



Purchasing Division

## Invitation for Bid

IFB-4568-18-DH

Kannah Creek Intake and/or Purdy Mesa Flowline Rehabilitation

### **Responses Due:**

November 7, 2018 prior to 3:30pm

**Accepting Electronic Responses Only**

**Responses Only Submitted Through the Rocky Mountain E-Purchasing System (RMEPS)**

**<https://www.rockymountainbidsystem.com/default.asp>**

(Purchasing Representative does not have access or control of the vendor side of RMEPS. If website or other problems arise during response submission, vendor **MUST** contact RMEPS to resolve issue prior to the response deadline. 800-835-4603)

### **Purchasing Representative(s):**

Duane Hoff Jr., Senior Buyer  
[duaneh@gjcity.org](mailto:duaneh@gjcity.org)  
970-244-1545

**AND**

Susan Hyatt, Senior Buyer  
[susanh@gjcity.org](mailto:susanh@gjcity.org)  
970-244-1513

This document has been developed specifically to solicit competitive responses for this solicitation, and may not be the same as previous City of Grand Junction solicitations. All vendors are urged to thoroughly review this solicitation prior to responding. Submittal by **FAX, EMAIL or HARD COPY IS NOT ACCEPTABLE** for this solicitation.

# Invitation for Bids

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# **1. Instructions to Bidders**

**1.1. Purpose:** The City of Grand Junction is soliciting competitive bids from qualified and interested companies for all labor, equipment, and materials required for repairs, upgrades, and renovation of Kannah Creek Intake and/or Purdy Mesa Flowline Rehabilitation. All dimensions and scope of work should be verified by Contractors prior to submission of bids.

**IFB Questions: CONTRACTORS SHALL SUBMIT ALL QUESTIONS TO BOTH PURCHASING AGENTS LISTED BELOW:**

Duane Hoff Jr., Senior Buyer  
[duaneh@gjcity.org](mailto:duaneh@gjcity.org)

**AND**

Susan Hyatt, Senior Buyer  
[susanh@gjcity.org](mailto:susanh@gjcity.org)

- 1.2. Mandatory Pre-Bid Meeting:** **Prospective bidders are required to attend a mandatory pre-bid meeting on October 18, 2018 at 10:30am.** Meeting location shall be 10001 Kannah Creek Road, Whitewater, CO. The purpose of this visit will be to inspect and to clarify the contents of this Invitation for Bids (IFB).
- 1.3. The Owner:** The Owner is the City of Grand Junction, Colorado and is referred to throughout this Solicitation. The term Owner means the Owner or his authorized representative.
- 1.4. Submission:** **Each bid shall be submitted in electronic format only, and only through the Rocky Mountain E-Purchasing website (<https://www.rockymountainbidsystem.com/default.asp>).** *This site offers both “free” and “paying” registration options that allow for full access of the Owner’s documents and for electronic submission of proposals. (Note: “free” registration may take up to 24 hours to process. Please Plan accordingly.)* Please view our “**Electronic Vendor Registration Guide**” at <http://www.gjcity.org/business-and-economic-development/bids/> for details. (Purchasing Representative does not have access or control of the vendor side of RMEPS. If website or other problems arise during response submission, vendor **MUST** contact RMEPS to resolve issue prior to the response deadline. **800-835-4603**)
- 1.5. Modification and Withdrawal of Bids Before Opening.** Bids may be modified or withdrawn by an appropriate document stating such, duly executed and submitted to the place where Bids are to be submitted at any time prior to Bid Opening.
- 1.6. Printed Form for Price Bid:** All Price Bids must be made upon the Price Bid Schedule attached, and should give the amounts both in words and in figures, and must be signed and acknowledged by the bidder.

The Offeror shall specify a unit price in figures for each pay item for which a quantity is given and shall provide the products (in numbers) of the respective unit prices and quantities in the Extended Amount column. The total Bid price shall be equal to the sum of all extended amount prices. When an item in the Price Bid Schedule provides a choice to be made by the Offeror, Offeror's choice shall be indicated in accordance with the specifications for that particular item and thereafter no further choice shall be permitted.

Where the unit of a pay item is lump sum, the lump sum amount shall be shown in the "extended amount" column and included in the summation of the total Bid.

All blank spaces in the Price Bid Schedule must be properly filled out.

Bids by corporations must be executed in the corporate name by the president or vice president or other corporate office accompanied by evidence of authority to sign. The corporate address and state of incorporation shall be shown below the signature.

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.

All names must be typed or printed below the signature.

The Offeror's Bid shall contain an acknowledgement of receipt of all Addenda, the numbers of which shall be filled in on the Contractor's Bid Form.

The contact information to which communications regarding the Bid are to be directed must be shown.

**Instructions for Completing Microsoft Excel Bid Schedules Spreadsheet:** All Price bids must be made upon the provided Microsoft Excel Bid Schedules Spreadsheet, and submitted in the same electronic format. This is a separate attachment to this solicitation. Note: Each Bid Schedule is contained in its own tab located at the bottom of the spreadsheet. The tabs are labeled as follows:

- \* Instructions (follow these instructions to complete each Bid Schedule);
- \* BID ALT 1 – KC;
- \* BID ALT 2 – PMFL REPLACEMENT;
- \* BID ALT 3 – PMFL TANK;
- \* Bid Summary (this is for totaling purposes only).

There are 4 separate bid schedules for this project, the Bidder shall submit a bid for each schedule utilizing the provided Microsoft Excel Bid Schedules Spreadsheet. The schedules for this project are as follows:

Bid Alternate 1 – Kannah Creek Intake: Consists of removal and replacement of dam/diversion structure, new PVC pipe to existing debris screen, new PVC pipe and flow measurement devices before reconnecting to existing Kannah Creek Pipeline downstream of the measurement facility. Electrical and automation control are also a component of these plans.

Bid Alternate 2 – Purdy Mesa Flowline Sullivan Draw Replacement: Consists of installation of approximately 6350 LF of 20” Water main pipe, replacement of two pressure control valves with new pressure sustaining and flow control valves, electrical and control features and appurtenances.

Bid Alternate 3 – Purdy Mesa Flow Control Tank: Consists of construction a volume control tank and appurtenant piping connections.

The Bidder’s proposal shall specify a unit bid price for each item in all bid schedules. Failure to include unit bid prices for each bid item in all bid schedules shall be cause for rejection of the Bidder’s proposal.

