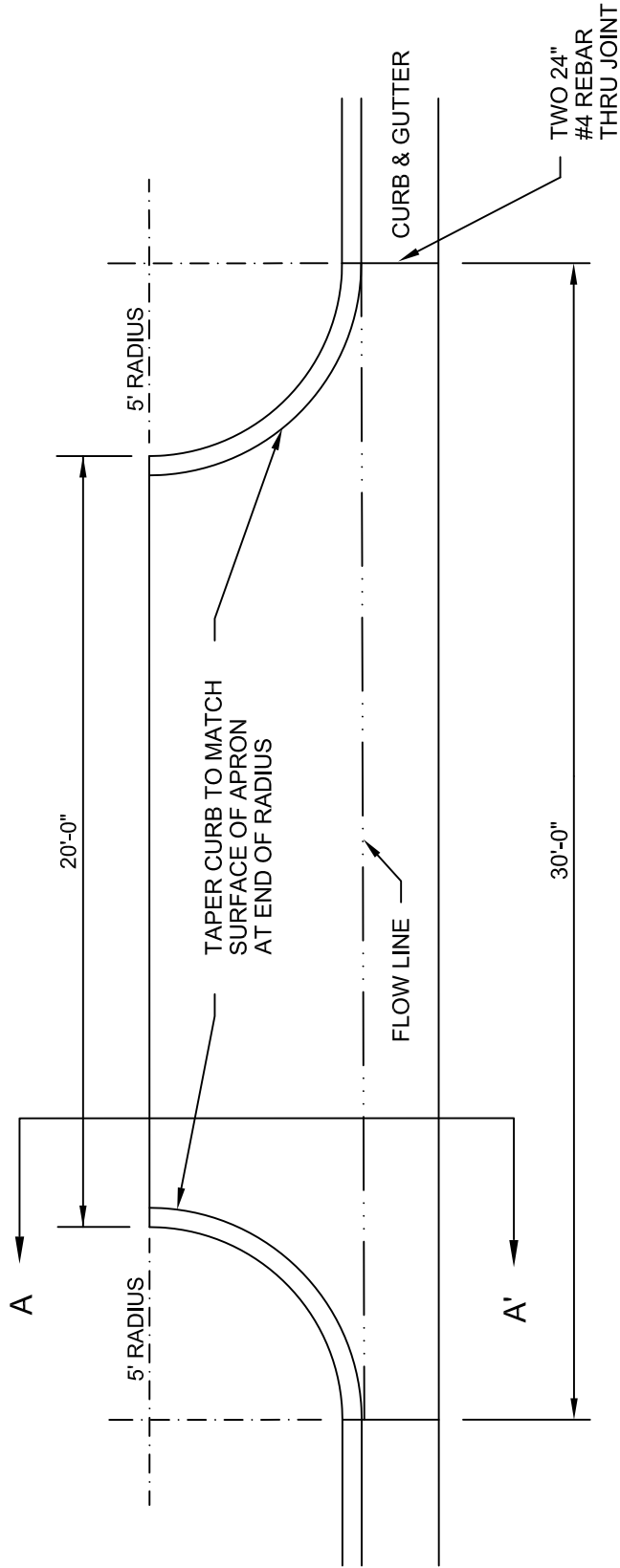
NOT TO SCALE

**STREET INTERSECTION
DETAIL**

DWG. NO. 03030-3.01c

CITY of SHERIDAN

NOVEMBER 2015



A - A'

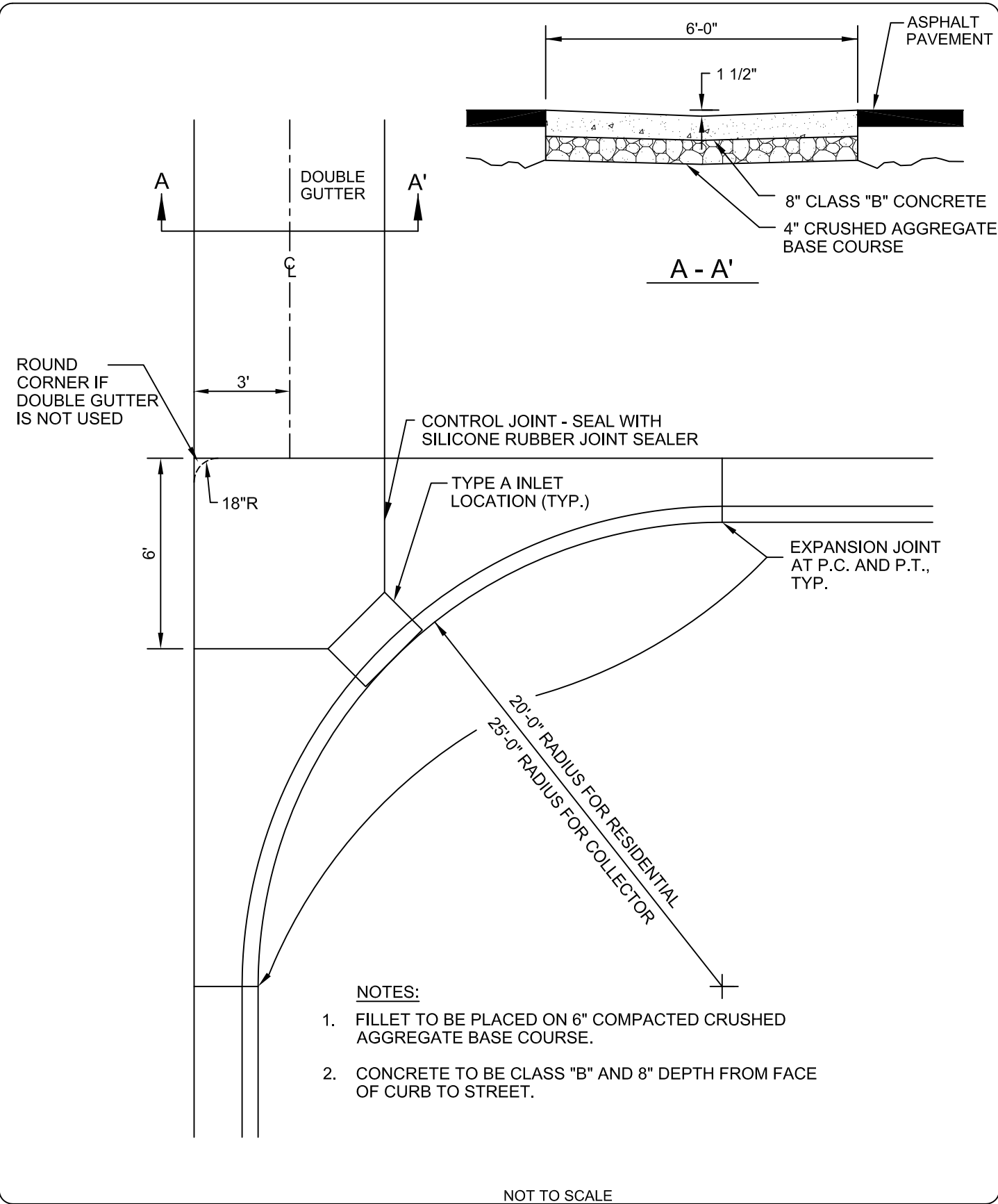
NOT TO SCALE

COMMERCIAL AND ALLEY
APPROACH DETAIL

DWG. NO. 03030-3.01d

CITY of SHERIDAN

NOVEMBER 2015

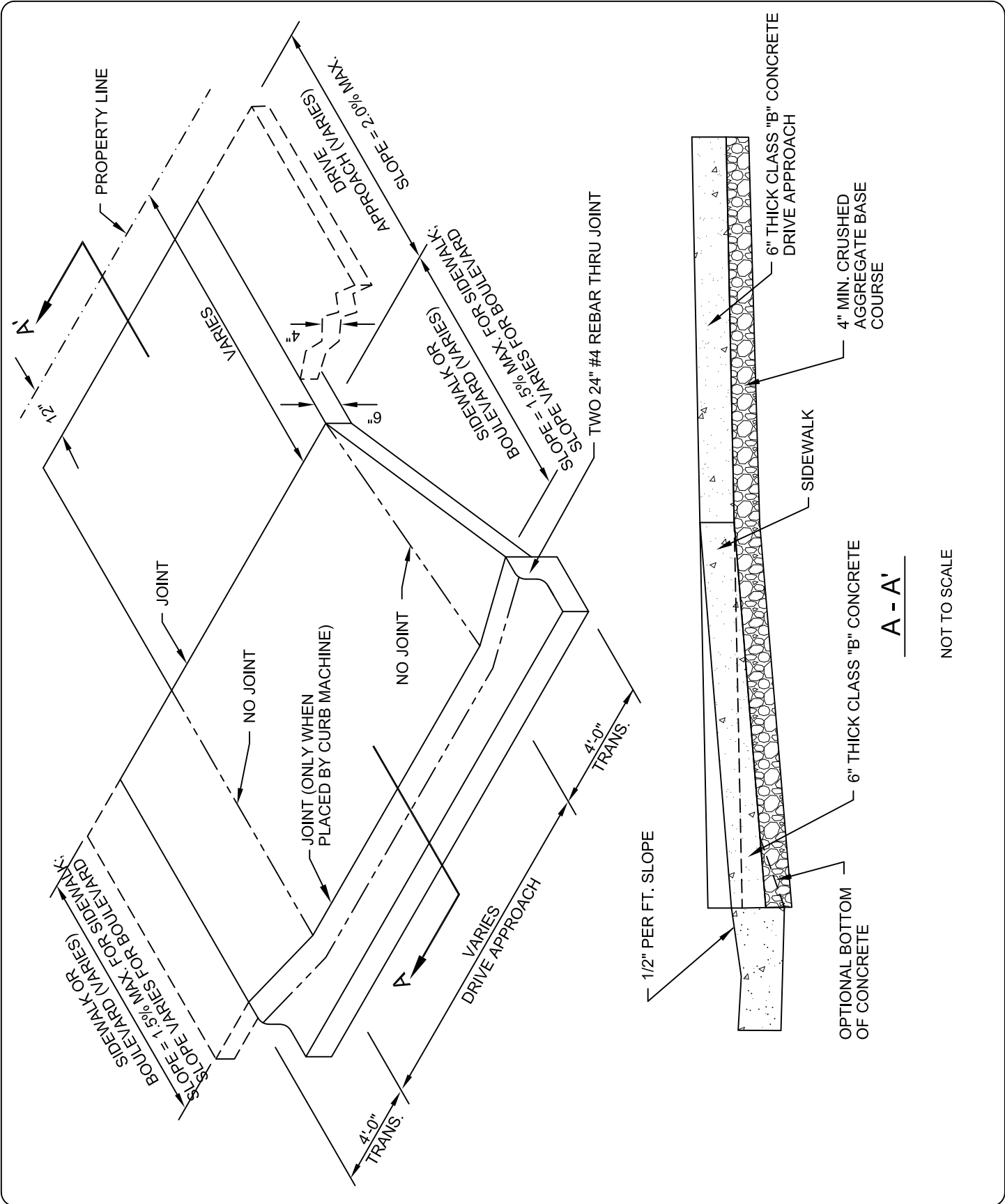


STANDARD FILLET
DETAIL

DWG. NO. 03030-3.01e

CITY of SHERIDAN

NOVEMBER 2015



**RESIDENTIAL APPROACH DETAIL
(WITH CONCRETE DRIVEWAY AND FLARE SECTIONS)**

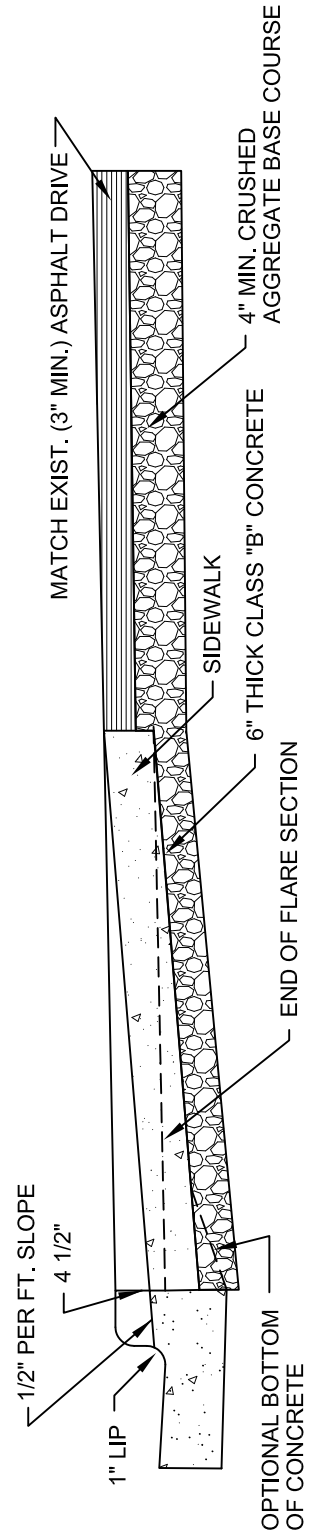
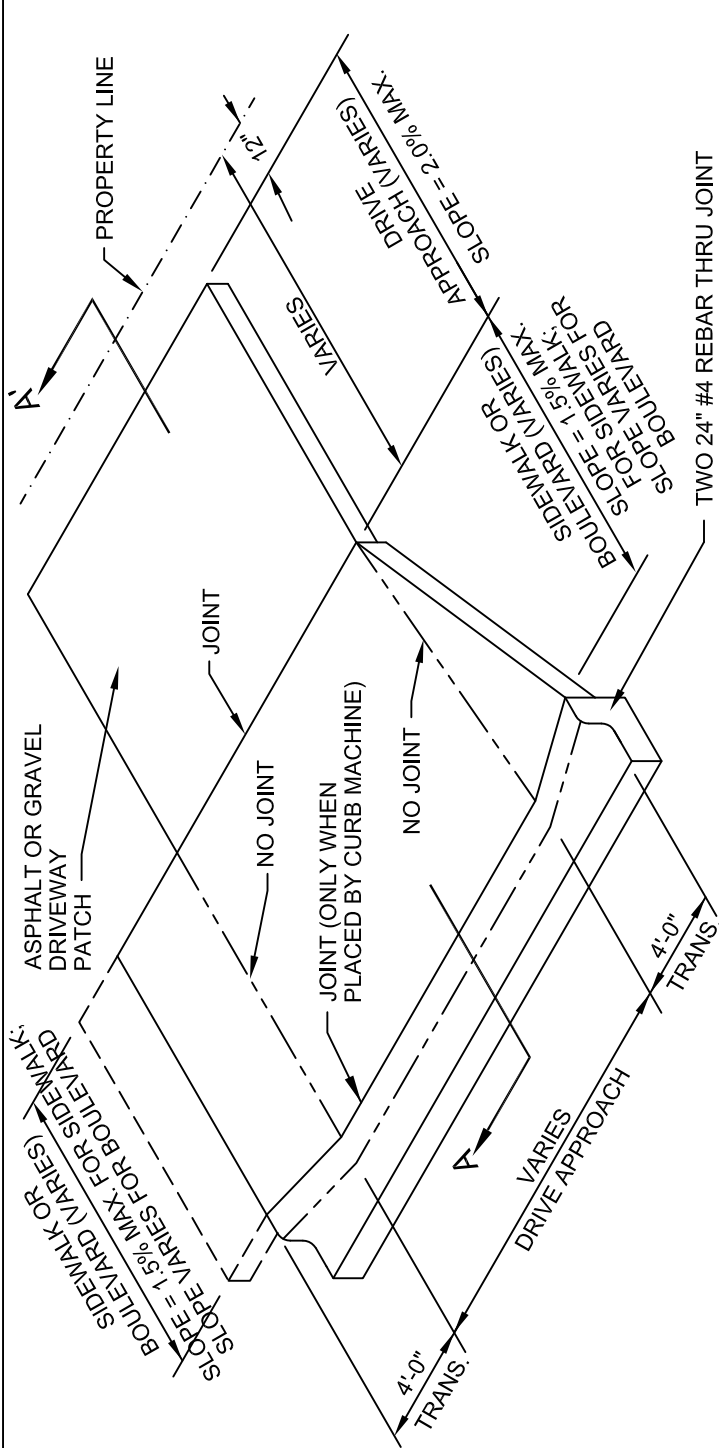
DWG. NO. 03030-3.01f

CITY of SHERIDAN

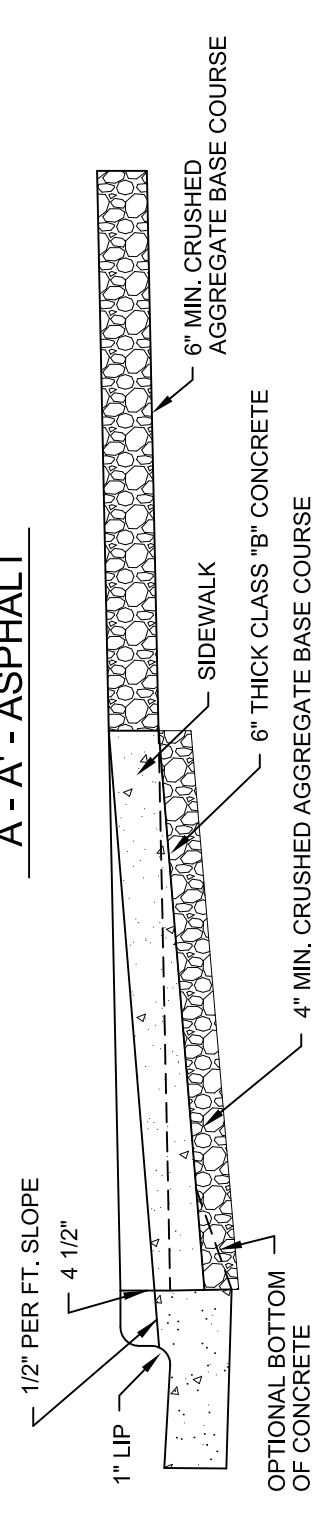
NOVEMBER 2015

A - A'