- 1.7. **Exclusions:** No oral, telephonic, emailed, or facsimile bid will be considered
- 1.8. **Contract Documents:** The complete IFB and bidder’s response compose the Contract Documents. Copies of bid documents can be obtained from the City Purchasing website, <http://www.gjcity.org/business-and-economic-development/bids/> .
- 1.9. **Additional Documents:** The July 2010 edition of the “City Standard Contract Documents for Capital Improvements Construction”, Plans, Specifications and other Bid Documents are available for review or download on the Public Works & Planning/Engineering page at [www.gjcity.org](http://www.gjcity.org). Electronic copies may be obtained on a CD format at the Department of Public Works and Planning at City Hall.
- 1.10. **Definitions and Terms:** See Article I, Section 3 of the General Contract Conditions in the *Standard Contract Documents for Capital Improvements Construction*.
- 1.11. **Examination of Specifications:** Bidders shall thoroughly examine and be familiar with the project Statement of Work. The failure or omission of any Offeror to receive or examine any form, addendum, or other document shall in no way relieve any Offeror from any obligation with respect to his bid. The submission of a bid shall be taken as evidence of compliance with this section. Prior to submitting a bid, each Offeror shall, at a minimum:
  - a. Examine the *Contract Documents* thoroughly;
  - b. Visit the site to familiarize themselves with local conditions that may in any manner affect cost, progress, or performance of the Work;
  - c. Become familiar with federal, state, and local laws, ordinances, rules, and regulations that may in any manner affect cost, progress or performance of the Work;
  - d. Study and carefully correlate Bidder's observations with the *Contract Documents*, and;
  - e. Notify the Engineer of all conflicts, errors, ambiguities or discrepancies in or among the *Contract Documents*

On request, the Owner will provide each Offeror access to the site to conduct such investigations and tests as each Bidder deems necessary for submission of a Bid. It shall be the Offeror's responsibility to make or obtain any additional examinations, investigations, explorations, tests and studies and obtain any additional information and data which pertain to the physical conditions (including without limitation, surface, subsurface and underground utilities) at or contiguous to the site or otherwise which may affect cost, progress or performance of the work and which the Offeror deems necessary to determine its Bid for performing the work in accordance with the time, price and other terms and conditions of the Contract Documents. Location of any excavation or boring made by Offeror shall be subject to prior approval of Owner and applicable agencies. Offeror shall fill all holes, restore all pavements to match the existing structural section and shall clean up and restore the site to its former condition upon completion of such exploration. The Owner reserves the right to require the Offeror to execute an access agreement with the Owner prior to accessing the site.

The lands upon which the Work is to be performed, rights of way, and access thereto, and other lands designated for use by Contractor in performing the Work, are identified on the Drawings.

Information and data reflected in the *Contract Documents* with respect to underground utilities at or contiguous to the site are based upon information and data furnished to the Owner and the Engineer by the owners of such underground utilities or others, and the Owner does not assume responsibility for the accuracy or completeness thereof, unless it is expressly provided otherwise in the *Contract Documents*.

By submission of a Bid, the Offeror shall be conclusively presumed to represent that the Offeror has complied with every requirement of these Instructions to Bidders, that the *Contract Documents* are not ambiguous and are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance of the Work.

- 1.12. **Questions Regarding Statement of Work:** Any information relative to interpretation of Scope of Work or specifications shall be requested of the Purchasing Representative, in writing, in ample time prior to the response time.
- 1.13. **Addenda & Interpretations:** If it becomes necessary to revise any part of this solicitation, a written addendum will be posted electronically on the City's website at <http://www.gjcity.org/business-and-economic-development/bids/> . The Owner is not bound by any oral representations, clarifications, or changes made in the written specifications by Owner, unless such clarification or change is provided in written addendum form from the City Purchasing Representative.
- 1.14. **Taxes:** The Owner is exempt from State retail and Federal tax. The bid price must be net, exclusive of taxes.
- 1.15. **Sales and Use Taxes:** The Contractor and all Subcontractors are required to obtain exemption certificates from the Colorado Department of Revenue for sales and use taxes in accordance with the provisions of the General Contract Conditions. Bids shall reflect this method of accounting for sales and use taxes on materials, fixtures and equipment.

- 1.16. Offers Binding 60 Days:** Unless additional time is required by the Owner, or otherwise specified, all formal offers submitted shall be binding for sixty (60) calendar days following opening date, unless the Bidder, upon request of the Purchasing Representative, agrees to an extension.
- 1.17. Collusion Clause:** Each bidder by submitting a bid certifies that it is not party to any collusive action or any action that may be in violation of the Sherman Antitrust Act. Any and all bids shall be rejected if there is evidence or reason for believing that collusion exists among bidders. The Owner may, or may not, accept future bids for the same services or commodities from participants in such collusion.
- 1.18. Disqualification of Bidders:** A Bid will not be accepted from, nor shall a Contract be awarded to, any person, firm, or corporation that is in arrears to the Owner, upon debt or contract, or that has defaulted, as surety or otherwise, upon any obligation to the Owner, or that is deemed irresponsible or unreliable.

Bidders may be required to submit satisfactory evidence that they are responsible, have a practical knowledge of the project bid upon and that they have the necessary financial and other resources to complete the proposed Work.

Either of the following reasons, without limitation, shall be considered sufficient to disqualify a Bidder and Bid:

- a. More than one Bid is submitted for the same Work from an individual, firm, or corporation under the same or different name; and
  - b. Evidence of collusion among Bidders. Any participant in such collusion shall not receive recognition as a Bidder for any future work of the Owner until such participant has been reinstated as a qualified bidder.
- 1.19. Public Disclosure Record:** If the bidder has knowledge of their employee(s) or sub-contractors having an immediate family relationship with a City/County employee or elected official, the bidder must provide the Purchasing Representative with the name(s) of these individuals. These individuals are required to file an acceptable "Public Disclosure Record", a statement of financial interest, before conducting business with the City/County.

## **2. General Contract Conditions for Construction Projects**

- 2.1. The Contract:** This Invitation for Bid, submitted documents, and any negotiations, when properly accepted by the City/County, shall constitute a contract equally binding between the City/County and Contractor. The contract represents the entire and integrated agreement between the parties hereto and supersedes all prior negotiations, representations, or agreements, either written or oral. The contract may be amended or modified with Change Orders, Field Orders, or Addendums.

- 2.2. The Work:** The term Work includes all labor necessary to produce the construction required by the Contract Documents, and all materials and equipment incorporated or to be incorporated in such construction.
- 2.3. Execution, Correlation, Intent, and Interpretations:** The Contract Documents shall be signed in not less than triplicate by the Owner (City/County) and Contractor. City/County will provide the contract. By executing the contract, the Contractor represents that he/she has visited the site, familiarized himself with the local conditions under which the Work is to be performed, and correlated his observations with the requirements of the Contract Documents. The Contract Documents are complementary, and what is required by any one, shall be as binding as if required by all. The intention of the documents is to include all labor, materials, equipment and other items necessary for the proper execution and completion of the scope of work as defined in the technical specifications and drawings contained herein. All drawings, specifications and copies furnished by the City/County are, and shall remain, City/County property. They are not to be used on any other project, and with the exception of one contract set for each party to the contract, are to be returned to the owner on request at the completion of the work.
- 2.4. The Owner:** The Owner is the City of Grand Junction, Colorado and is referred to throughout the Contract Documents. The term Owner means the Owner or his authorized representative. The Owner shall, at all times, have access to the work wherever it is in preparation and progress. The Contractor shall provide facilities for such access. The Owner will make periodic visits to the site to familiarize himself generally with the progress and quality of work and to determine, in general, if the work is proceeding in accordance with the contract documents. Based on such observations and the Contractor's Application for Payment, the Owner will determine the amounts owing to the Contractor and will issue Certificates for Payment in such amounts, as provided in the contract. The Owner will have authority to reject work which does not conform to the Contract documents. Whenever, in his reasonable opinion, he considers it necessary or advisable to insure the proper implementation of the intent of the Contract Documents, he will have authority to require the Contractor to stop the work or any portion, or to require special inspection or testing of the work, whether or not such work can be then be fabricated, installed, or completed. The Owner will not be responsible for the acts or omissions of the Contractor, and sub-Contractor, or any of their agents or employees, or any other persons performing any of the work.
- 2.5. Contractor:** The Contractor is the person or organization identified as such in the Agreement and is referred to throughout the Contract Documents. The term Contractor means the Contractor or his authorized representative. The Contractor shall carefully study and compare the General Contract Conditions of the Contract, Specification and Drawings, Scope of Work, Addenda and Modifications and shall at once report to the Owner any error, inconsistency or omission he may discover. Contractor shall not be liable to the Owner for any damage resulting from such errors, inconsistencies or omissions. The Contractor shall not commence work without clarifying Drawings, Specifications, or Interpretations.
- 2.6. Sub-Contractors:** A sub-contractor is a person or organization who has a direct contract with the Contractor to perform any of the work at the site. The term sub-contractor is

referred to throughout the contract documents and means a sub-contractor or his authorized representative.

- 2.7. Award of Sub-Contractors & Other Contracts for Portions of the Work:** Contractor shall submit with their bid response to the Owner, in writing for acceptance, a list of the names of the sub-contractors or other persons or organizations proposed for such portions of the work as may be designated in the proposal requirements, or, if none is so designated, the names of the sub-contractors proposed for the principal portions of the work. Prior to the award of the contract, the Owner shall notify the successful Contractor in writing if, after due investigation, has reasonable objection to any person or organization on such list. If, prior to the award of the contract, the Owner has a reasonable and substantial objection to any person or organization on such list, and refuses in writing to accept such person or organization, the successful Contractor may, prior to the award, withdraw their proposal without forfeiture of proposal security. If the successful Contractor submits an acceptable substitute with an increase in the proposed price to cover the difference in cost occasioned by the substitution, the Owner may, at their discretion, accept the increased proposal or may disqualify the Contractor. If, after the award, the Owner refuses to accept any person or organization on such list, the Contractor shall submit an acceptable substitute and the contract sum shall be increased or decreased by the difference in cost occasioned by such substitution and an appropriate Change Order shall be issued. However, no increase in the contract sum shall be allowed for any such substitution unless the Contractor has acted promptly and responsively in submitting a name with respect thereto prior to the award.
- 2.8. Quantities of Work and Unit Price:** Materials or quantities stated as unit price items in the Bid are supplied only to give an indication of the general scope of the Work, and are as such, estimates only. The Owner does not expressly or by implication agree that the actual amount of Work or material will correspond therewith, and reserves the right after award to increase or decrease the quantity of any unit item of the Work without a change in the unit price except as set forth in Article VIII, Section 70 of the *General Contract Conditions*. The City also reserves the right to make changes in the Work (including the right to delete any bid item in its entirety or add additional bid items) as set forth in Article VIII, Sections 69 through 71 of the *General Contract Conditions*.
- 2.9. Substitutions:** The materials, products and equipment described in the *Solicitation Documents* shall be regarded as establishing a standard of required performance, function, dimension, appearance, or quality to be met by any proposed substitution. No substitution will be considered prior to receipt of Bids unless the Offeror submits a written request for approval to the City Purchasing Division at least ten (10) days prior to the date for receipt of Bids. Such requests for approval shall include the name of the material or equipment for which substitution is sought and a complete description of the proposed substitution including drawings, performance and test data, and other information necessary for evaluation, including samples if requested. The Offeror shall set forth changes in other materials, equipment, or other portions of the Work including changes of the work of other contracts, which incorporation of the proposed substitution would require to be included. The Owner's decision of approval or disapproval of a proposed substitution shall be final. If the Owner approves a proposed substitution before receipt of Bids, such approval will be set forth in an Addendum. Offerors shall not rely upon approvals made in any other manner.

- 2.10. Supervision and Construction Procedures:** The Contractor shall supervise and direct the work, using his best skill and attention. He shall be solely responsible for all construction means, methods, techniques, sequences and procedures and for coordinating all portions of the work under the contract.
- 2.11. Warranty:** The Contractor warrants to the Owner that all materials and equipment furnished under this contract will be new unless otherwise specified, and that all work will be of good quality, free from faults and defects and in conformance with the Contract Documents. All work not so conforming to these standards may be considered defective. If required by Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. If within ten (10) days after written notice to the Contractor requesting such repairs or replacement, the Contractor should neglect to make or undertake with due diligence to the same, the City may make such repairs or replacements. All indirect and direct costs of such correction or removal or replacement shall be at the Contractor's expense. The Contractor will also bear the expenses of making good all work of others destroyed or damaged by the correction, removal or replacement of his defective work.
- 2.12. Permits, Fees, & Notices:** The Contractor shall secure and pay for all permits, governmental fees and licenses necessary for the proper execution and completion of the work. The Contractor shall give all notices and comply with all laws, ordinances, rules, regulations and orders of any public authority bearing on the performance of the work. If the Contractor observes that any of the Contract Documents are at variance in any respect, he shall promptly notify the Owner in writing, and any necessary changes shall be adjusted by approximate modification. If the Contractor performs any work knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to the Owner, he shall assume full responsibility and shall bear all costs attributable.
- 2.13. Responsibility for Those Performing the Work:** The Contractor shall be responsible to the Owner for the acts and omissions of all his employees and all sub-contractors, their agents and employees, and all other persons performing any of the work under a contract with the Contractor.
- 2.14. Use of the Site:** The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents, and shall not unreasonably encumber the site with any materials or equipment.
- 2.15. Cleanup:** The Contractor at all times shall keep the premises free from accumulation of waste materials or rubbish caused by his operations. At the completion of work he shall remove all his waste materials and rubbish from and about the project, as well as all his tools, construction equipment, machinery and surplus materials.
- 2.16. Insurance:** The Contractor shall secure and maintain such insurance policies as will provide the coverage and contain other provisions specified in the General Contract Conditions, or as modified in the Special Contract Conditions.