NOT TO SCALE



A - A' - ASPHALT



A - A' - GRAVEL

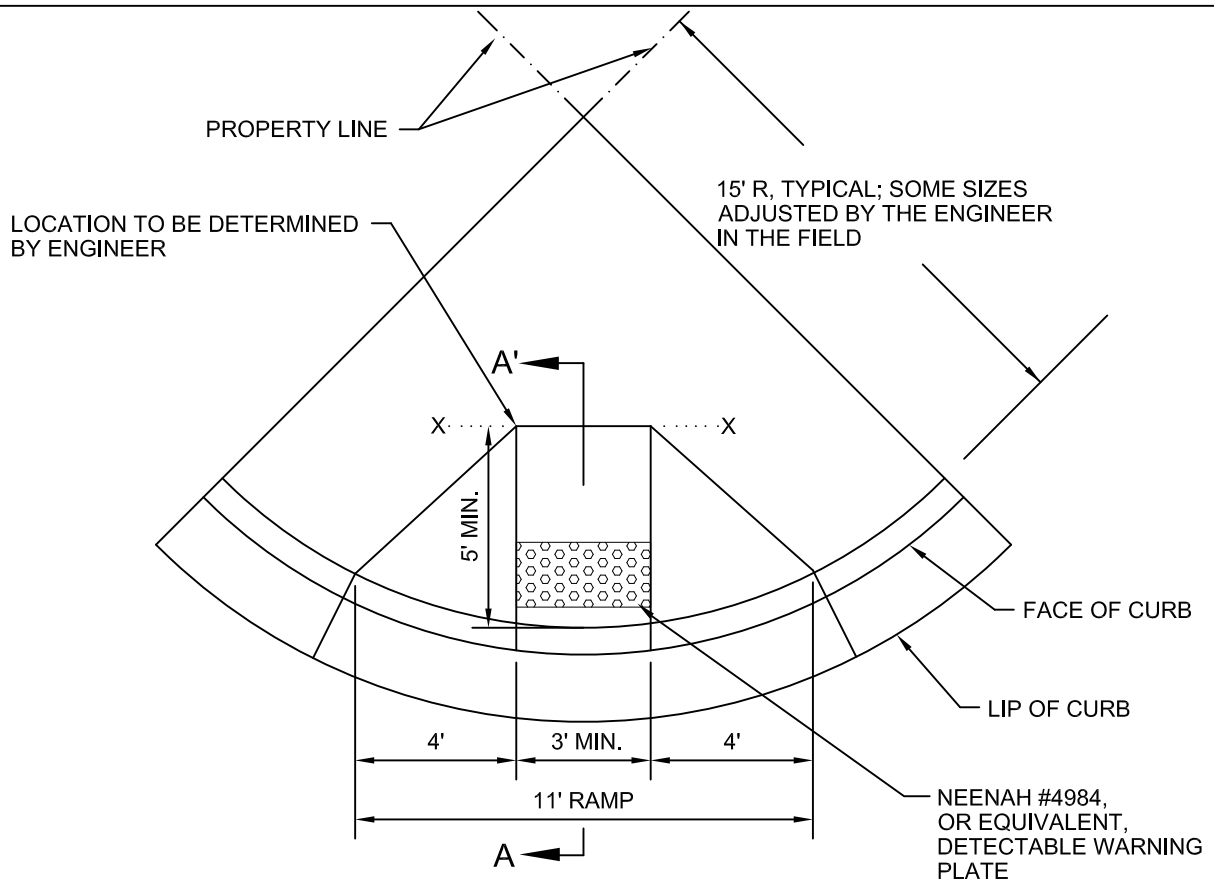
NOT TO SCALE

**RESIDENTIAL APPROACH DETAIL
(WITH ASPHALT OR GRAVEL DRIVEWAY PATCH)**

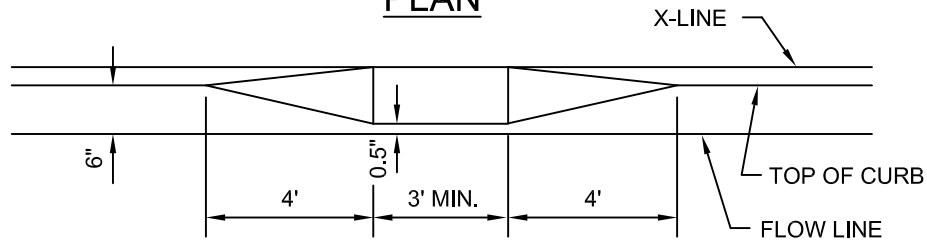
DWG. NO. 03030-3.01g

CITY of SHERIDAN

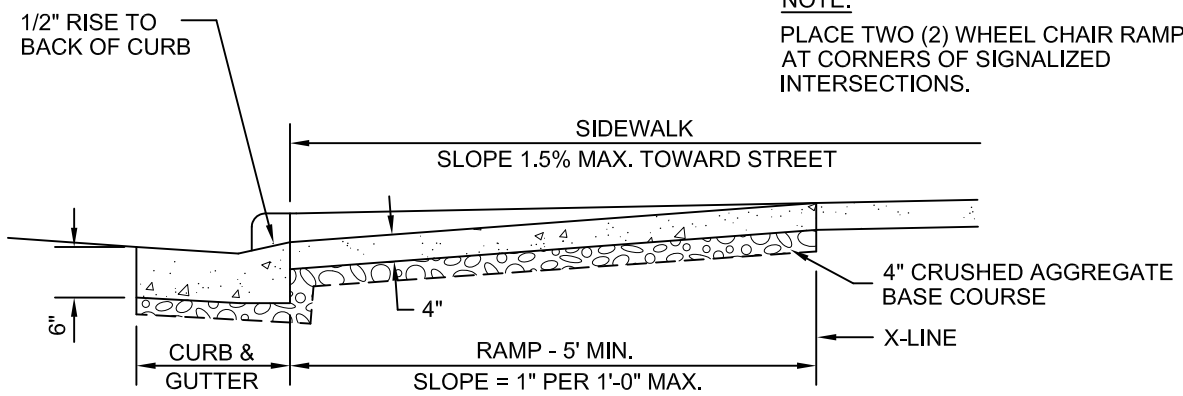
NOVEMBER 2015



PLAN



RAMP - FRONT



NOTE:
PLACE TWO (2) WHEEL CHAIR RAMPS AT CORNERS OF SIGNALIZED INTERSECTIONS.

A - A'

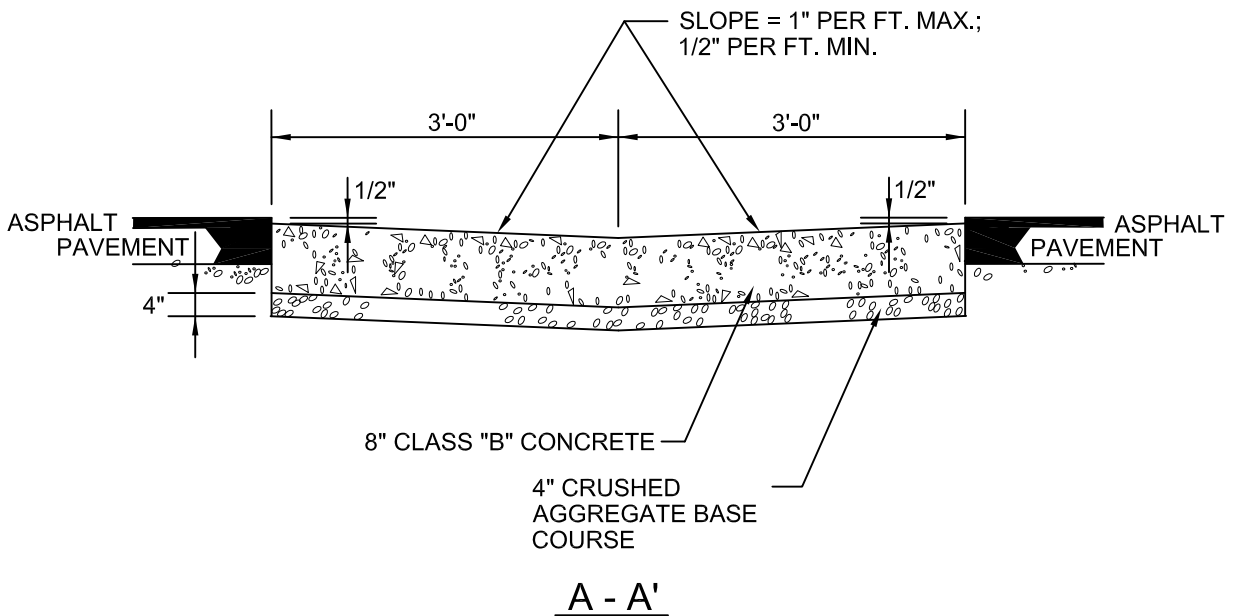
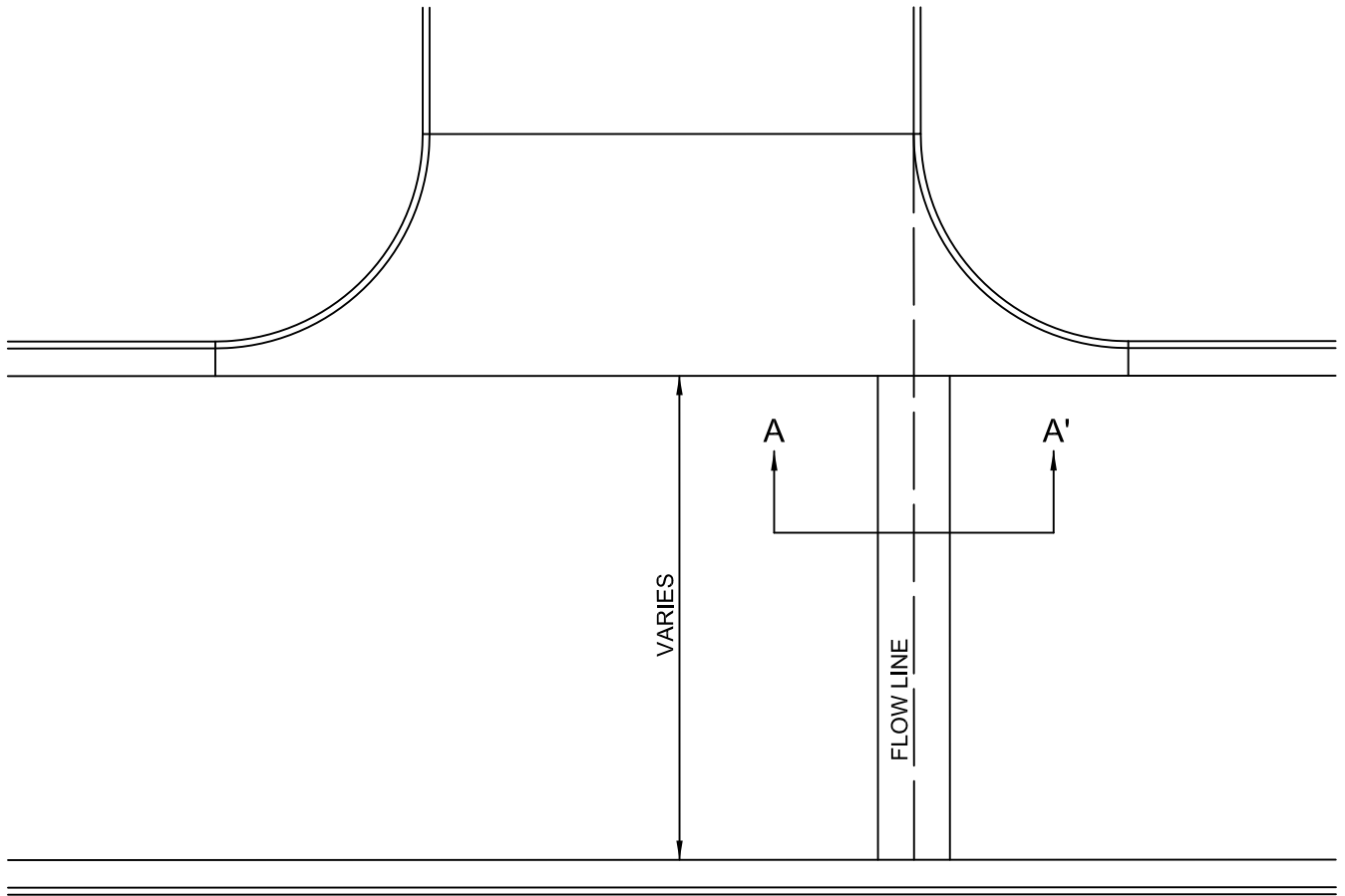
NOT TO SCALE

**PEDESTRIAN ADA
RAMP DETAIL**

DWG. NO. 03030-3.01h

CITY of SHERIDAN

NOVEMBER 2015



NOTE:

1. SEE DWG. NO. 03020-2.01b FOR DOUBLE GUTTER WITH CONCRETE PAVEMENT DETAIL.

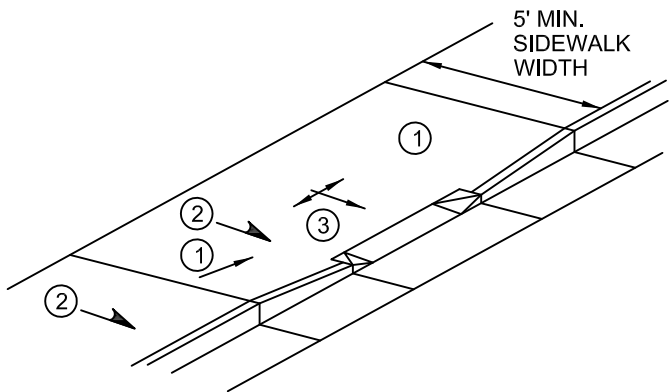
NOT TO SCALE

DOUBLE GUTTER DETAIL

DWG. NO. **03030-3.01i**

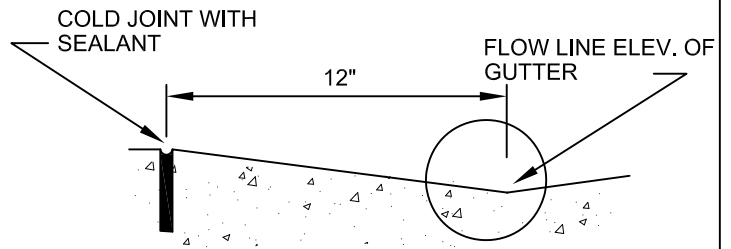
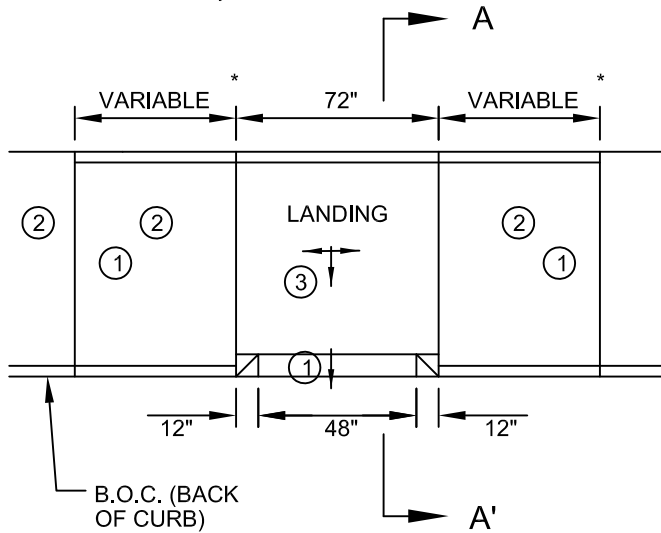
CITY of SHERIDAN

NOVEMBER 2015



NOTES:

- ① → RAMP SLOPE - RAMP SLOPE SHALL GENERALLY BE 1:12. RAMP SLOPE SHALL NOT EXCEED 1:12.
- ② → CROSS SLOPE - POSITIVE DRAINAGE SHALL BE PROVIDED BY SLOPING SIDEWALK AND/OR RAMP TOWARD STREET AT 1:5%; CROSS-SLOPE SHALL NOT EXCEED 1.5%.
- ③ → LANDING SLOPE - LANDING SLOPE SHALL NOT EXCEED 1.5% IN ANY DIRECTION. POSITIVE DRAINAGE SHALL BE PROVIDED TOWARD THE STREET AS SHOWN BY SINGLE-TIP ARROW. LANDING CAN BE SLOPED IN EITHER DIRECTION TO A MAX. OF 1.5% AS SHOWN BY DOUBLE-TIP ARROW.

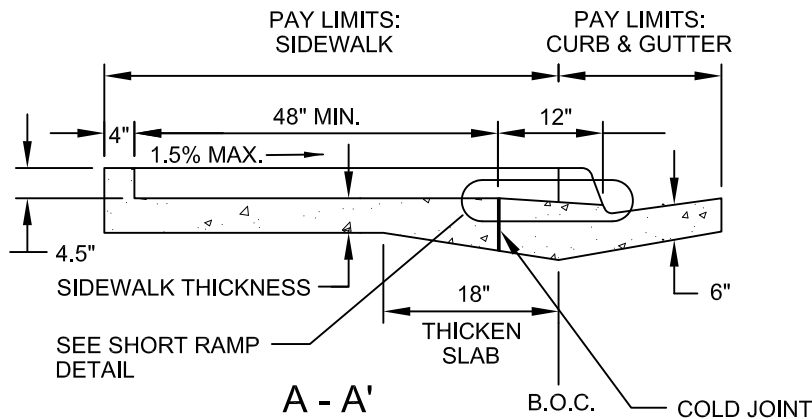


* VARIABLE LENGTH BASED ON RUNNING SLOPE OF SIDEWALK. FOR FLAT CONDITIONS AND CURB HEIGHT = 6":
 ELEV. OF FLOW LINE = 0"
 ELEV. OF LANDING = 1.5"
 RISE OF PARALLEL RAMPS = 4.5"
 VARIABLE DIMENSION = 4.5'

THIS DETAIL PROVIDES AN ELEVATED LANDING TO REDUCE ICE, SNOW, GRAVEL AND WATER FROM ACCUMULATING IN THE LANDING. THE LANDING IS ELEVATED 1.5" ABOVE THE GUTTER FLOW LINE. THIS DETAIL CAN ONLY BE USED WITH 5 FT. OR WIDER SIDEWALKS SO THAT THE LANDING IS WIDE ENOUGH FOR WHEEL CHAIR TURNING MOVEMENTS.

PLAN VIEW

SHORT RAMP DETAIL



NOT TO SCALE

ADA RAMP IN SIDEWALK DETAIL

DWG. NO. 03030-3.01j

CITY of SHERIDAN

NOVEMBER 2015

Arterial	Dimension Reference	Local			Collector			Arterial		
		Residential	Commercial	Industrial	Residential	Commercial	Industrial	Residential	Commercial	Industrial
Width ¹	W									
Minimum		12	20	20	12	20	20	15	15	20
Maximum		32 ²	40	40	30	40	40	36	40	40
Right-turn Radius	R									
Minimum		0	5	10	0	15	25	0	25	30
Maximum ³		0	10	20	0	50	50	0	50	50
Minimum Spacing ⁴										
From Property Line	P	0	R	R	0	R	R	R	R	R
From Street Corner	C	20	40	40	50	50	50	NA	NA	NA
Between Driveways	S	10 ⁵	25	25	35	50	50	NA	NA	NA
Angle ⁶	A	45°	70°	70°	45°	70°	70°			

¹The minimum width of commercial driveways is intended to apply to one-way operation. In high pedestrian activity areas, such as in a central business district or in the same block with an auditorium, school, or library, the maximum basic width should be 30 feet. The width shown applies to rural routes and most City streets including neighborhood business, residential, and industrial streets. The width is intended to be measured along the right-of-way line, in most instances, at the inner limit of a curbed radius or between the line of the radius and the near edge of a curbed island at least 50 square feet in area.

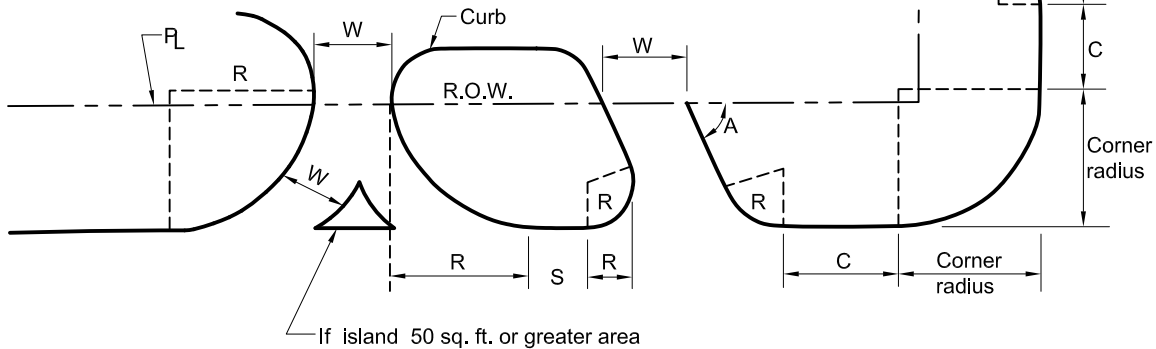
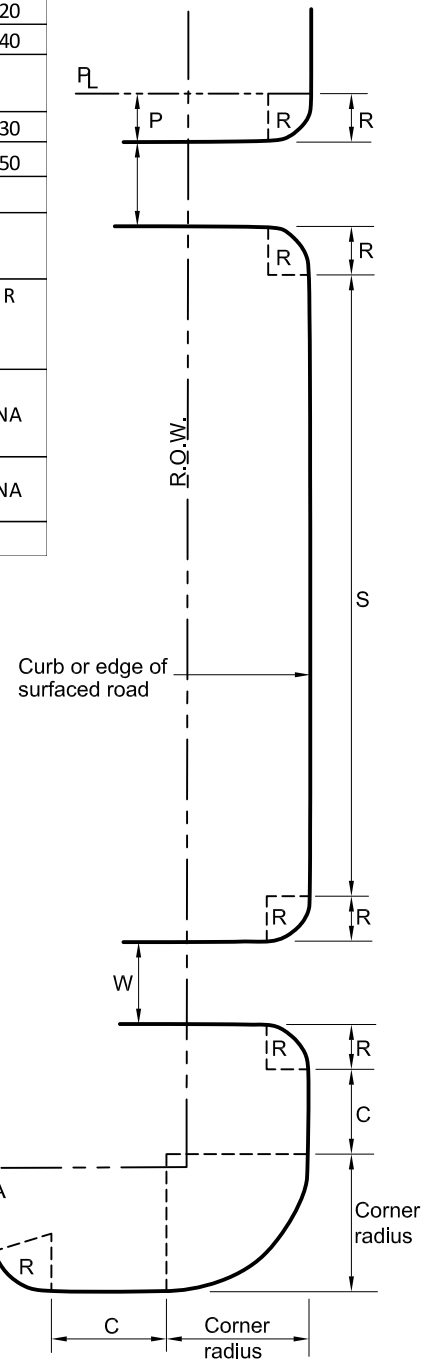
²Maximum width on bulb of cul-de-sac shall be 24 feet.

³On the side of a driveway exposed to entry or exit by right-turning vehicles. In high pedestrian activity areas, the radii should be half the values shown. The maximum radii for major generator driveways shall be designed in accordance with *A Policy on Geometric Design of Highways and Streets*, published by AASHTO latest edition.

⁴Measured along the curb or edge of pavement from the roadway end of the curb radius. In high pedestrian activity areas, the minimum spacing between driveways should be 5 feet.

⁵Minimum space between driveways may be reduced to 5 feet on one side on local streets only at the discretion of the City Engineer.

⁶Minimum acute angle measured from edge of pavement, and generally based on one-way operation. For two-way driveways, and in high pedestrian activity areas, the minimum angle should be 80 degrees.



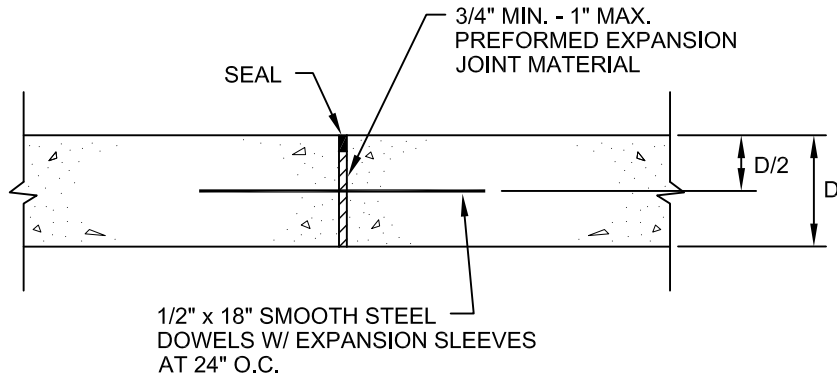
NOT TO SCALE

APPROACH DIMENSIONS DETAIL

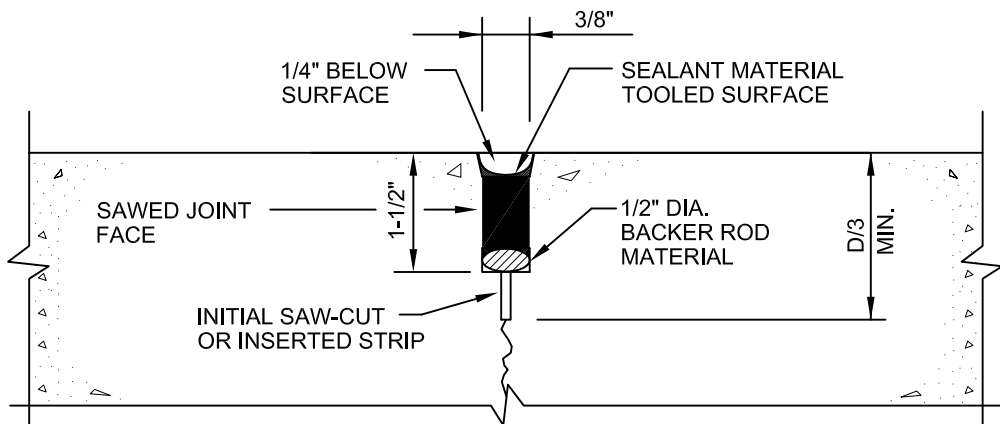
DWG. NO. 03030-3.01k

CITY of SHERIDAN

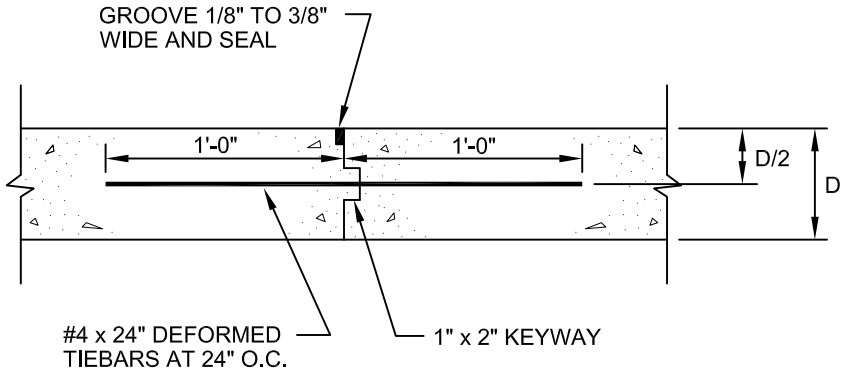
NOVEMBER 2015



A - EXPANSION JOINT



B - CONTRACTION JOINT



C - CONSTRUCTION JOINT

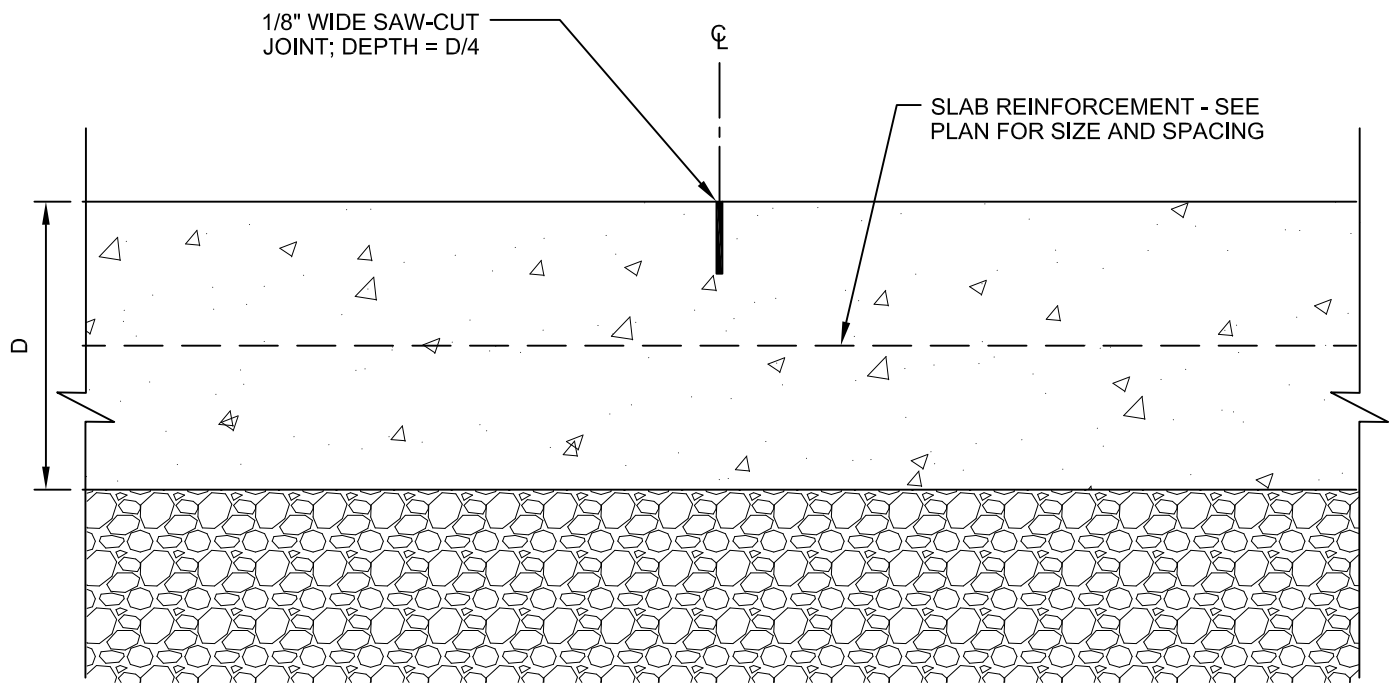
NOT TO SCALE

CONSTRUCTION, EXPANSION AND CONTRACTION JOINT DETAILS

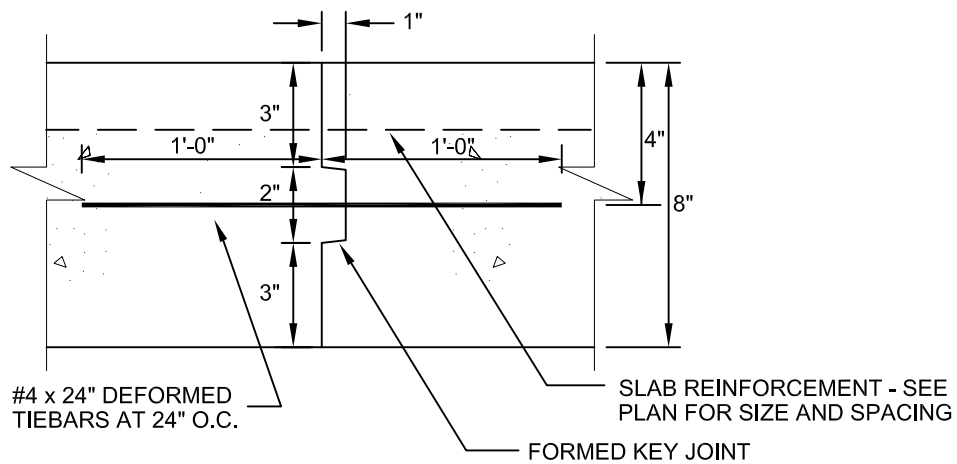
DWG. NO. 03040-2.01a

CITY of SHERIDAN

NOVEMBER 2015



A - TYPICAL SAW-CUT JOINT



NOTES:

1. RETAINED-IN-PLACE GALVANIZED STEEL KEY FORM MAY BE USED IN LIEU OF FORMED KEY JOINT SHOWN. STEEL KEY FORM SHALL MATCH NOMINAL SLAB THICKNESS.
2. EXTEND REBAR THROUGH KEYWAY AND TIE TO ADJOINING SLAB.

B - TYPICAL KEYWAY JOINT

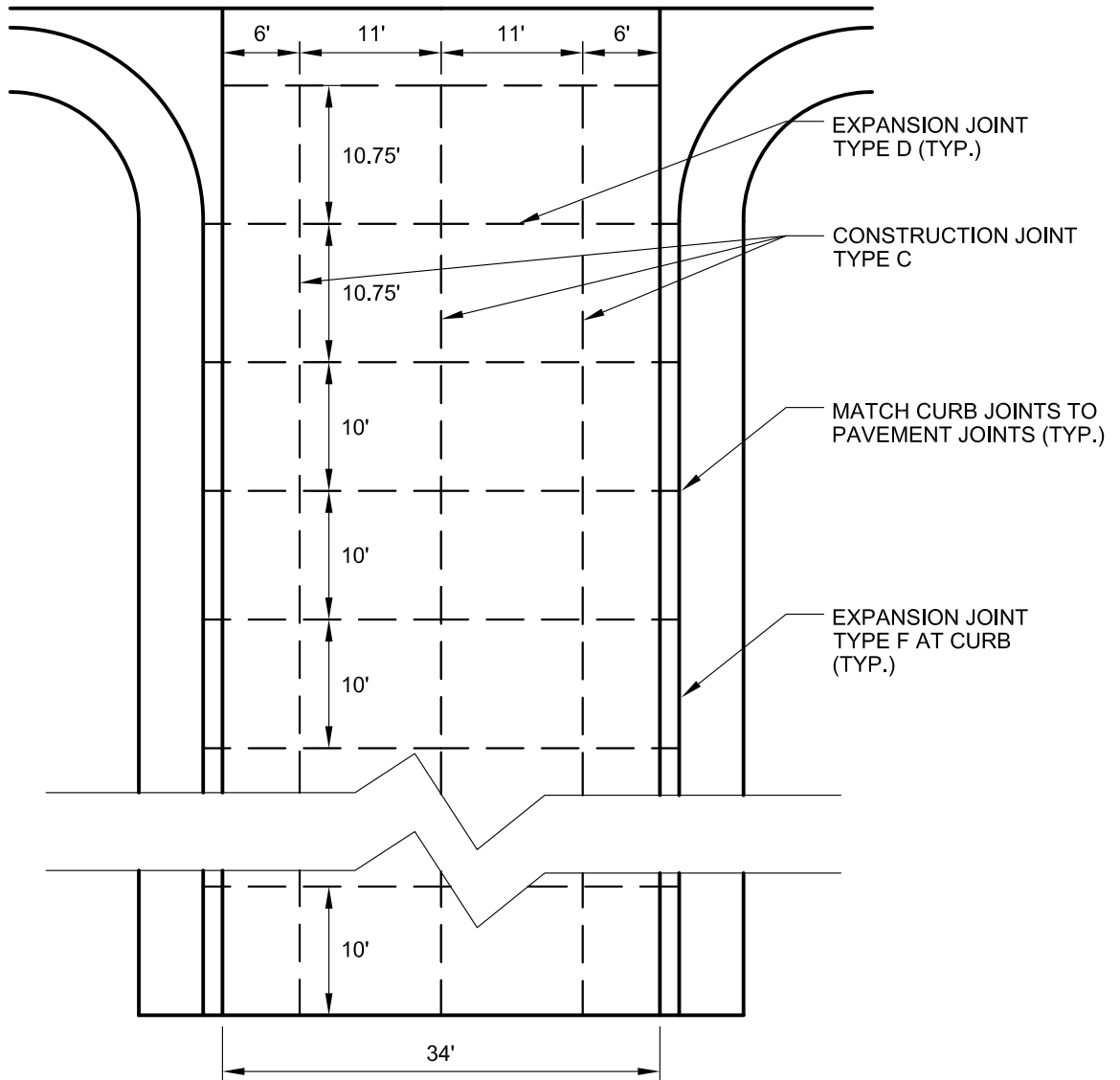
NOT TO SCALE

SAW-CUT / KEYWAY JOINTS DETAIL

DWG. NO. 03040-2.01b

CITY of SHERIDAN

NOVEMBER 2015



NOTES:

1. SEE 03040-2.01D FOR CONCRETE PAVEMENT JOINT DETAILS.
2. THIS DETAIL PERTAINS TO A STANDARD 39-FOOT WIDE STREET (34 FEET OF CONCRETE SURFACING). SEE PLANS FOR OTHER WIDTHS.
3. JOINT A-1 ONLY APPLIES IF THERE IS A TRANSITION TO ASPHALT.
4. JOINT SEALANT IS INCIDENTAL TO CONCRETE PAVING.