The Contractor shall file a copy of the policies or Certificates of Insurance acceptable to the City with the Engineer within ten (10) Calendar Days after issuance of the Notice of Award. These Certificates of Insurance shall contain a provision that coverage afforded under the policies shall not be canceled unless at least thirty (30) Calendar Days prior written notice has been given to the City.

- 2.17. Indemnification:** The Contractor shall defend, indemnify and save harmless the Owner, and all its officers, employees, insurers, and self-insurance pool, from and against all liability, suits, actions, or other claims of any character, name and description brought for or on account of any injuries or damages received or sustained by any person, persons, or property on account of any negligent act or fault of the Contractor, or of any Contractor's agent, employee, sub-contractor or supplier in the execution of, or performance under, any contract which may result from proposal award. Contractor shall pay any judgment with cost which may be obtained against the Owner growing out of such injury or damages.
- 2.18. Miscellaneous Conditions:** **Material Availability:** Contractors must accept responsibility for verification of material availability, production schedules, and other pertinent data prior to submission of bid. It is the responsibility of the bidder to notify the Owner immediately if materials specified are discontinued, replaced, or not available for an extended period of time. **OSHA Standards:** All bidders agree and warrant that services performed in response to this invitation shall conform to the standards declared by the US Department of Labor under the Occupational Safety and Health Act of 1970 (OSHA). In the event the services do not conform to OSHA standards, the Owner may require the services to be redone at no additional expense to the Owner.
- 2.19. Time:** Time is of the essence with respect to the time of completion of the Project and any other milestones or deadline which are part of the Contract. It will be necessary for each Bidder to satisfy the City of its ability to complete the Work within the Contract Time set forth in the Contract Documents. The Contract Time is the period of time allotted in the Contract Documents for completion of the work. The date of commencement of the work is the date established in a Notice to Proceed. If there is no Notice to Proceed, it shall be the date of the Contract or such other date as may be established therein, or as established as entered on the Bid Form. The Date of Substantial Completion of the work or designated portions thereof is the date certified by the Owner when construction is sufficiently complete, in accordance with the Contract Documents.
- 2.20. Progress & Completion:** The Contractor shall begin work on the date of commencement as defined in the Contract, and shall carry the work forward expeditiously with adequate forces and shall complete it within the contract time.
- 2.21. Payment & Completion:** The Contract Sum is stated in the Contract and is the total amount payable by the Owner to the Contractor for the performance of the work under the Contract Documents. Upon receipt of written notice that the work is ready for final inspection and acceptance and upon receipt of application for payment, the Owner's Project Manager will promptly make such inspection and, when he finds the work acceptable under the Contract Documents and the Contract fully performed, the Owner shall make payment in the manner provided in the Contract Documents.

**2.22. Bid Bond:** Each Bid shall as a guaranty of good faith on the part of the Bidder be accompanied by a Bid Guaranty consisting of: a certified or cashier's check drawn on an approved national bank or trust company in the state of Colorado, and made payable without condition to the City; or a **Bid Bond** written by an approved corporate surety in favor of the City. The amount of the Bid Guaranty shall not be less than 5% of the total Bid amount. Once a Bid is accepted and a Contract is awarded, the apparent successful bidder has ten calendar days to enter into a contract in the form prescribed and to furnish the bonds with a legally responsible and approved surety. Failure to do so will result in forfeiture of the Bid Guaranty to the City as Liquidated Damages.

Each bidder shall guaranty its total bid price for a period of sixty (60) Calendar Days from the date of the bid opening.

**2.23. Performance & Payment Bonds:** Contractor shall furnish a Performance and a Payment Bond, each in an amount at least equal to that specified for the contract amount as security for the faithful performance and payment of all Contractor's obligations under the Contract Documents. These bonds shall remain in effect for the duration of the Warranty Period (as specified in the Special Conditions). Contractor shall also furnish other bonds that may be required by the Special Conditions. All bonds shall be in the forms prescribed by the Contract Documents and be executed by such sureties as (1) are licensed to conduct business in the State of Colorado and (2) are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Audit Staff, Bureau of Accounts, U.S. Treasury Department. All bonds signed by an agent must be accompanied by a certified copy of the Authority Act. If the surety on any bond furnished by the Contractor is declared bankrupt, or becomes insolvent, or its rights to do business in Colorado are terminated, or it ceases to meet the requirements of clauses (1) and (2) of this section, Contractor shall within five (5) days thereafter substitute another bond and surety, both of which shall be acceptable to the City.

**2.24. Retention:** The Owner will deduct money from the partial payments in amounts considered necessary to protect the interest of the Owner and will retain this money until after completion of the entire contract. The amount to be retained from partial payments will be five (5) percent of the value of the completed work, and not greater than five (5) percent of the amount of the Contract. When the retainage has reached five (5) percent of the amount of the Contract no further retainage will be made and this amount will be retained until such time as final payment is made.

**2.25. Liquidated Damages for Failure to Enter Into Contract:** Should the Successful Bidder fail or refuse to enter into the Contract within ten Calendar Days from the issuance of the Notice of Award, the City shall be entitled to collect the amount of such Bidder's Bid Guaranty as Liquidated Damages, not as a penalty but in consideration of the mutual release by the City and the Successful Bidder of all claims arising from the City's issuance of the Notice of Award and the Successful Bidder's failure to enter into the Contract and the costs to award the Contract to any other Bidder, to readvertise, or otherwise dispose of the Work as the City may determine best serves its interest.

**2.26. Liquidated Damages for Failure to Meet Project Completion Schedule:** If the Contractor does not achieve Final Completion by the required date, whether by neglect, refusal or any other reason, the parties agree and stipulate that the Contractor shall pay liquidated damages to the City for each such day that final completion is late. As provided elsewhere, this provision does not apply for delays caused by the City. The date for Final Completion may be extended in writing by the Owner.

The Contractor agrees that as a part of the consideration for the City's awarding of this Contract liquidated damages in the daily amount of **\$500.00** is reasonable and necessary to pay for the actual damages resulting from such delay. The parties agree that the real costs and injury to the City for such delay include hard to quantify items such as: additional engineering, inspection and oversight by the City and its agents; additional contract administration; inability to apply the efforts of those employees to the other work of the City; perceived inefficiency of the City; citizens having to deal with the construction and the Work, rather than having the benefit of a completed Work, on time; inconvenience to the public; loss of reputation and community standing for the City during times when such things are very important and very difficult to maintain.

The Contractor must complete the Work and achieve final completion included under the Bid Schedule in the number of consecutive calendar days after the City gives is written Notice to Proceed. When the Contractor considers the entire Work ready for its intended use, Contractor shall certify in writing that the Work is substantially complete. In addition to the Work being substantially complete, Final Completion date is the date by which the Contractor shall have fully completed all clean-up, and all items that were identified by the City in the inspection for final completion. Unless otherwise stated in the Special Conditions, for purposes of this liquidated damages clause, the Work shall not be finished and the Contract time shall continue to accrue until the City gives its written Final Acceptance.