* CONTRACTOR SHALL PROVIDE JOINTING PLAN FOR APPROVAL PRIOR TO PAVING.

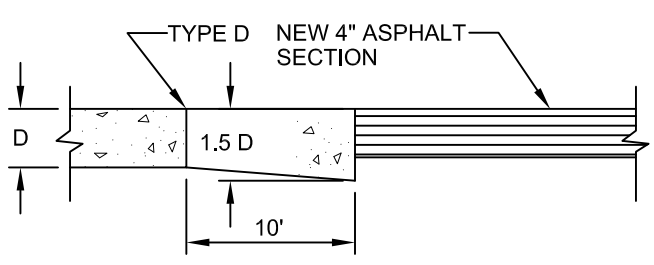
NOT TO SCALE

**TYPICAL JOINTS FOR CONCRETE
PAVEMENT DETAIL***

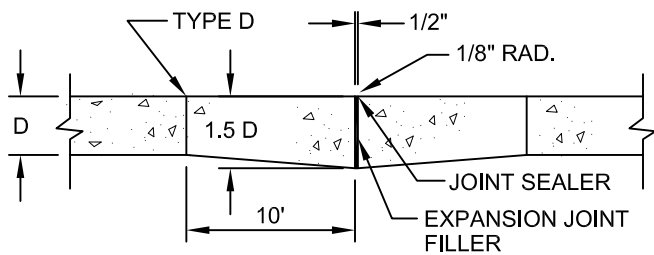
DWG. NO. 03040-2.01c

CITY of SHERIDAN

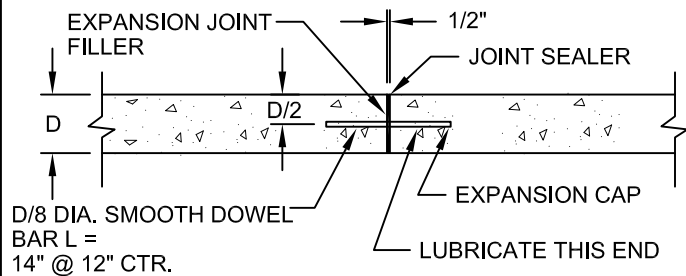
NOVEMBER 2015



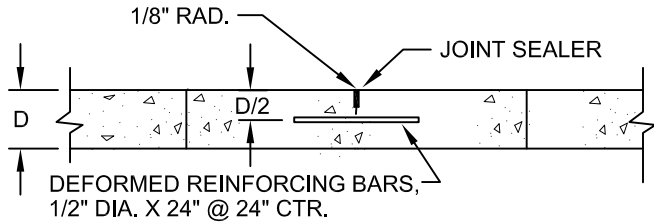
EXPANSION JOINT (ASPHALT CONNECTION)
TYPE A-1



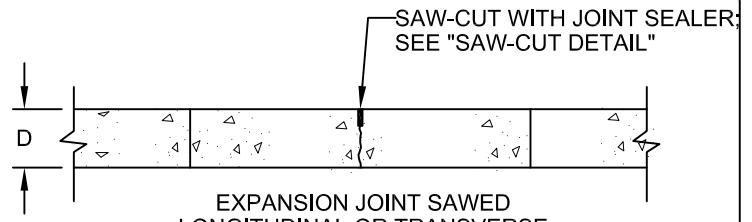
EXPANSION JOINT (CONCRETE CONNECTION)
TYPE A-2



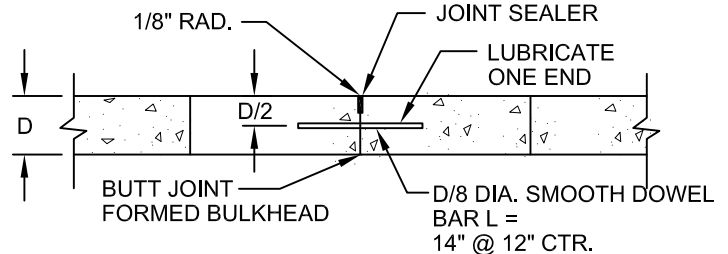
ALTERNATE EXPANSION JOINT
TYPE A-3



TIED BUTT LONGITUDINAL CONSTRUCTION JOINT
TYPE C

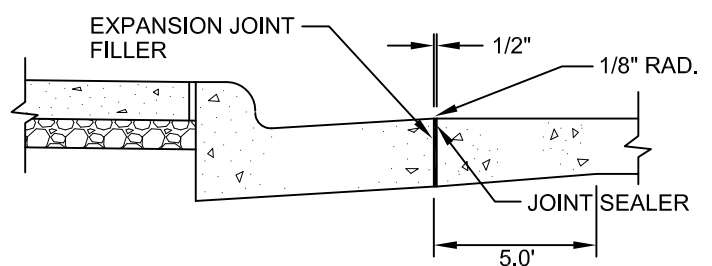


TYPE D

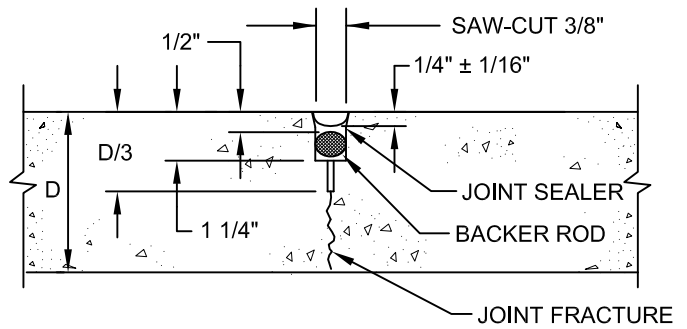


PLANNED TRANSVERSE CONSTRUCTION JOINT
(USED AT NORMAL JOINT SPACING)

TYPE E



EXPANSION JOINT (CONCRETE CONNECTION)
TYPE F



SAW-CUT DETAIL

NOTES:

1. THE DEFORMED STEEL TIE BARS SHALL BE PLACED PERPENDICULAR TO THE CENTERLINE OF THE ROADWAY AT THE SPACING SHOWN, BEGINNING 6" FROM THE OUTER EDGES OF THE PAVEMENT.
2. SAWED OR PLASTIC STRIP JOINTS SHALL NOT DEVIATE MORE THAN 1" FROM THE EDGE OF A 12'-0" STRAIGHTEDGE.
3. ONLY ONE OF THE TWO TYPES OF JOINTS (LONGITUDINAL OR TRANSVERSE) SHALL BE FORMED BY A PLASTIC STRIP, AND THE OTHER JOINT SHALL BE SAWED, UNLESS OTHERWISE SHOWN ON THE PLANS.

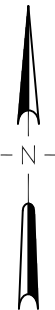
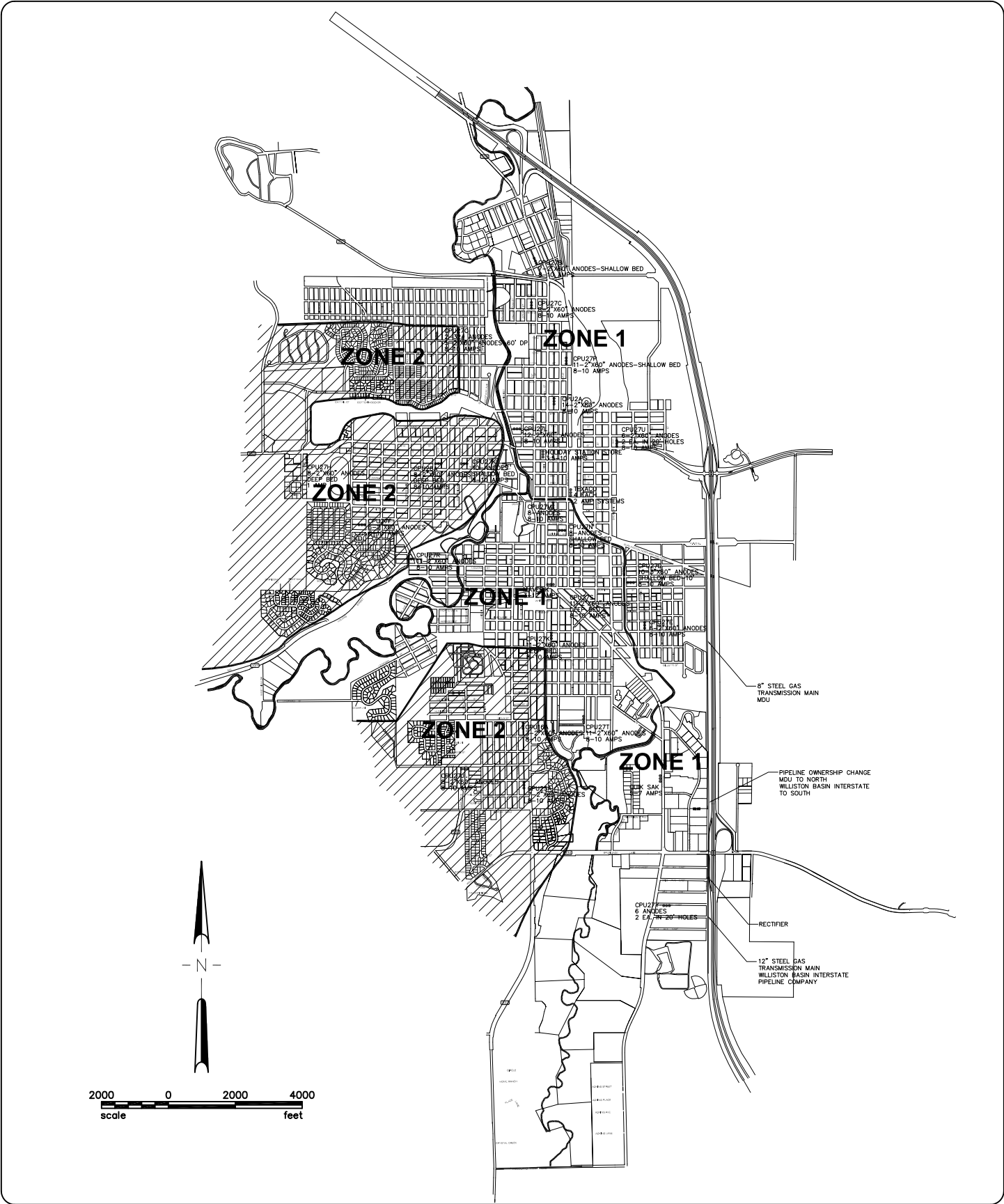
NOT TO SCALE

**CONCRETE PAVEMENT JOINT DETAILS
(SEE 03040-2.01C)**

DWG. NO. 03040-2.01d

CITY of SHERIDAN

NOVEMBER 2015

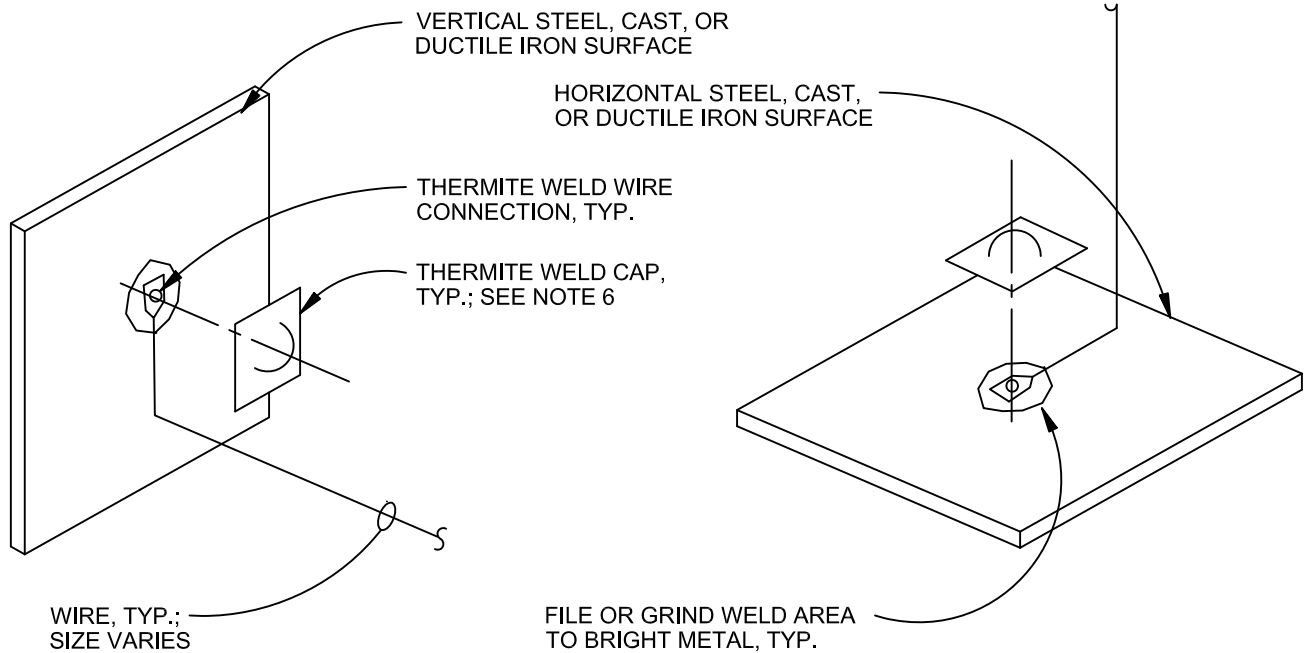


SOIL CORROSION ZONES / SELECTION OF ANODE TYPE

DWG. NO. 13900

CITY of SHERIDAN

NOVEMBER 2015



NOTES:

1. COPPER SLEEVE REQUIRED FOR THERMITE WELDING OF #10 AWG AND SMALLER WIRE.
2. USE COPPER SLEEVE FOR THERMITE WELDING OF #4 AND #2 AWG JOINT BONDING WIRES.
3. WELDER AND CARTRIDGE SIZE VARIES ACCORDING TO SURFACE SHAPE, MATERIAL, AND HORIZONTAL OR VERTICAL SURFACE. CONSULT WELDER MANUFACTURER FOR RECOMMENDED WELDER AND CARTRIDGE.
4. FOR MULTIPLE WIRE CONNECTIONS TO PIPE, SEPARATE THERMITE WELD WIRE CONNECTIONS BY ONE PIPE DIAMETER MINIMUM, 2'-0" MAXIMUM.
5. USE 15 GRAM MAXIMUM SIZE WELD CARTRIDGES FOR CONNECTIONS TO PETROLEUM AND NATURAL GAS PIPELINES OR STRUCTURES. WIRE CONNECTIONS SHALL BE AS SPECIFIED AND APPROVED BY THE OWNER.
6. COAT COMPLETED THERMITE WELD CONNECTIONS WITH ROYSTON PREFABRICATED HANDYCAP II AND 747 PRIMER.

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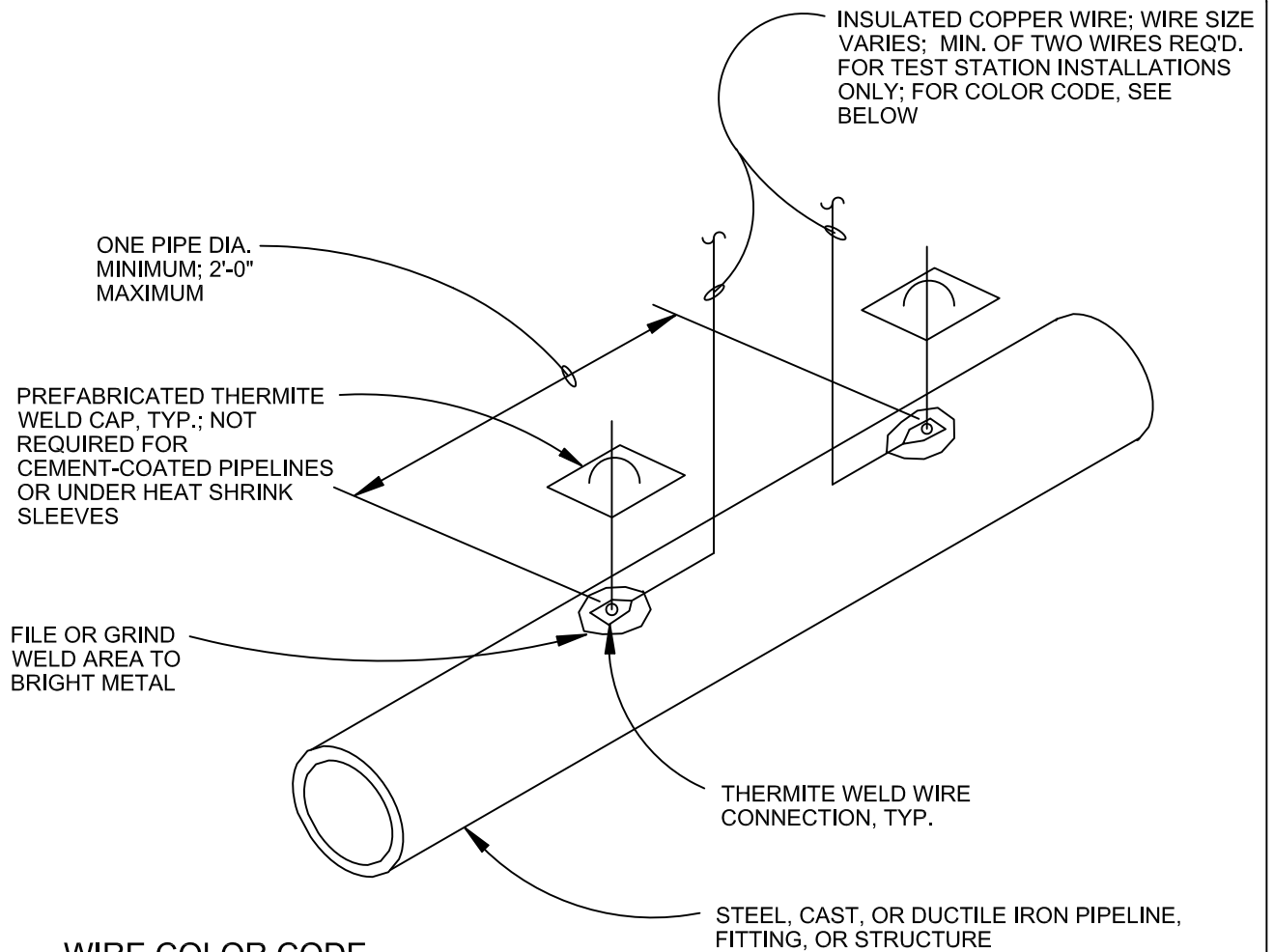
NOT TO SCALE

WIRE CONNECTION FOR VERTICAL AND HORIZONTAL SURFACES DETAIL

DWG. NO. 13901

CITY of SHERIDAN

NOVEMBER 2015



WIRE COLOR CODE

1. PIPELINE TEST WIRES:
 WATER - BLUE
 FOREIGN PIPELINES - WHITE, OR AS REQUESTED BY FOREIGN PIPELINE COMPANY
 CURRENT TEST SPAN WIRES - UPSTREAM SIDE, MARK W/ RED TAPE
2. UNPROTECTED PIPELINE - BLACK
3. CASINGS - ORANGE
4. ANODE LEADS - BLACK
5. REFERENCE ELECTRODE WIRES - YELLOW
6. TRACER WIRES - BLUE

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NOT TO SCALE

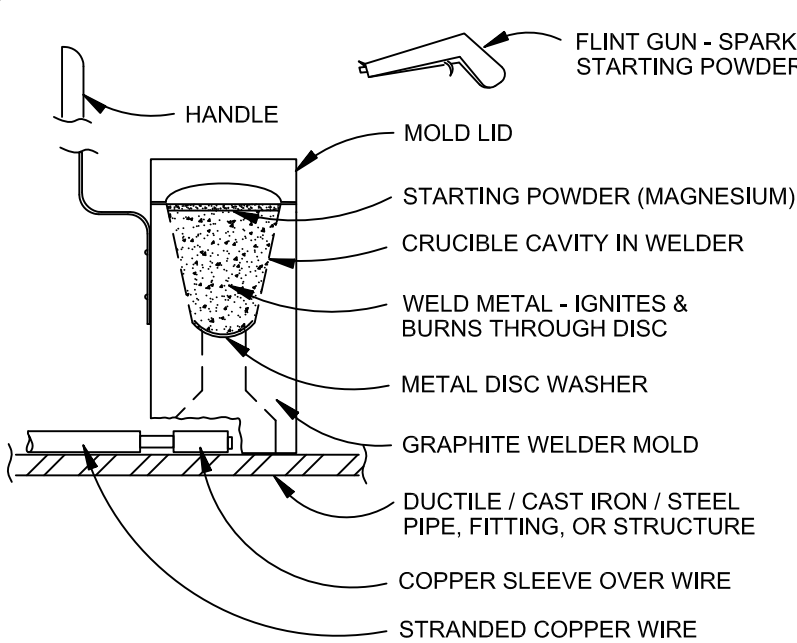
PIPELINE WIRE CONNECTION DETAIL

DWG. NO.

13902

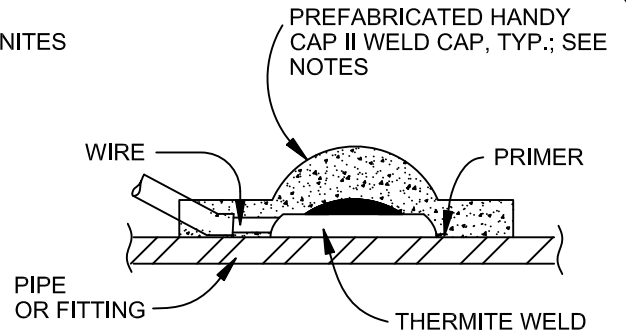
CITY of SHERIDAN

NOVEMBER 2015



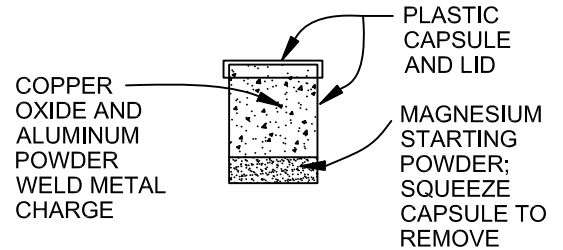
THERMITE WELD

USE CAST IRON CHARGES FOR DUCTILE IRON AND CAST IRON PIPE OR FITTINGS; USE STEEL CHARGES FOR STEEL PIPE OR FITTINGS



PREFABRICATED WELD CAP

(WIRE BRAZED TO STRUCTURE, TYP.)



WELD METAL CAPSULE

(TYPE AND SIZE VARY)



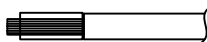
STEP 1

FILE STRUCTURE CONNECTION AREA (2"x2") TO BARE, BRIGHT, SHINY METAL & CLEAN. ALL WIRE WELDS SHALL BE A MINIMUM OF ONE PIPE DIAMETER APART, UP TO A MAXIMUM OF 2 FEET SEPARATION DISTANCE.



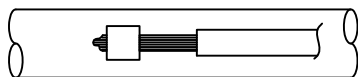
STEP 2

STRIP INSULATION FROM WIRE. ATTACH COPPER SLEEVE (REQUIRED ON No. 10 AWG WIRE & SMALLER & No. 2 & No. 4 AWG JOINT BOND WIRES, AS SPECIFIED).



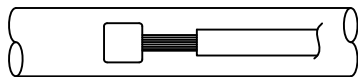
STEP 3

ATTACH COPPER SLEEVE TO WIRE WITH CORRECT HAMMER DIE OR CRIMP TOOL. FACTORY SLEEVES SHALL BE ANGLED AND FIELD-MADE BONDS SHALL HAVE WIRE EXTEND 1/4" PAST SLEEVE SO WIRE IS EXPOSED TO THERMITE WELD.



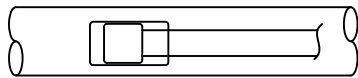
STEP 4

PLACE WASHER IN BOTTOM OF MOLD AND FILL CRUCIBLE W/ POWDER; CLOSE LID, HOLD MOLD FIRMLY W/ OPENING AWAY FROM OPERATOR & IGNITE W/ FLINT GUN.



STEP 5

REMOVE SLAG FROM CONNECTION; VISUALLY INSPECT & TAP WELD FOR SOUNDNESS W/ HAMMER. REPLACE ALL POORLY-FORMED, UNSIGHTLY, OR DEFECTIVE WELDS.



STEP 6

CLEAN & COAT CONNECTION & EXPOSED STRUCTURE SURFACE W/ SPECIFIED PREFABRICATED WELD CAP, HEAT SHRINK SLEEVE, OR PIPE COATING. REPAIR COATING PER COATING MANUFACTURER'S RECOMMENDATION.

GENERAL EXOTHERMIC WELD PROCEDURES

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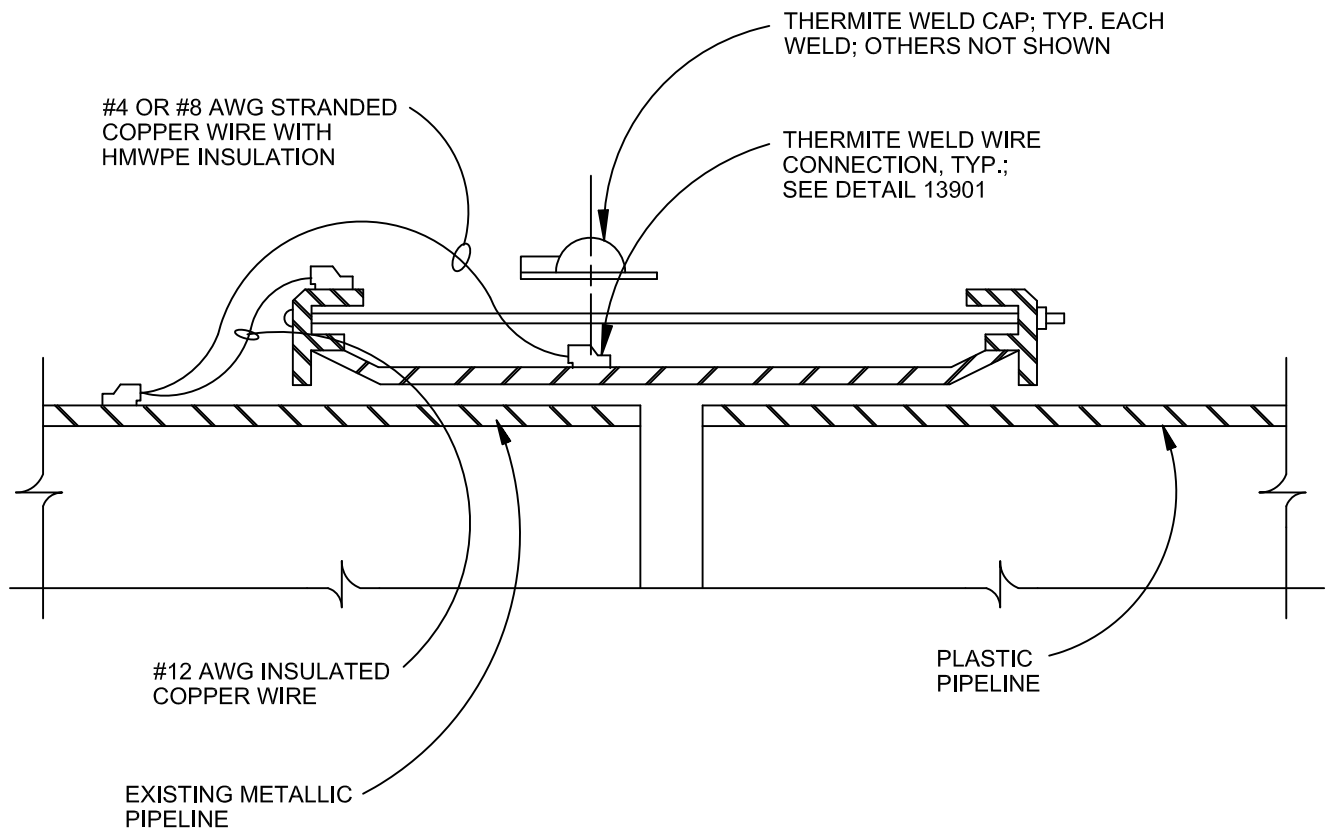
THERMITE WELD AND WIRE CONNECTION DETAIL

DWG. NO.

13903

CITY of SHERIDAN

NOVEMBER 2015



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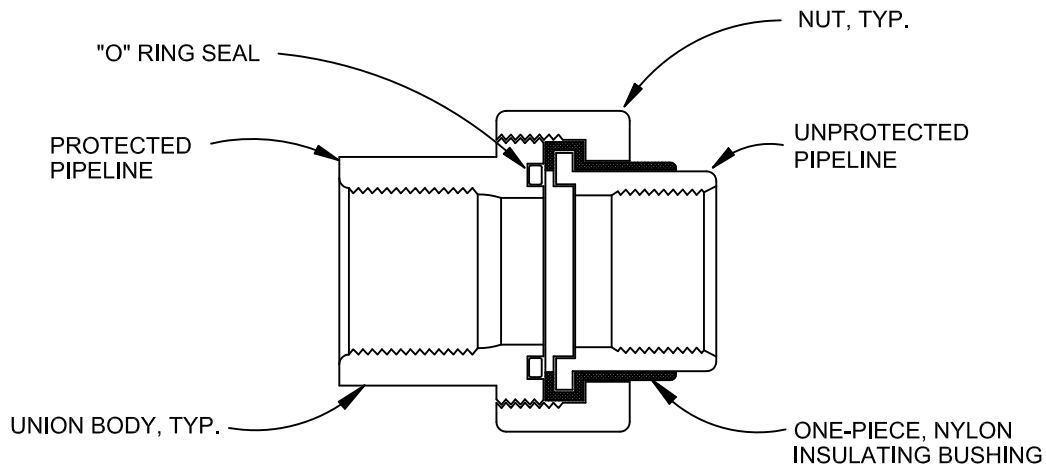
BONDING OF FLEXIBLE COUPLING AT CONNECTION TO PLASTIC PIPE DETAIL

DWG. NO.

13910

CITY of SHERIDAN

NOVEMBER 2015



NOTES:

1. "O" RING TYPE INSULATING UNION SHOWN. OTHER TYPES (BRASS INSULATED CURB BALL VALVES, STRAIGHT COUPLINGS, CORPORATION BALL VALVES, METER COUPLINGS, ETC.) SIMILAR.
2. INSULATING O-RING AND NYLON INSULATOR BUSHING SHALL BE MOLDED & BONDED TO THE UNION BODY BY MANUFACTURER.
3. ABOVE-GRADE IRON PIPE SHALL HAVE GALVANIZED OR COATED STEEL BODIES; UNIONS IN BURIED OR CORROSIVE AREAS SHALL BE COATED.
4. COPPER LINE INSULATORS SHALL HAVE BRASS UNION BODY WITH INSULATORS FORMED AND MOLDED INTO BRASS BODY.

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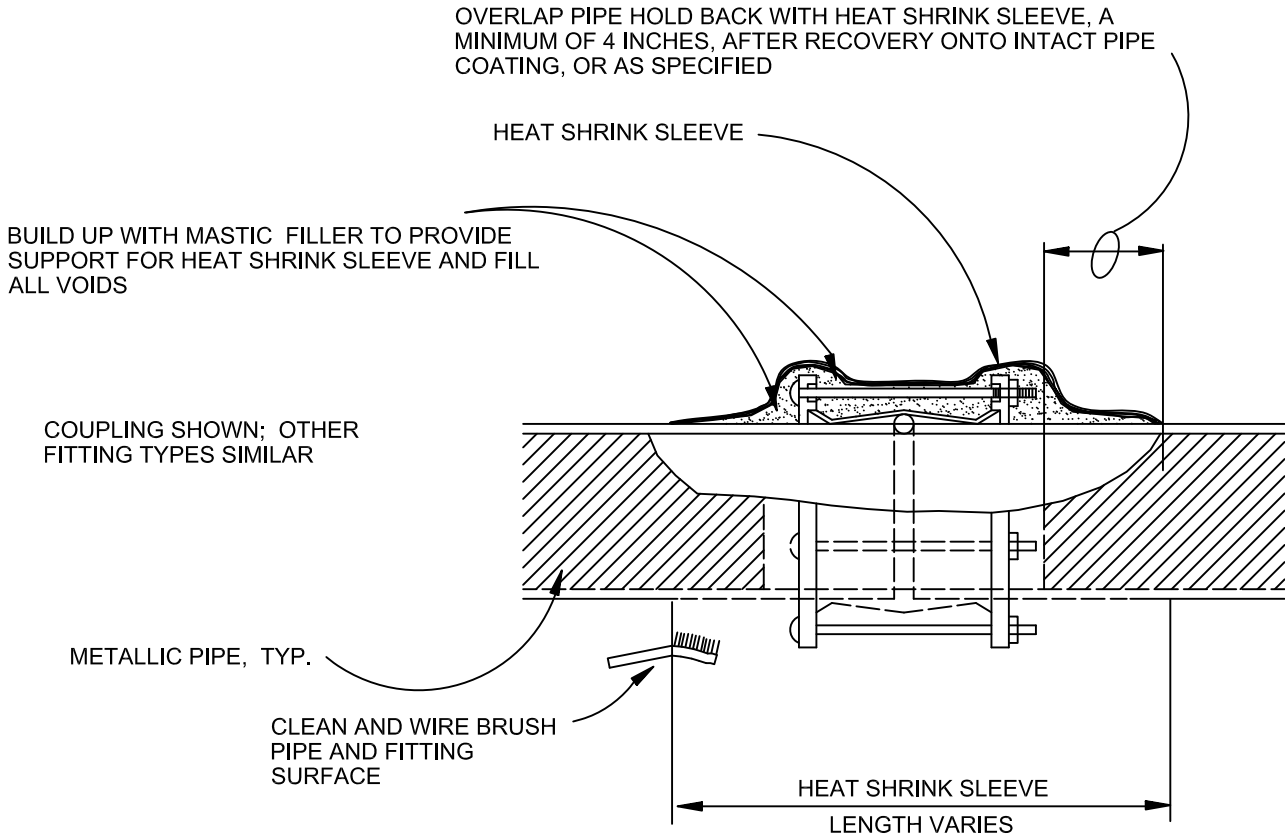
**INSULATING UNIONS AND / OR
COPPER SERVICE INSULATORS DETAIL**

DWG. NO.