If the Contractor shall fail to pay said liquidated damages promptly upon demand thereof after having failed to achieve Final Completion on time, the City shall first look to any retainage or other funds from which to pay said liquidated damages; if retainage or other liquid funds are not available to pay said liquidated damages amounts, the Surety on the Contractor's Performance Bond and Payment Bond shall pay such liquidated damages. In addition, the City may withhold all, or any part of, such liquidated damages from any payment otherwise due the Contractor.

Liquidated damages as provided do not include any sums to reimburse the City for extra costs which the City may become obligated to pay on other contracts which were delayed or extended because of the Contractor's failure to complete the Work within the Contract Time. Should the City incur additional costs because of delays or extensions to other contracts resulting from the Contractor's failure of timely performance, the Contractor agrees to pay these costs that the City incurs because of the Contractor's delay, and these payments are separate from and in addition to any liquidated damages.

The Contractor agrees that the City may use its own forces or hire other parties to obtain Substantial or Final Completion of the work if the time of completion has elapsed and the Contractor is not diligently pursuing completion. In addition to the Liquidated Damages provided for, the Contractor agrees to reimburse the City for all expenses thus incurred.

- 2.27. Contingency/Force Account:** Contingency/Force Account work will be authorized by the Owner's Project Manager and is defined as minor expenses to cover miscellaneous or unforeseen expenses related to the project. The expenses are not included in the Drawings, Specifications, or Scope of Work and are necessary to accomplish the scope of this contract. Contingency/Force Account Authorization will be directed by the Owner through an approved form. Contingency/Force Account funds are the property of the Owner and any Contingency/Force Account funds, not required for project completion, shall remain the property of the Owner. Contractor is not entitled to any Contingency/Force Account funds, that are not authorized by Owner or Owner's Project Manager.
- 2.28. Protection of Persons & Property:** The Contractor shall comply with all applicable laws, ordinances, rules, regulations and orders of any public authority having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss. Contractor shall erect and maintain, as required by existing safeguards for safety and protection, and all reasonable precautions, including posting danger signs or other warnings against hazards promulgating safety regulations and notifying owners and users of adjacent utilities. When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct by the Contractor in the execution of the work, or in consequence of the non-execution thereof by the Contractor, he shall restore, at his own expense, such property to a condition similar or equal to that existing before such damage or injury was done, by repairing, rebuilding, or otherwise restoring as may be directed, or it shall make good such damage or injury in an acceptable manner.
- 2.29. Changes in the Work:** The Owner, without invalidating the contract, may order changes in the work within the general scope of the contract consisting of additions, deletions or other revisions, the contract sum and the contract time being adjusted accordingly. All such changes in the work shall be authorized by Change Order and shall be executed under the applicable conditions of the contract documents. A Change Order is a written order to the Contractor signed by the Owner issued after the execution of the contract, authorizing a change in the work or an adjustment in the contract sum or the contract time. The contract sum and the contract time may be changed only by Change Order.
- 2.30. Claims for Additional Cost or Time:** If the Contractor wishes to make a claim for an increase in the contract sum or an extension in the contract time, he shall give the Owner written notice thereof within a reasonable time after the occurrence of the event giving rise to such claim. This notice shall be given by the Contractor before proceeding to execute the work, except in an emergency endangering life or property in which case the Contractor shall precede in accordance with the regulations on safety. No such claim shall be valid unless so made. Any change in the contract sum or contract time resulting from such claim shall be authorized by Change Order.
- 2.31. Minor Changes in the Work:** The Owner shall have authority to order minor changes in the work not involving an adjustment in the contract sum or an extension of the contract time and not inconsistent with the intent of the contract documents.
- 2.32. Field Orders:** The Owner may issue written Field Orders which interpret the Contract Documents in accordance with the specifications, or which order minor changes in the

work in accordance with the agreement, without change in the contract sum or time. The Contractor shall carry out such Field Orders promptly.

- 2.33. Uncovering & Correction of Work:** The Contractor shall promptly correct all work rejected by the Owner as defective or as failing to conform to the contract documents whether observed before or after substantial completion and whether or not fabricated installed or completed. The Contractor shall bear all costs of correcting such rejected work, including the cost of the Owner's additional services thereby made necessary. If within one (1) year after the date of completion or within such longer period of time as may be prescribed by law or by the terms of any applicable special guarantee required by the contract documents, any of the work found to be defective or not in accordance with the contract documents, the Contractor shall correct it promptly after receipt of a written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discover of condition. All such defective or non-conforming work under the above paragraphs shall be removed from the site where necessary and the work shall be corrected to comply with the contract documents without cost to the Owner. The Contractor shall bear the cost of making good all work of separate Contractors destroyed or damaged by such removal or correction. If the Owner prefers to accept defective or non-conforming work, he may do so instead of requiring its removal and correction, in which case a Change Order will be issued to reflect an appropriate reduction in the payment or contract sum, or, if the amount is determined after final payment, it shall be paid by the Contractor.
- 2.30. Amendment:** No oral statement of any person shall modify or otherwise change, or affect the terms, conditions or specifications stated in the resulting contract. All amendments to the contract shall be made in writing by the Owner.
- 2.31. Assignment:** The Contractor shall not sell, assign, transfer or convey any contract resulting from this IFB, in whole or in part, without the prior written approval from the Owner.
- 2.32. Compliance with Laws:** Bids must comply with all Federal, State, County and local laws governing or covering this type of service and the fulfillment of all ADA (Americans with Disabilities Act) requirements.
- 2.33. Confidentiality:** All information disclosed by the Owner to the Contractor for the purpose of the work to be done or information that comes to the attention of the Contractor during the course of performing such work is to be kept strictly confidential.
- 2.34. Conflict of Interest:** No public official and/or City/County employee shall have interest in any contract resulting from this IFB.
- 2.35. Contract Termination:** This contract shall remain in effect until any of the following occurs: (1) contract expires; (2) completion of services; (3) acceptance of services or, (4) for convenience terminated by either party with a written *Notice of Cancellation* stating therein the reasons for such cancellation and the effective date of cancellation.