13913

CITY of SHERIDAN

NOVEMBER 2015



NOTES:

1. MASTIC FILLER AND SLEEVE SHALL BE AS RECOMMENDED BY HEAT SHRINK MANUFACTURER FOR EACH PIPE AND JOINT TYPE.
2. CLEAN AND ROUGHEN FITTING AND PIPE SURFACE WITH WIRE BRUSH AND APPLY MASTIC FILLER AND HEAT SHRINK SLEEVE PER HEAT SHRINK SLEEVE MANUFACTURER'S DIRECTIONS.
3. JOINT BOND WIRES / STRAPS, ANODE & TEST LEADS (NOT SHOWN) SHALL BE COMPLETELY ENCASED UNDER THE HEAT SHRINK SLEEVE COATING.
4. HEAT SHRINK SLEEVE JOINT COATING SHALL COMPLETELY ENCASE PIPE HOLD BACK, JOINT, AND EXTEND A MINIMUM 4" ONTO INTACT PIPE COATING. MASTIC FILLER SHALL PROVIDE SMOOTH TRANSITION AT ALL EDGES AND STEP-DOWNS AND FILL ALL VOIDS.
5. CORROSION PROTECTION IS SHOWN FOR FLEXIBLE COUPLING JOINT TYPE; PROTECTION OF OTHER JOINT AND FITTING TYPES SIMILAR.
6. COUPLING SHOWN; OTHER FITTING TYPES SIMILAR.

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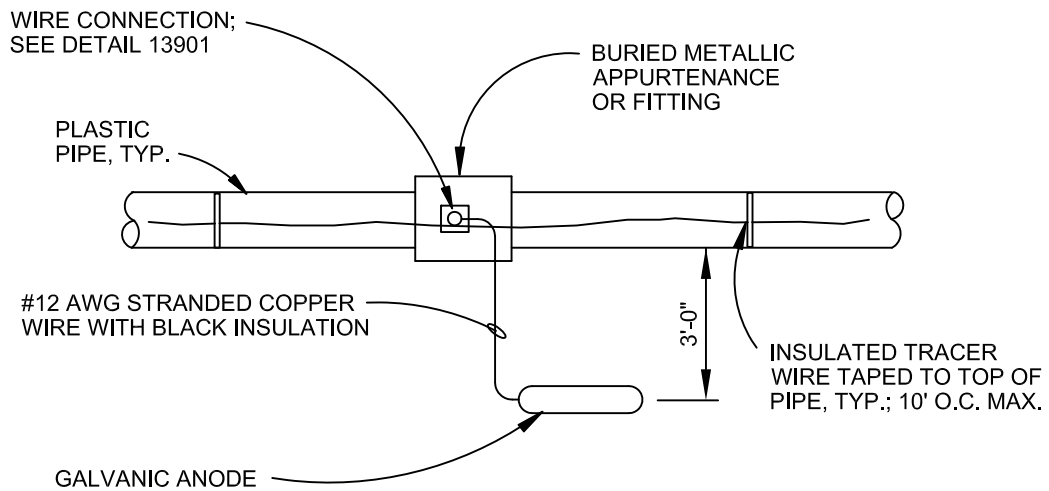
NOT TO SCALE

HEAT SHRINK SLEEVE FOR FLEXIBLE COUPLINGS OR FITTINGS DETAIL

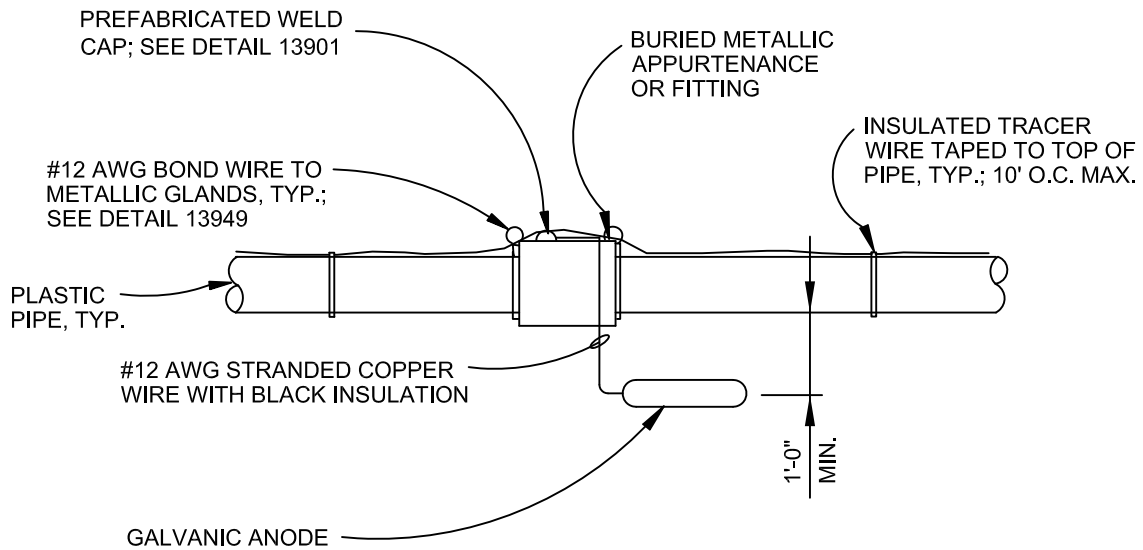
DWG. NO. 13918

CITY of SHERIDAN

NOVEMBER 2015



PLAN



ELEVATION

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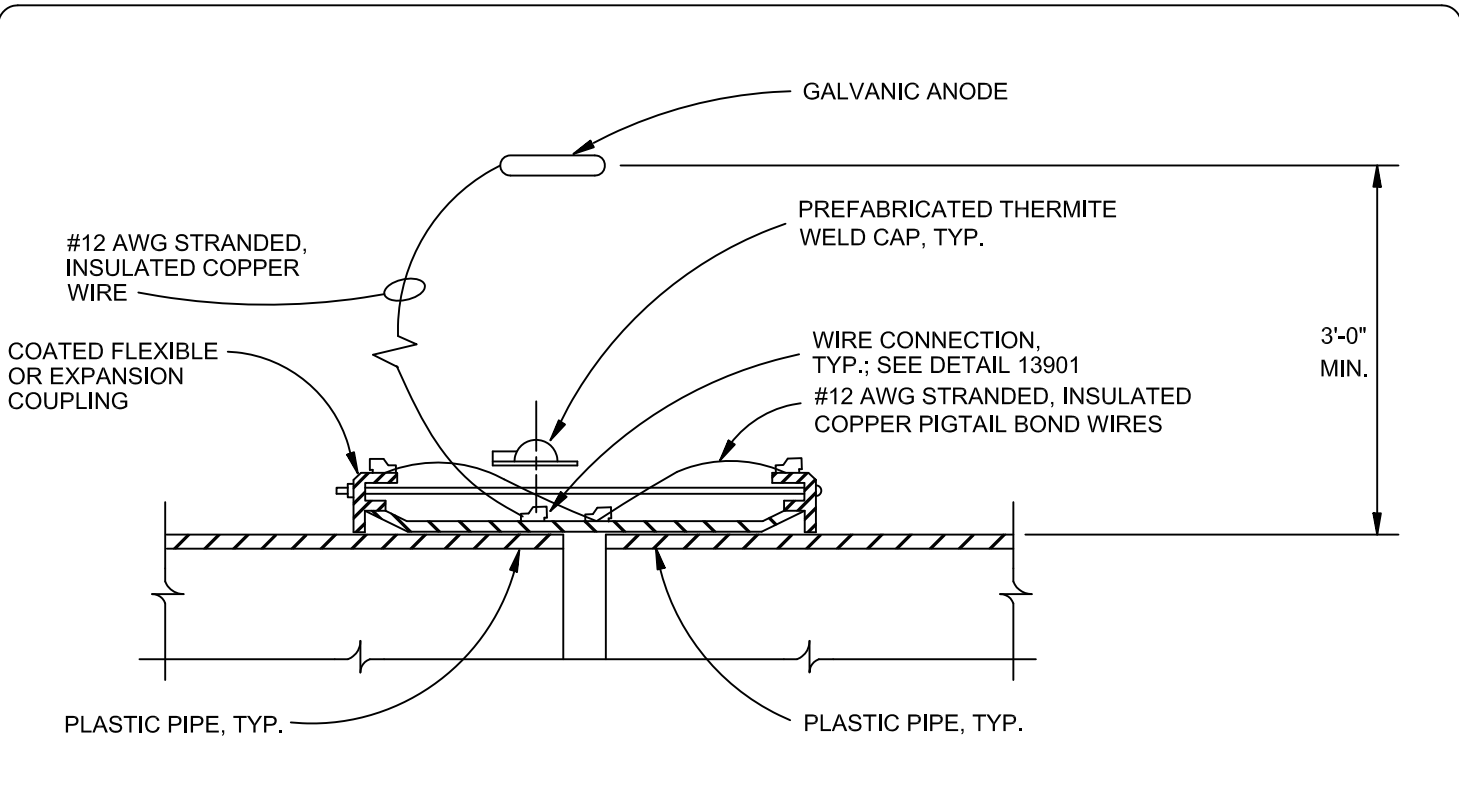
NOT TO SCALE

**GALVANIC ANODE INSTALLATION
AT BURIED METALLIC FITTINGS DETAIL**

DWG. NO. **13940**

CITY of SHERIDAN

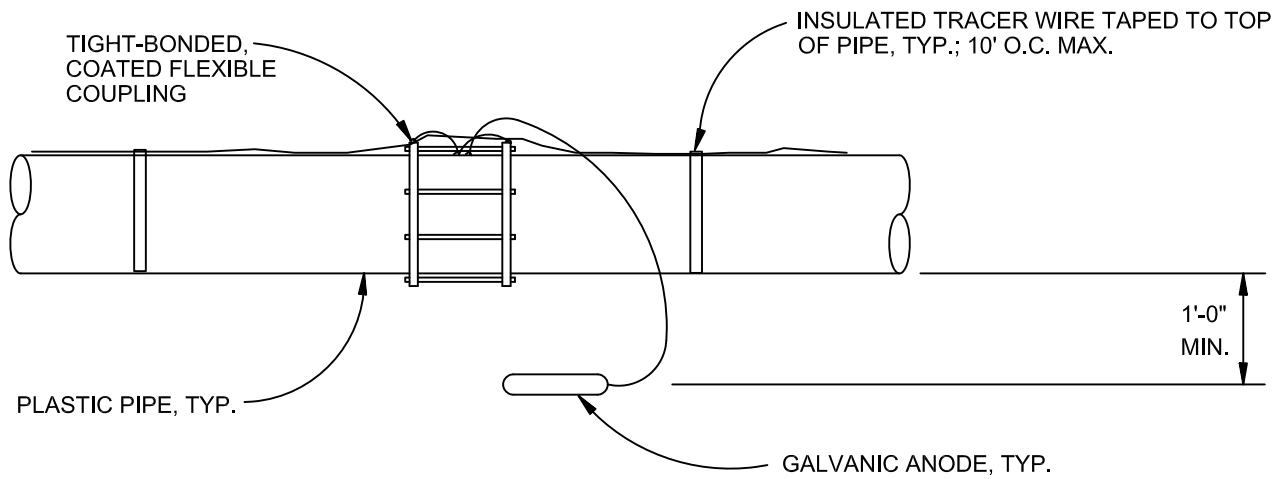
NOVEMBER 2015



SECTION

NOTE:

PROVIDE NUMBER & SIZE OF ANODES AS SPECIFIED. MINIMUM SHALL BE 1 ANODE.



ELEVATION

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CORROSION PROTECTION FOR FLEXIBLE COUPLING ON PLASTIC PIPE DETAIL

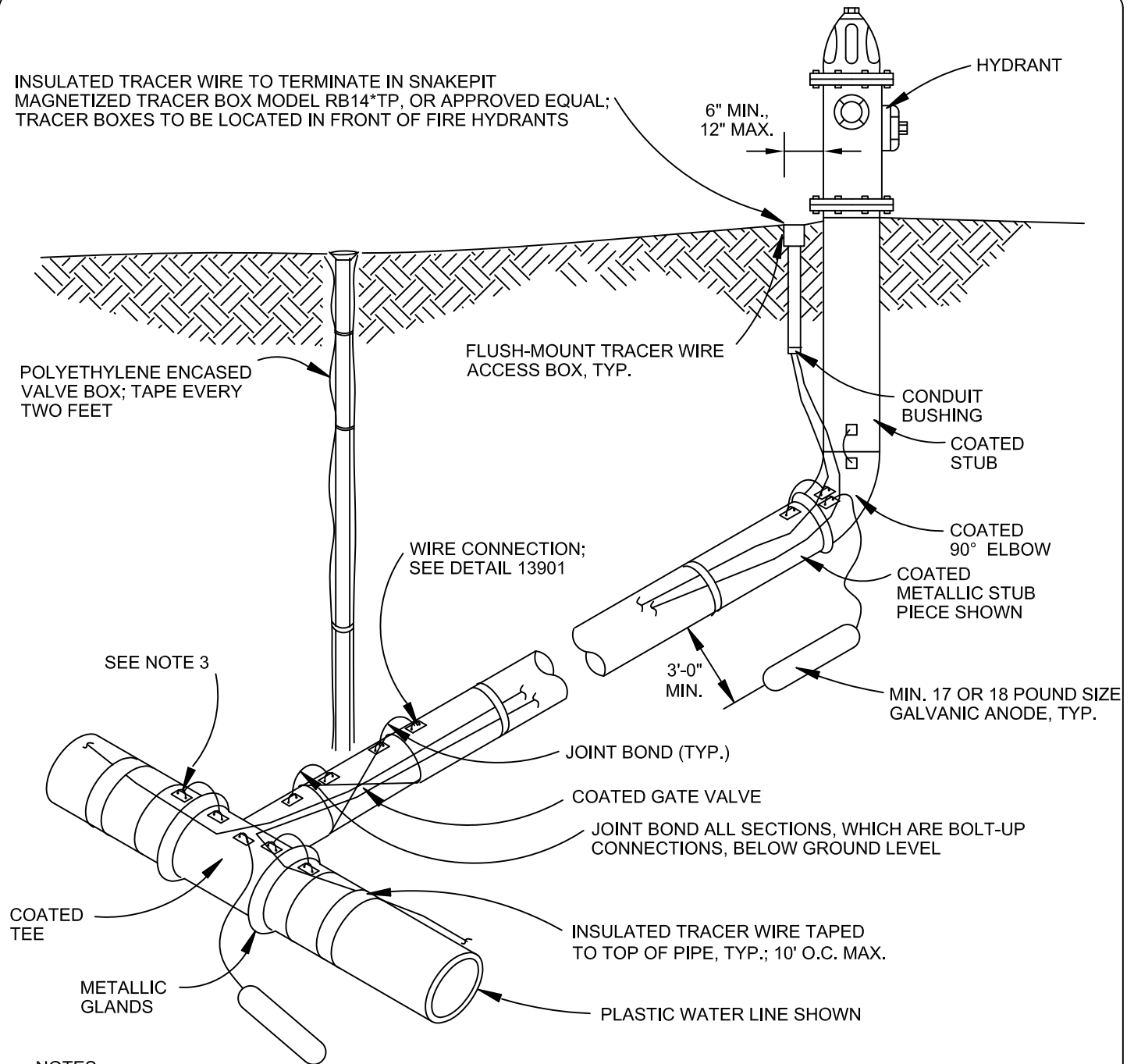
DWG. NO.

13943

CITY of SHERIDAN

NOVEMBER 2015

INSULATED TRACER WIRE TO TERMINATE IN SNAKEPIT
MAGNETIZED TRACER BOX MODEL RB14*TP, OR APPROVED EQUAL;
TRACER BOXES TO BE LOCATED IN FRONT OF FIRE HYDRANTS



NOTES:

1. INSTALL GALVANIC ANODE 1'-0" BELOW PIPELINE, FITTING, OR VALVE INVERT ELEVATION.
2. INSTALL MINIMUM NUMBER AND SIZE OF GALVANIC ANODES SPECIFIED; MINIMUM OF ONE PER EACH METALLIC FITTING OR TWO TOTAL ASSEMBLY.
3. #12 AWG PIGTAIL BOND WIRES TO METALLIC GLANDS, TYP. (SEE DETAIL 13949); OR, INSTALL MARS CAP ON EACH STAINLESS STEEL BOLT.

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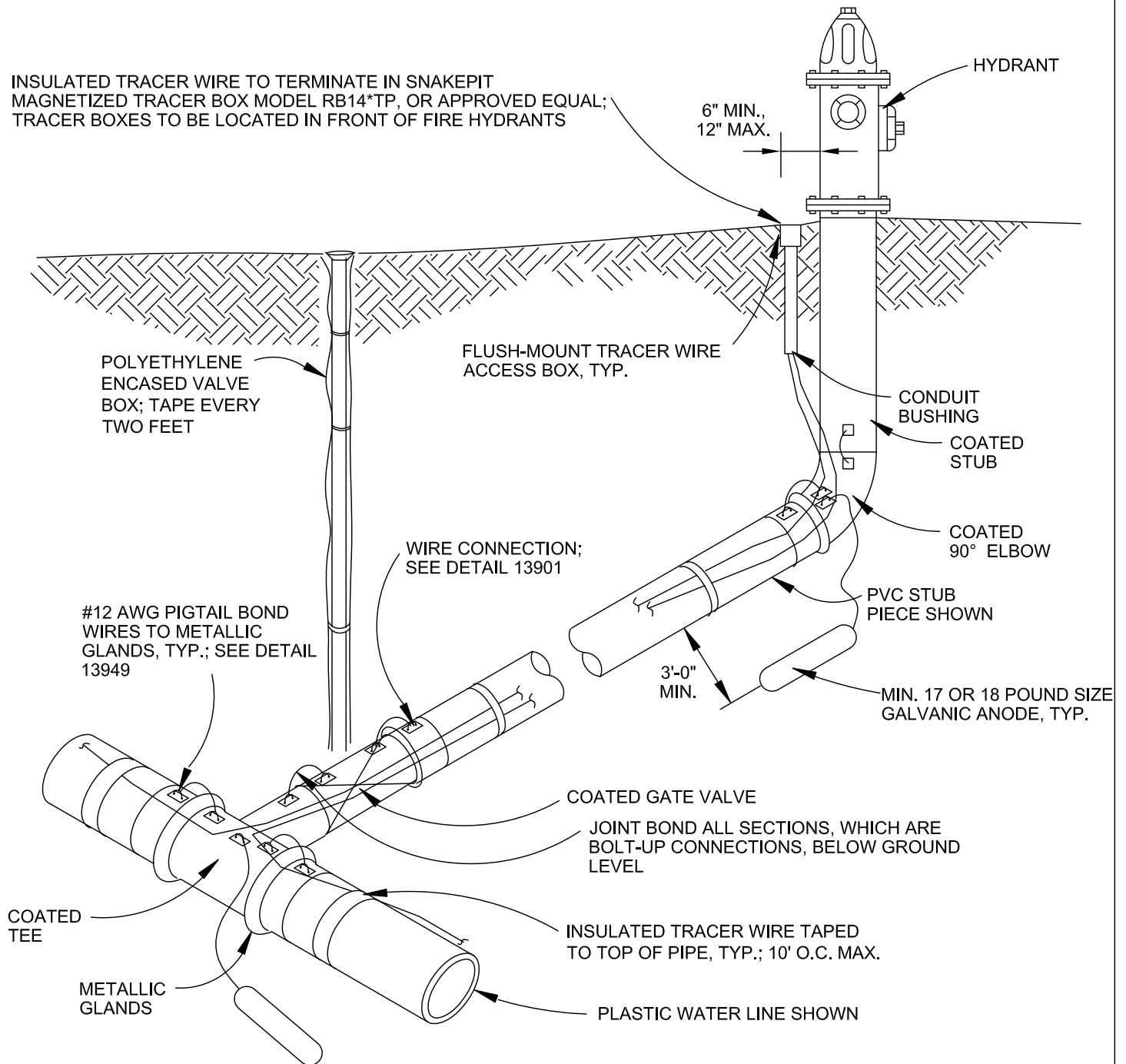
**GALVANIC ANODE INSTALLATION AT
HYDRANT ASSEMBLIES W/ DUCTILE STUB DETAIL**

DWG. NO. 13944D

CITY of SHERIDAN

NOVEMBER 2015

INSULATED TRACER WIRE TO TERMINATE IN SNAKEPIT
MAGNETIZED TRACER BOX MODEL RB14*TP, OR APPROVED EQUAL;
TRACER BOXES TO BE LOCATED IN FRONT OF FIRE HYDRANTS



NOTES:

1. INSTALL GALVANIC ANODE 1'-0" BELOW PIPELINE, FITTING, OR VALVE INVERT ELEVATION.
2. INSTALL MINIMUM NUMBER AND SIZE OF GALVANIC ANODES SPECIFIED; MINIMUM OF ONE PER EACH METALLIC FITTING OR TWO TOTAL ASSEMBLY.

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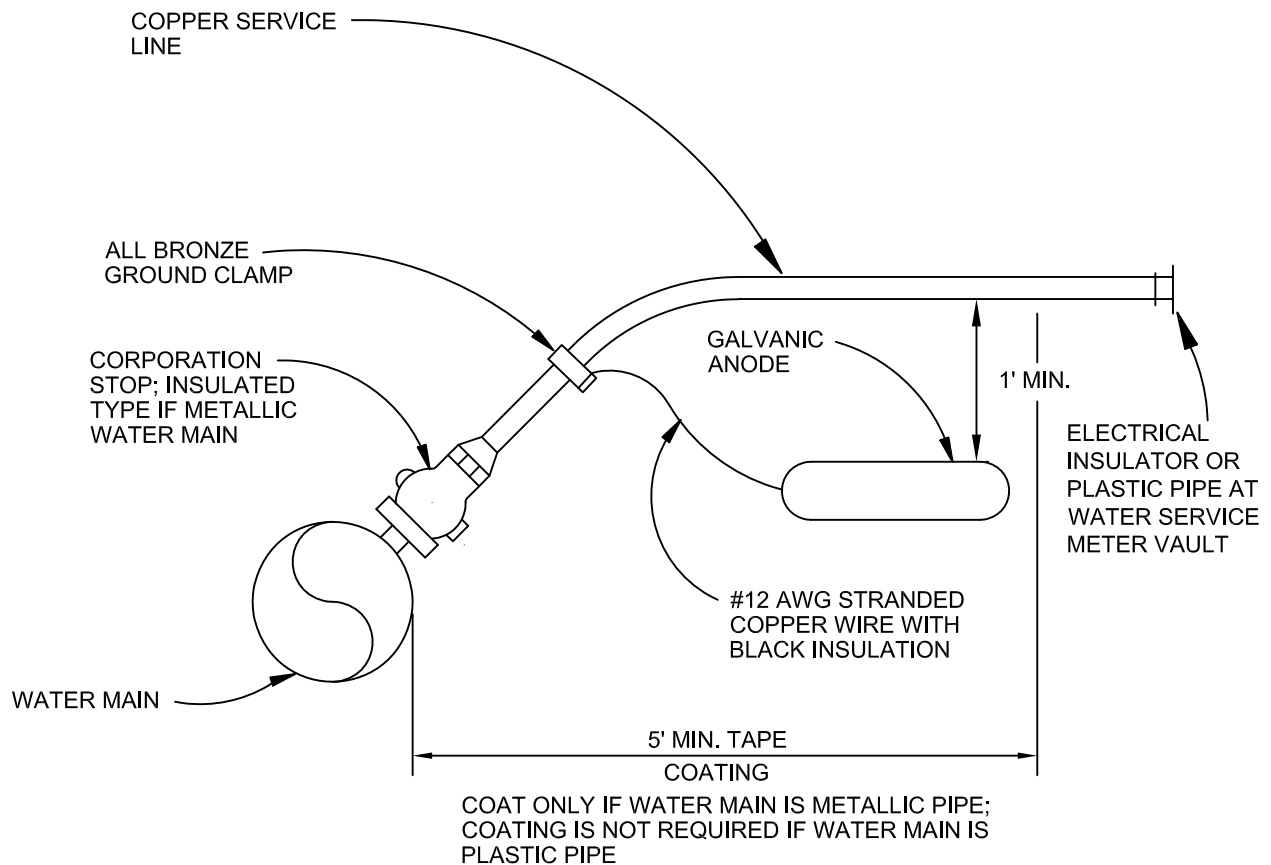
**GALVANIC ANODE INSTALLATION AT
HYDRANT ASSEMBLIES W/ PVC STUB DETAIL**

DWG. NO.

13944P

CITY of SHERIDAN

NOVEMBER 2015



NOTES:

1. INSTALL ANODE 3'-5' FROM PIPE AND 1'-0" BELOW PIPE INVERT ELEVATION. TAPE COAT SERVICE LINE FROM METALLIC WATER MAIN, MIN. 5', OR AS SPECIFIED. APPLY TAPE COATING PER SPECIFICATION.
2. ACTUAL ORIENTATION OF SERVICE LINE IS IN THE HORIZONTAL PLANE.
3. WITH HDPE SERVICE LINE, WRAP CORPORATION STOP WITH PETROLATUM TAPE.

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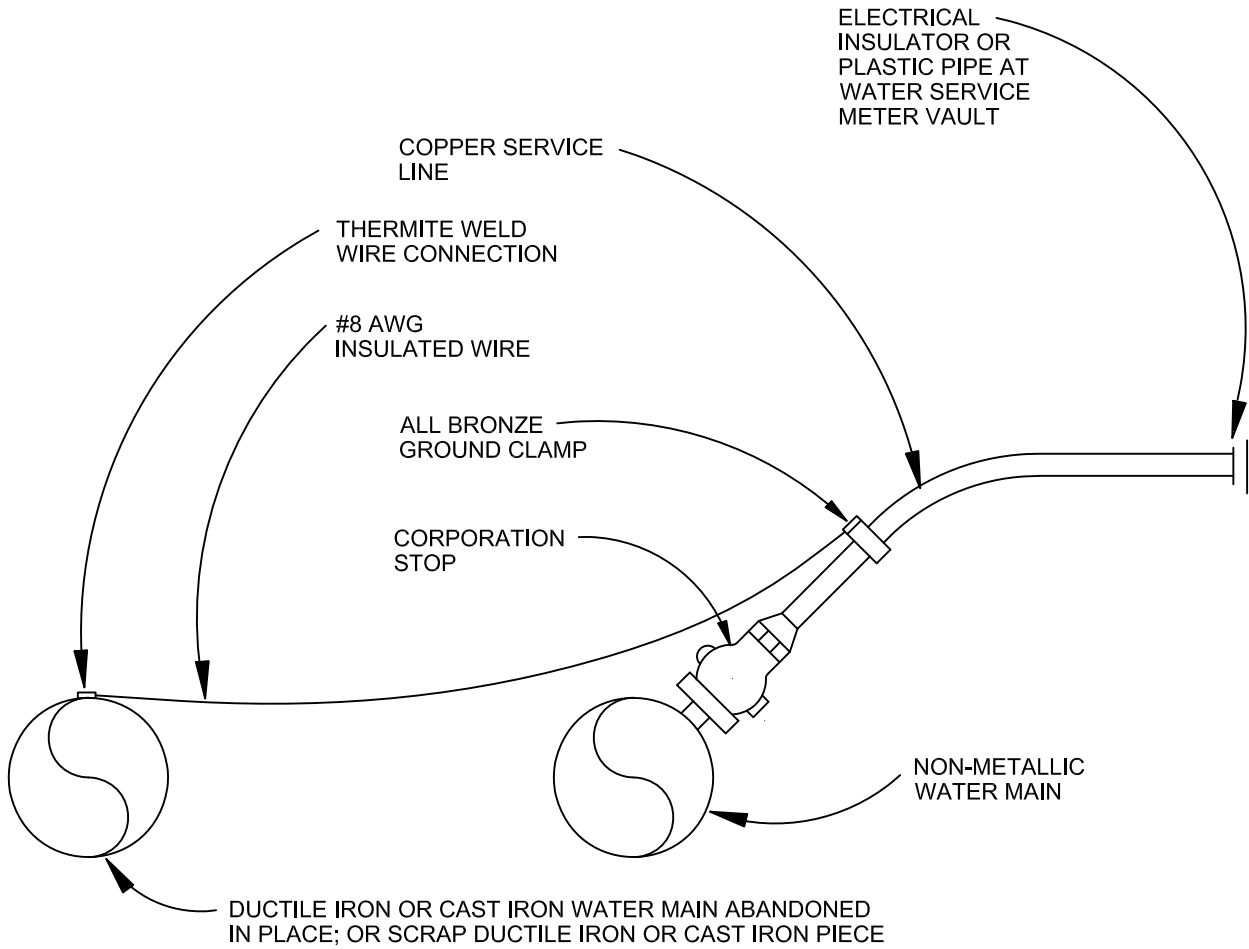
**ANODE WIRE CONNECTION TO
COPPER SERVICE LINE DETAIL**

DWG. NO.

13945

CITY of SHERIDAN

NOVEMBER 2015



NOTE:

PIPE ANODE SHALL BE 6-INCH DIAMETER MINIMUM
 CAST OR DUCTILE IRON PIPE, 10-FOOT MINIMUM LENGTH.

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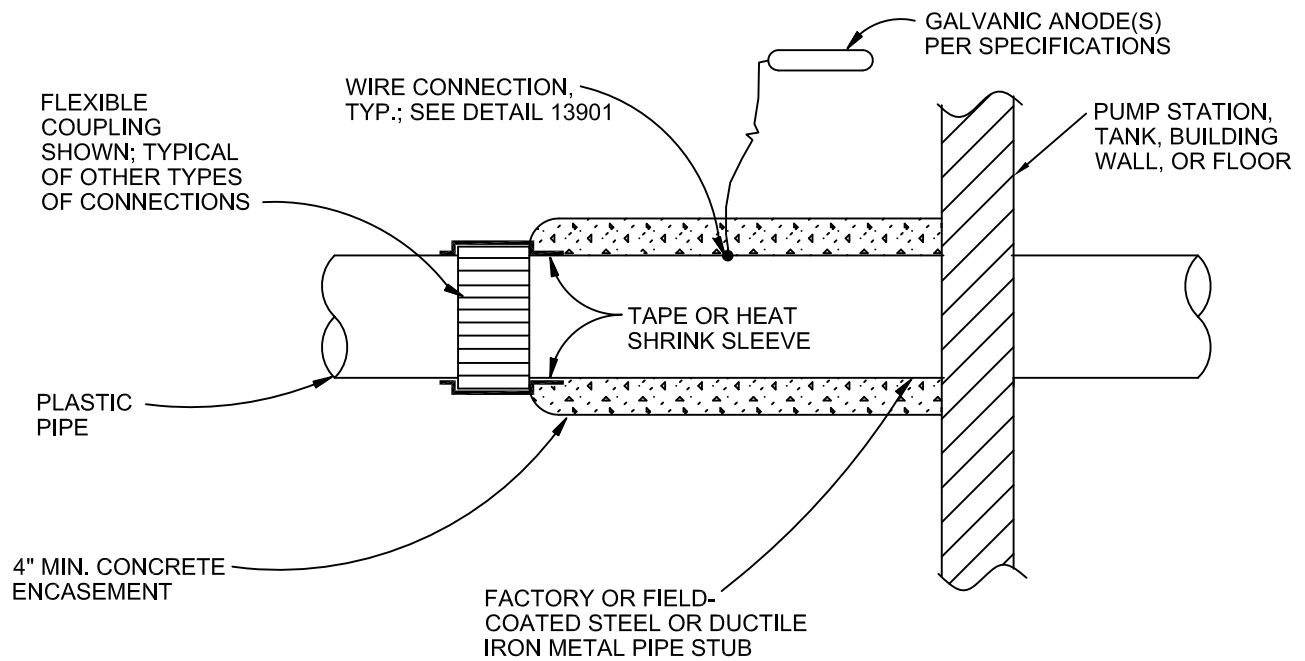
NOT TO SCALE

**DUCTILE OR CAST IRON
 PIPE ANODE DETAIL**

DWG. NO. 13946

CITY of SHERIDAN

NOVEMBER 2015



NOTES:

1. CADWELD WIRES. ASSEMBLE AND TEST COUPLING FITTING CONNECTION AND COAT PRIOR TO CONCRETE ENCASEMENT AND BACKFILLING.
2. COAT METAL PIPE STUB PER SPECIFICATIONS PRIOR TO ENCASEMENT.
3. CENTER 12" WIDE JOINT WRAP TAPE OR HEAT SHRINK SLEEVE ON FLEXIBLE COUPLING AND PIPE INTERFACE AFTER TESTING AND BEFORE ENCASEMENT.
4. COMPLETELY ENCASE COATED STEEL OR DUCTILE IRON PIPE STUB BETWEEN FLEXIBLE COUPLING AND CONCRETE STRUCTURE, BUILDING WALL, FLOOR, OR UNDER TANK WITH A MINIMUM 4-INCH THICK CONCRETE LAYER.
5. INSTALL GALVANIC ANODE(S) TO CONCRETE ENCASED PIPE; ONE MINIMUM.
6. PROVIDE COMPLETE CONCRETE ENCASEMENT FOR FULL LENGTH OF METAL PIPE STUB UNDER CONCRETE FLOOR SLABS OR TANK BOTTOMS.

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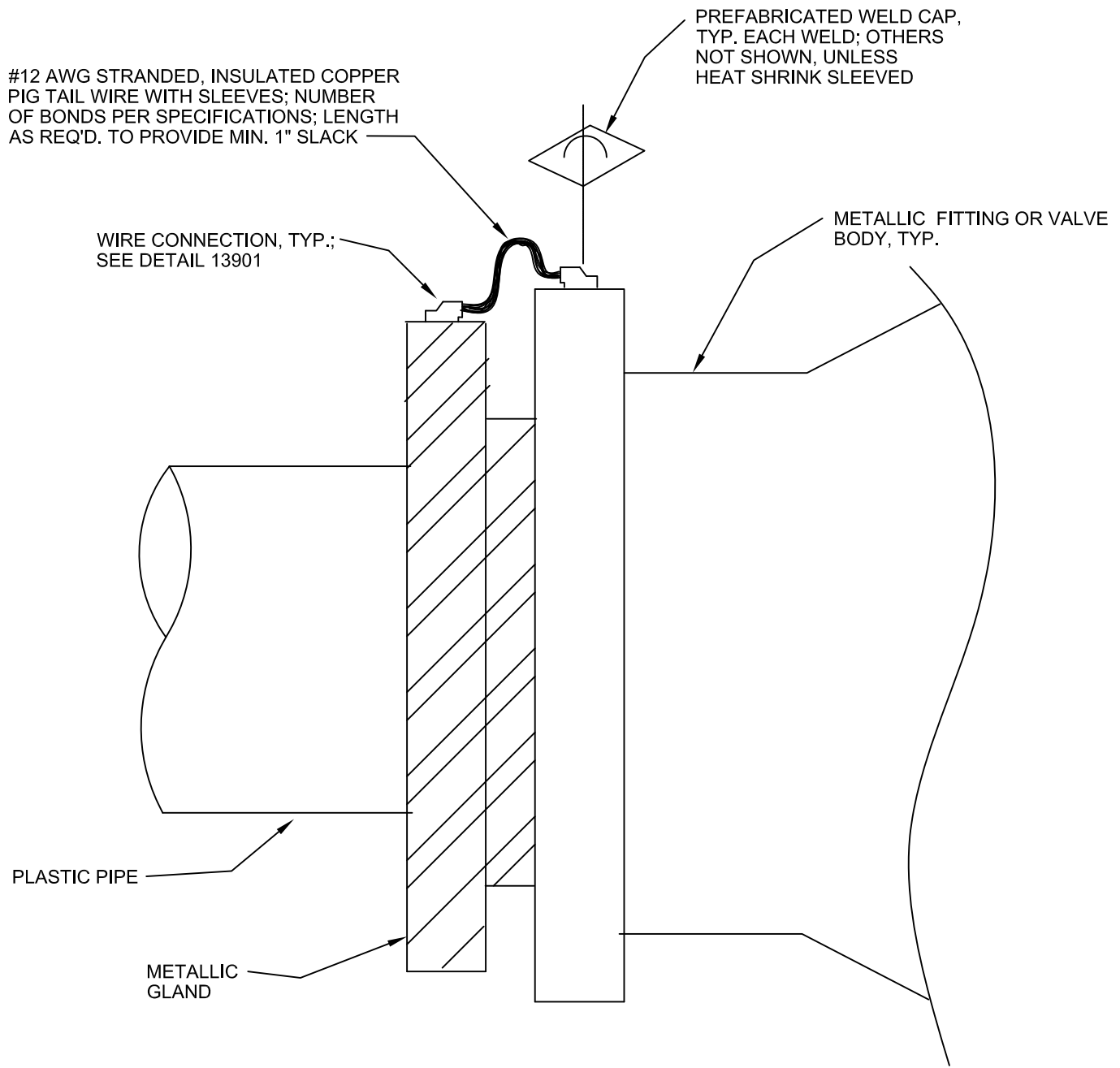
**CONCRETE-ENCASED METAL PIPE STUB
BETWEEN PLASTIC PIPE FLEXIBLE COUPLING
AND CONCRETE STRUCTURE CONNECTION DETAIL**

DWG. NO.