- 2.36. Employment Discrimination:** During the performance of any services per agreement with the Owner, the Contractor, by submitting a Bid, agrees to the following conditions:
- 2.36.1.** The Contractor shall not discriminate against any employee or applicant for employment because of race, religion, color, sex, age, handicap, or national origin except when such condition is a legitimate occupational qualification reasonably necessary for the normal operations of the Contractor. The Contractor agrees to post in conspicuous places, visible to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause.
  - 2.36.2.** The Contractor, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, shall state that such Contractor is an Equal Opportunity Employer.
  - 2.36.3.** Notices, advertisements, and solicitations placed in accordance with federal law, rule, or regulation shall be deemed sufficient for the purpose of meeting the requirements of this section.
- 2.37. Affirmative Action:** In executing a Contract with the City, the Contractor agrees to comply with Affirmative Action and Equal Employment Opportunity regulations presented in the General Contract Conditions.
- 2.38. Immigration Reform and Control Act of 1986 and Immigration Compliance:** The Offeror certifies that it does not and will not during the performance of the contract employ illegal alien workers or otherwise violate the provisions of the Federal Immigration Reform and Control Act of 1986 and/or the immigration compliance requirements of State of Colorado C.R.S. § 8-17.5-101, *et.seq.* (House Bill 06-1343).
- 2.39. Ethics:** The Contractor shall not accept or offer gifts or anything of value nor enter into any business arrangement with any employee, official, or agent of the Owner.
- 2.40. Failure to Deliver:** In the event of failure of the Contractor to deliver services in accordance with the contract terms and conditions, the Owner, after due oral or written notice, may procure the services from other sources and hold the Contractor responsible for any costs resulting in additional purchase and administrative services. This remedy shall be in addition to any other remedies that the Owner may have.
- 2.41. Failure to Enforce:** Failure by the Owner at any time to enforce the provisions of the contract shall not be construed as a waiver of any such provisions. Such failure to enforce shall not affect the validity of the contract or any part thereof or the right of the Owner to enforce any provision at any time in accordance with its terms.
- 2.42. Force Majeure:** The Contractor shall not be held responsible for failure to perform the duties and responsibilities imposed by the contract due to legal strikes, fires, riots, rebellions, and acts of God beyond the control of the Contractor, unless otherwise specified in the contract.

**2.43. Independent Contractor:** The Contractor shall be legally considered an Independent Contractor and neither the Contractor nor its employees shall, under any circumstances, be considered servants or agents of the Owner. The Owner shall be at no time legally responsible for any negligence or other wrongdoing by the Contractor, its servants, or agents. The Owner shall not withhold from the contract payments to the Contractor any federal or state unemployment taxes, federal or state income taxes, Social Security Tax or any other amounts for benefits to the Contractor. Further, the Owner shall not provide to the Contractor any insurance coverage or other benefits, including Workers' Compensation, normally provided by the Owner for its employees.

**2.44. Nonconforming Terms and Conditions:** A bid that includes terms and conditions that do not conform to the terms and conditions of this Invitation for Bid is subject to rejection as non-responsive. The Owner reserves the right to permit the Contractor to withdraw nonconforming terms and conditions from its bid prior to a determination by the Owner of non-responsiveness based on the submission of nonconforming terms and conditions.

Items for non-responsiveness may include, but not be limited to:

- a. Submission of the Bid on forms other than those supplied by the City;
- b. Alteration, interlineation, erasure, or partial detachment of any part of the forms which are supplied herein;
- c. Inclusion of unauthorized additions conditional or alternate Bids or irregularities of any kind which may tend to make the Bid incomplete, indefinite, or ambiguous as to its meaning;
- d. Failure to acknowledge receipt of any or all issued Addenda;
- e. Failure to provide a unit price or a lump sum price, as appropriate, for each pay item listed except in the case of authorized alternative pay items;
- f. Failure to list the names of Subcontractors used in the Bid preparation as may be required in the Solicitation Documents;
- g. Submission of a Bid that, in the opinion of the Owner, is unbalanced so that each item does not reasonably carry its own proportion of cost or which contains inadequate or unreasonable prices for any item;
- h. Tying of the Bid with any other bid or contract; and
- i. Failure to calculate Bid prices as described herein.

**2.45. Evaluation of Bids and Offers:** The Owner reserves the right to:

- reject any and all Bids,
- waive any and all informalities,
- negotiate final terms with the Successful Bidder, and
- disregard any and all nonconforming, nonresponsive or conditional Bids.

Discrepancies between words and figures will be resolved in favor of words. Discrepancies between Unit Prices and Extended Prices will be resolved in favor of the Unit Prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum. The corrected extensions and totals will be shown in the tabulation of Bids.

The Owner may consider the qualifications and experience of Subcontractors and other persons and organizations (including those who are to furnish the principal items of material or equipment) proposed for those portions of the work as to which the identity of Subcontractors and other persons and organizations must be submitted. Operating costs, maintenance considerations performance data, and guarantees of materials and equipment may also be considered by the Owner.

The Owner will conduct such investigations as deemed necessary to assist in the evaluation of any Bid and to establish the responsibility, qualifications and financial ability of the Offeror, proposed Subcontractors and other persons and organizations to do the Work in accordance with the *Contract Documents* to the City's satisfaction within the Contract Time.

The Offeror shall furnish the Owner all information and data requested by the Owner to determine the ability of the Offeror to perform the Work. The Owner reserves the right to reject the Bid if the evidence submitted by, or investigation of such Offeror fails to satisfy the Owner that such Offeror is properly qualified to carry out the obligations of the Contract and to complete the Work contemplated therein.

By submitting a Bid, each Offeror authorizes the Owner to perform such investigation of the Offeror as the Owner deems necessary to establish the responsibility, qualifications and financial ability of the Offeror and, by its signature thereon, authorizes the Owner to obtain reference information concerning the Offeror and releases the party providing such information and the Owner from any and all liability to the Offeror as a result of such reference information so provided.

The Owner reserves the right to reject the Bid of any Offeror who does not pass any evaluation to the Owner's satisfaction.

If the Contract is to be awarded, it will be awarded to the Offeror who, by evaluation, the Owner determines will best meet the Owner's interests.

The Owner reserves the right to accept or reject the Work contained in any of the Price Bid Schedules or alternates, either in whole or in part.

**2.46. Award of Contract:** Unless otherwise indicated, a single award will be made for all the bid items in an individual bid schedule. In the event that the Work is contained in more than one Bid Schedule, the City may award Schedules individually or in combination. In the case of two Bid Schedules which are alternative to each other, only one of such alternative Schedules will be awarded. Within forty-five (45) Calendar Days of Bid Opening, the City will issue a Notice of Award to the Successful Bidder which will be accompanied by four (4) unsigned copies of the Contract and the Performance and Payment Bond forms. Within ten (10) Calendar Days thereafter, the Successful Bidder



shall sign and deliver four (4) copies of the Contract, Performance Bond, Payment Bond and Certificates of Insurance to the City. Within ten (10) Calendar Days thereafter, the City will deliver two (2) fully executed counterparts of the Contract to the Contractor. No contract shall exist between the Successful Bidder and the City and the Successful Bidder shall have no rights at law or in equity until the Contract has been duly executed by the City.