13948

CITY of SHERIDAN

NOVEMBER 2015



NOTES:

1. BOND PLASTIC PIPE METALLIC GLANDS TO METALLIC FITTING BODY.

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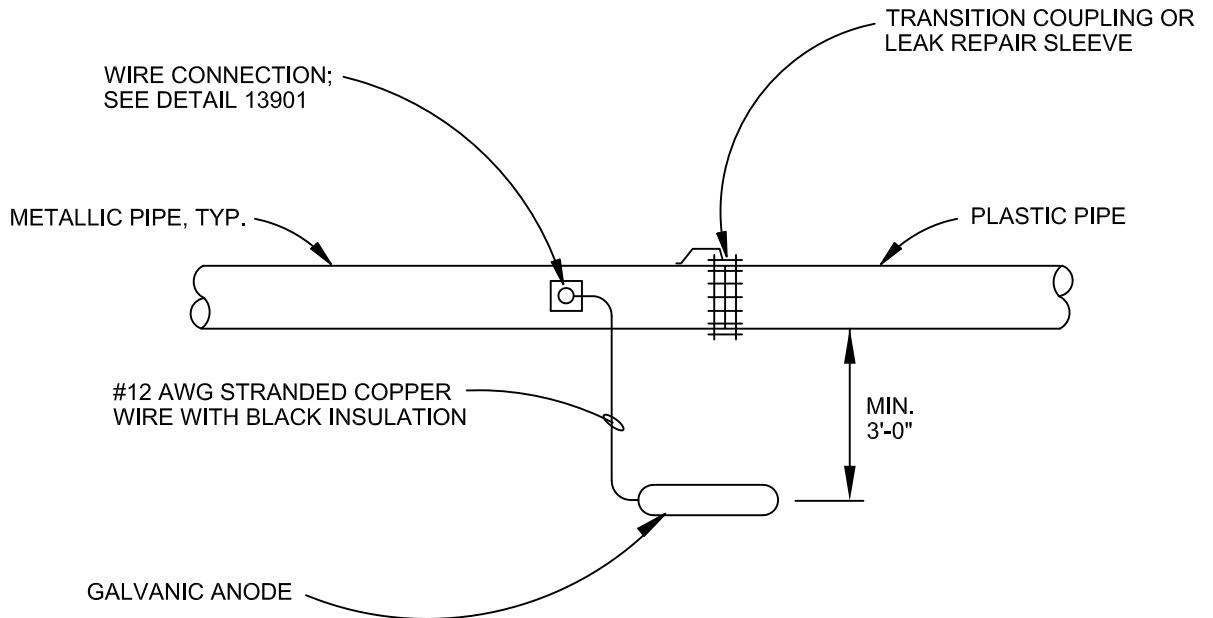
**METALLIC FITTING
GLANDS DETAIL**

DWG. NO.

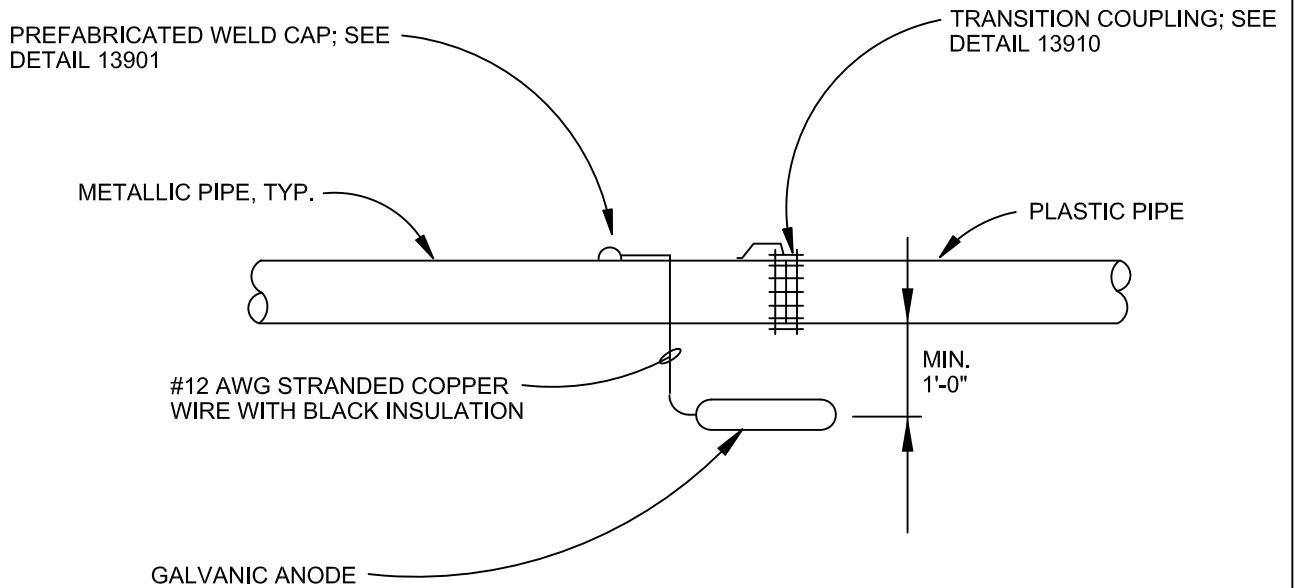
13949

CITY of SHERIDAN

NOVEMBER 2015



PLAN



ELEVATION

NOTE:

1. INSTALL TYPE, SIZE, AND NUMBER OF ANODES SPECIFIED.
2. INSTALL 2 ANODES (17 OR 18 POUND) AT ALL LEAK REPAIR LOCATIONS.

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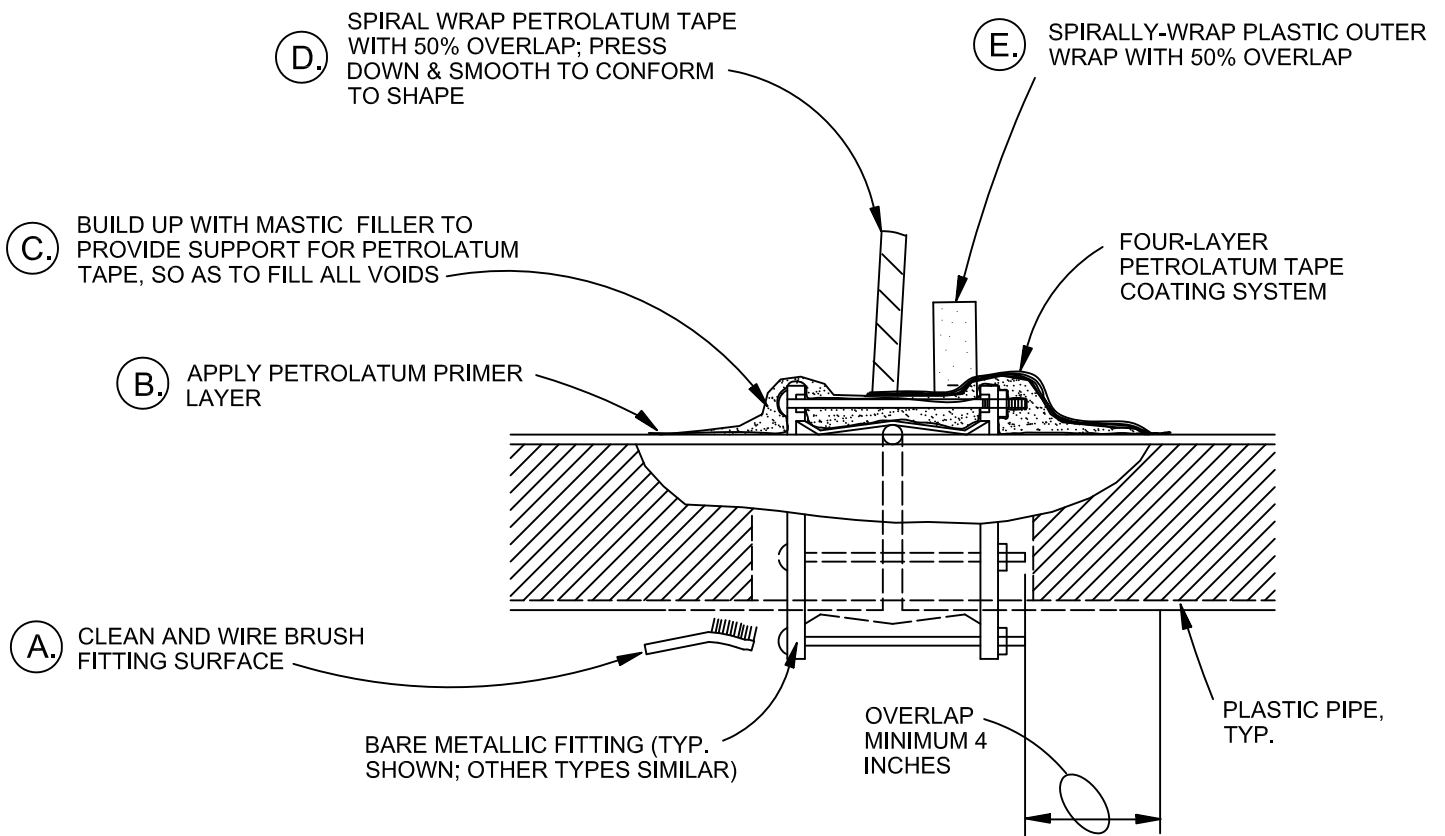
**GALVANIC ANODE INSTALLATION FOR
EXISTING METALLIC PIPE CONNECTIONS
OR LEAK REPAIR LOCATIONS DETAIL**

DWG. NO.

13950R

CITY of SHERIDAN

NOVEMBER 2015



NOTES:

1. PRIMER, MASTIC FILLER, TAPE, AND OUTER WRAP AS RECOMMENDED BY TAPE MANUFACTURER FOR EACH FITTING TYPE AND ENVIRONMENT.
2. CLEAN AND ROUGHEN FITTING SURFACE WITH WIRE BRUSH AND APPLY PETROLATUM PRIMER LAYER, MASTIC FILLER, PETROLATUM TAPE, AND PLASTIC OUTER WRAP, PER MANUFACTURER'S DIRECTIONS.
3. JOINT BOND WIRES, ANODE & TEST LEADS (NOT SHOWN) SHALL BE COATED WITH HANDYCAP & THEN ENCASED UNDER PETROLATUM TAPE COATING.
4. PRIMER AND MASTIC FILLER SHALL PROVIDE SMOOTH TRANSITION AT ALL EDGES AND STEP-DOWNS AND FILL ALL VOIDS.
5. PETROLATUM TAPE COATING SHALL COMPLETELY ENCASE BARE METALLIC FITTING & EXTEND A MIN. 4" ONTO PLASTIC PIPE SURFACE.
6. FOUR-LAYER SYSTEM WITH PROTECTIVE WRAP FOR BURIED CONDITIONS AND THREE-LAYER SYSTEM FOR ABOVE-GRADE APPLICATIONS.
7. CORROSION PROTECTION IS SHOWN FOR FLEXIBLE COUPLING JOINT TYPE. PROTECTION OF OTHER BARE OR COPPER METALLIC FITTING TYPES SIMILAR.

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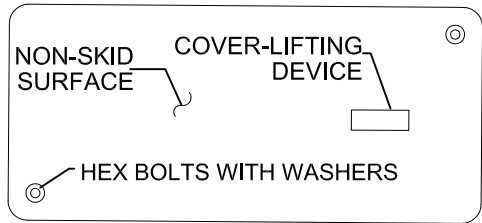
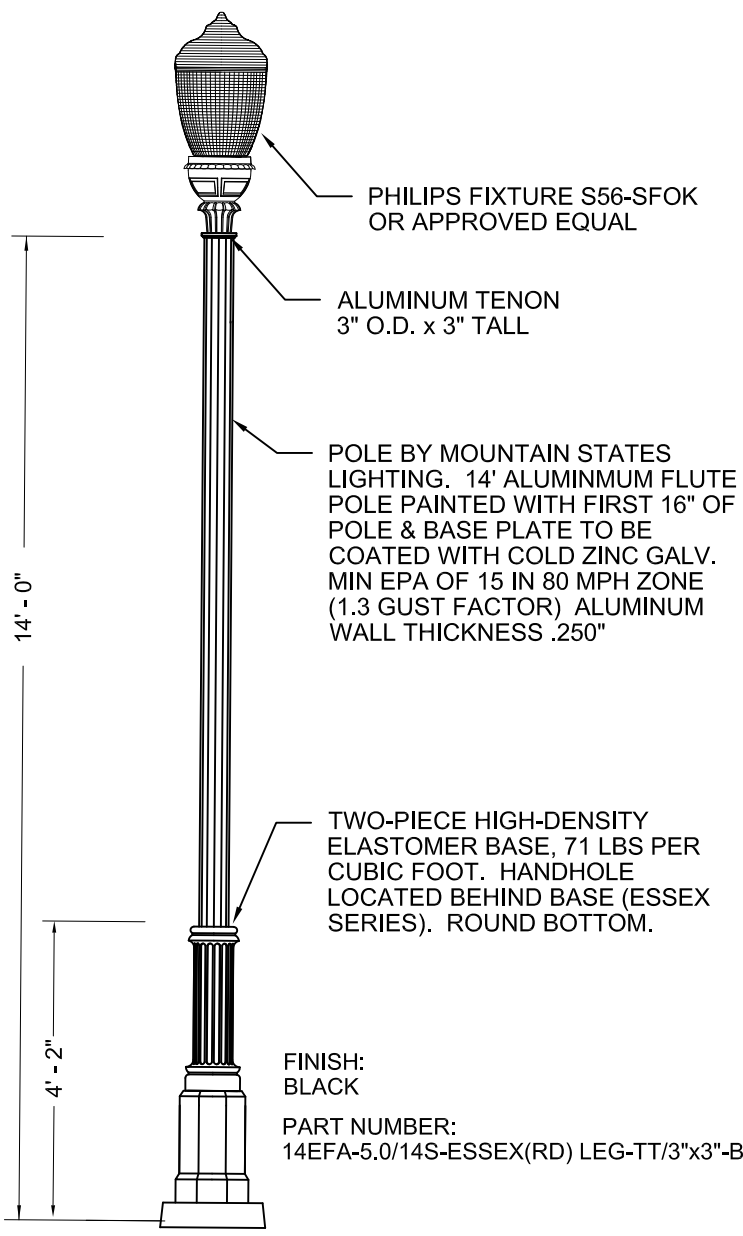
PETROLATUM TAPE COATING FOR BARE METALLIC COUPLINGS & FITTINGS DETAIL

DWG. NO.

13967

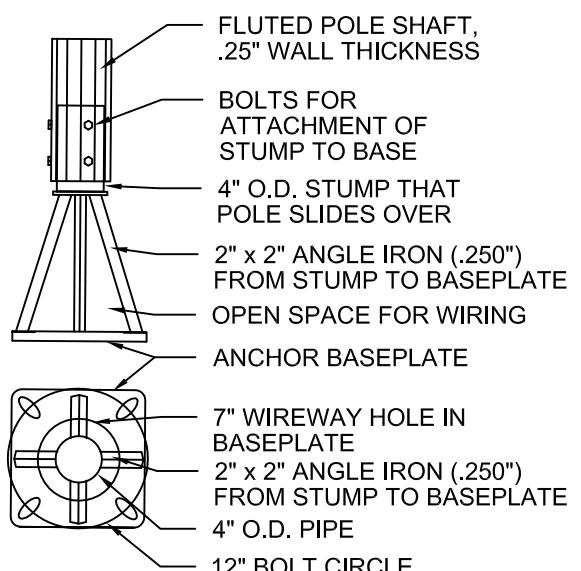
CITY of SHERIDAN

NOVEMBER 2015



FINISH: BLACK

PULL BOX COVER DETAIL



ANCHOR PLATE DETAIL

LIGHT POLE DETAIL

NOTES:

1. SEE CONTRACT DOCUMENTS FOR COMPLETE ROADWAY LIGHTING SPECIFICATIONS AND DETAILS, INCLUDING POSSIBLE REVISIONS TO THIS STANDARD DETAIL.

NOT TO SCALE

DECORATIVE LIGHTING DETAILS

DWG. NO. 26010-1

CITY of SHERIDAN

NOVEMBER 2015