The Successful Bidder's failure to sign and submit a Contract and other documents set forth in this Paragraph within the prescribed time shall be just cause of annulment of the award, and forfeiture of the Bid Guaranty. The award of Contract may then be made to the next qualified Bidder in the same manner as previously prescribed.

- 2.47. Ownership:** All plans, prints, designs, concepts, etc., shall become the property of the Owner.
- 2.48. Oral Statements:** No oral statement of any person shall modify or otherwise affect the terms, conditions, or specifications stated in this document and/or resulting agreement. All modifications to this request and any agreement must be made in writing by the Owner.
- 2.49. Patents/Copyrights:** The Contractor agrees to protect the Owner from any claims involving infringements of patents and/or copyrights. In no event shall the Owner be liable to the Contractor for any/all suits arising on the grounds of patent(s)/copyright(s) infringement. Patent/copyright infringement shall null and void any agreement resulting from response to this IFB.
- 2.50. Remedies:** The Contractor and Owner agree that both parties have all rights, duties, and remedies available as stated in the Uniform Commercial Code.
- 2.51. Venue:** Any agreement as a result of responding to this IFB shall be deemed to have been made in, and shall be construed and interpreted in accordance with, the laws of the City of Grand Junction, Mesa County, Colorado.
- 2.52. Expenses:** Expenses incurred in preparation, submission and presentation of this IFB are the responsibility of the company and cannot be charged to the Owner.
- 2.53. Sovereign Immunity:** The Owner specifically reserves its right to sovereign immunity pursuant to Colorado State Law as a defense to any action arising in conjunction to this agreement.
- 2.54. Non-Appropriation of Funds:** The contractual obligation of the Owner under this contract is contingent upon the availability of appropriated funds from this fiscal year budget as approved by the City Council or Board of County Commissioners from this fiscal year only. State of Colorado Statutes prohibit obligation of public funds beyond the fiscal year for which the budget was approved. Anticipated expenditures/obligations beyond the end of the current Owner's fiscal year budget shall be subject to budget approval. Any contract will be subject to and must contain a governmental non-appropriation of funds clause.

**2.55. Cooperative Purchasing:** Purchases as a result of this solicitation are primarily for the City/County. Other governmental entities may be extended the opportunity to utilize the resultant contract award with the agreement of the successful provider and the participating agencies. All participating entities will be required to abide by the specifications, terms, conditions and pricings established in this Bid. The quantities furnished in this bid document are for only the City/County. It does not include quantities for any other jurisdiction. The City or County will be responsible only for the award for its jurisdiction. Other participating entities will place their own awards on their respective Purchase Orders through their purchasing office or use their purchasing card for purchase/payment as authorized or agreed upon between the provider and the individual entity. The City/County accepts no liability for payment of orders placed by other participating jurisdictions that choose to piggy-back on our solicitation. Orders placed by participating jurisdictions under the terms of this solicitation will indicate their specific delivery and invoicing instructions.

**2.56. Keep Jobs in Colorado Act:** Contractor shall be responsible for ensuring compliance with Article 17 of Title 8, Colorado Revised Statutes requiring 80% Colorado labor to be employed on public works. Contractor shall, upon reasonable notice provided by the Owner, permit the Owner to inspect documentation of identification and residency required by C.R.S. §8-17-101(2)(a). If Contractor claims it is entitled to a waiver pursuant to C.R.S. §8-17-101(1), Contractor shall state that there is insufficient Colorado labor to perform the work such that compliance with Article 17 would create an undue burden that would substantially prevent a project from proceeding to completion, and shall include evidence demonstrating the insufficiency and undue burden in its response.

Unless expressly granted a waiver by the Owner pursuant to C.R.S. §8-17-101(1), Contractor shall be responsible for ensuring compliance with Article 17 of Title 8, Colorado Revised Statutes requiring 80% Colorado labor to be employed on public works. Contractor shall, upon reasonable notice provided by the Owner, permit the Owner to inspect documentation of identification and residency required by C.R.S. §8-17-101(2)(a).

**2.56.1.** "Public project" is defined as:

- (a) any construction, alteration, repair, demolition, or improvement of any land, building, structure, facility, road, highway, bridge, or other public improvement suitable for and intended for use in the promotion of the public health, welfare, or safety and any maintenance programs for the upkeep of such projects
- (b) for which appropriate or expenditure of moneys may be reasonably expected to be \$500,000.00 or more in the aggregate for any fiscal year
- (c) except any project that receives federal moneys.

### **3. Statement of Work**

**3.1. GENERAL:** The Kannah Creek Intake diverts water to the primary reservoir for the City of Grand Junction. The diversion has been operating since the early 1900's. While updates have been made in the following decades, much of the existing site is past its design life. The intake also has several maintenance challenges including, debris

blockage, ice buildup in the winter, and aging facilities. The purpose of this project is to address these maintenance concerns, upgrade equipment to extend service life and enable more automated control and reporting.

The Purdy Mesa Flowline (PMFL) is one of two water transmission lines that carry water from the reservoirs at the base of the Grand Mesa to the City Water Treatment Plant on Orchard Mesa (WTP). The PMFL was built in the 1940's and has exceeded its design life. While there is no history of line breaks in the project reach, it has been given a high priority for replacement due to the challenges that would be associated with emergency repairs in the rugged and steep terrain. This replacement project will renew aging infrastructure and ensure reliable service for the City's water customers for the future. The project extends from the top of Sullivan Draw just upstream of and including the existing flow control tower (see Bid Alternate 3) and ends approximately 1.25 miles northwest at a manhole that houses the second of two valves that are to be replaced as part of this project.

The City is advertising three (3) project Bid Alternates. See Instructions for Completing Microsoft Excel Bid Schedules Spreadsheet in Section 1.6.

**3.2. PROJECT DESCRIPTION:** The City of Grand Junction is soliciting competitive bids from qualified and interested companies for all labor, equipment, and materials required for:

Bid Alternative 1 - The rehabilitation of the City of Grand Junction Kannah Creek Intake. All dimensions scope of work should be verified by Contractors prior to submission of bids. The project generally consists of the demolition and reconstruction of the concrete intake structure, demolition and installation of 330 LF of 24" C-900 PVC DR-25 water line, 152' LF of 18" C-900 DR-25 water line, replacement of headgate, installation of a horizontal debris screen, two 6" air valves, two electromagnetic flow meters (one 8" and one 18"), and bypass pipe in 3 locations. Removal and disposal of existing steel pipe and screen structure including removal of concrete structure for screen to one foot above ground level and fill of remaining concrete structure. Control upgrades include bypass control valves and electronic automation including one Programmable Logic Controller (PLC), which will be housed in a new prefabricated structure. The new structure must also contain irrigation pump and control and the water treatment equipment that provides potable water to the City's Water Supply Supervisor residence. Potable water service to this residence must be maintained for the duration of the project. All concrete installation shall include 6" of Class 6 aggregate base course.

Bid Alternate 2 – Purdy Mesa Flowline at Sullivan Draw. All dimensions scope of work should be verified by Contractors prior to submission of bids. The project generally consists and of the installation of approximately 6,530 LF of 20" Eagle Loc C-900 PVC DR-25 water line, installation of Pressure Sustaining Valve Assembly, installation of Flow Control Valve Assembly, SCADA equipment and implementation, 6" and 8" air valves, insertion flow meter (20"), and other appurtenant work. Control upgrades include control valves and electronic automation, including one Programmable Logic Controller (PLC) and three photo voltaic power supply(s), which will be housed in new CMU structures, and level sensor equipment to monitor water depth in the tank (either existing or Bid Alt 3 tank), and appurtenant work.

Bid Alternate 3 – Purdy Mesa Flowline - Volume Control Tank. All dimensions scope of work should be verified by Contractors prior to submission of bids. The project generally consists of the construction of a Volume Control Tank and appurtenant piping connections. Control upgrades include control valves and 6” air valve, site grading and revegetation, and appurtenant work.

### 3.3. SPECIAL CONDITIONS & PROVISIONS:

**3.3.1 Mandatory Pre-Bid Meeting:** Prospective bidders are required to attend a mandatory pre-bid meeting on October 18, 2018 at 10:30am. Meeting location shall be on site, located at 10001 Kannah Creek Rd, Whitewater, CO. The purpose of this visit will be to inspect and to clarify the contents of this Invitation for Bids (IFB).

### **3.3.2 QUESTIONS REGARDING SOLICITATION PROCESS/SCOPE OF WORK: CONTRACTORS SHALL SUBMIT ALL QUESTIONS TO BOTH PURCHASING AGENTS LISTED BELOW:**

Duane Hoff Jr., Senior Buyer  
[duaneh@gjcity.org](mailto:duaneh@gjcity.org)

**AND**

Susan Hyatt, Senior Buyer  
[susanh@gjcity.org](mailto:susanh@gjcity.org)

**3.3.2 Project Manager:** The Project Manager for the Project is John Eklund, Project Engineer, who can be reached at (970) 244-1558. During Construction, all notices, letters, submittals, and other communications directed to the City shall be addressed and mailed or delivered to:

City of Grand Junction  
Department of Public Works and Planning  
Attn: John Eklund, Project Manager  
333 West Avenue, Building C  
Grand Junction, CO 81501

**3.3.3 Affirmative Action:** The Contractor is not required to submit a written Affirmative Action Program for the Project.

**3.3.4 Pricing:** Pricing shall be all inclusive to include but not be limited to: all labor, equipment, supplies, materials, freight (F.O.B. Destination – Freight Pre-paid and Allowed to each site), travel, mobilization costs, fuel, set-up and take down costs, and full-time inspection costs, and all other costs related to the successful completion of the project.

Contractor shall complete a Bid Schedule for each project they have interest in being awarded. If a Contractor is interested in award of all 3 projects, Contractor shall complete the Bid Summary Tab Schedule and indicate Percentage of Deduction (if any) for each project, if awarded all 3 projects.

The Owner shall not pay nor be liable for any other additional costs including but not limited to: taxes, shipping charges, insurance, interest, penalties, termination payments, attorney fees, liquidated damages, etc.

**3.3.5 Freight/Shipping:** All freight/shipping shall be F.O.B. Destination – Freight Pre-Paid and Allowed to the project site(s), Grand Junction, CO.

Contractor must meet all federal, state, and local rules, regulations, and requirements for providing such services.

**Pre-purchased items will be paid for by the City. Items must be stored by contractor safe from tampering, theft, wear from climate exposure, etc.**

**3.3.6 Award(s):** Owner reserves the right to make award(s) and/or combinations of awards that are in its best interest. Award may be made to a single Contractor or multiple Contractors.

**3.3.7 Contract:** A binding contract shall consist of: (1) the IFB and any amendments thereto, (2) the bidder's response (bid) to the IFB, (3) clarification of the bid, if any, and (4) the City's Purchasing Department's acceptance of the bid by "Notice of Award" or by "Purchase Order". All Exhibits and Attachments included in the IFB shall be incorporated into the contract by reference.

A. The contract expresses the complete agreement of the parties and, performance shall be governed solely by the specifications and requirements contained therein.

B. Any change to the contract, whether by modification and/or supplementation, must be accomplished by a formal contract amendment signed and approved by and between the duly authorized representative of the bidder and the City Purchasing Division or by a modified Purchase Order prior to the effective date of such modification. The bidder expressly and explicitly understands and agrees that no other method and/or no other document, including acts and oral communications by or from any person, shall be used or construed as an amendment or modification to the contract.

**3.3.8 Time of Completion:** Each Bid Alternate must be completed by a specific date. These date are based on a variety of operational constraints that dictate the optimal time of year to perform the respective construction. These operational constraints are described in 3.3.7a. Required Dates of Substantial Completion are as follows:

- \* Bid Alternate 1 – Kannah Creek Intake: November 15, 2019;
- \* Bid Alternate 2 – PMFL Sullivan Draw Replacement: May 17, 2019;
- \* Bid Alternate 3 – Purdy Mesa Flow Control Tank: May 17, 2019.

The contractor(s) awarded this Contract will provide a project schedule at the pre-construction meeting that outline start dates and various milestones for each Bid Alternate. Project schedule will also state total number of Calendar Days required for each Bid Alternate. Once work on any Bid Alternate has begun, the Contractor shall complete that bid alternate as efficiently as practicable. No Bid Alternate may be left temporarily unfinished without written authorization from the Project Engineer.

Completion is achieved when site cleanup and all punch list items (resulting from the final inspection) have been completed. Completion shall have the meaning set forth in Article I, Section 3 (Definitions and Terms) of the General Contract Conditions.

**3.3.9 Working Days and Hours:** The working days and hours shall be as stated in the General Contract Conditions or as mutually agreed upon in the preconstruction meeting with the following exception:

All work shall be performed Monday – Friday between the hours of 7:00 AM to 5:00 PM.

**3.3.10 Licenses and Permits:** Contractor is responsible for obtaining all necessary licenses and permits required for Construction, at Contractors expense. See Section 2.12. Contractor shall supply to Owner all copies of finalized permits.

**3.3.11 Permits:** The following permits are required for the Project and will be obtained by the City at no cost to the Contractor:

**Bid Alternate 1** - USACE Nation Wide Permit 3 (pending) and SHPO Mitigation Plan. (Notice to proceed of this Bid Alternate will only be issued once this permit is finalized)

**Bid Alternate 2** – USACE Nation Wide Permit 12 and BLM Mitigation Plan.

**Bid Alternate 3** – BLM Mitigation Plan.

The following permits are required for the Project and shall be obtained and paid for by the Contractor, with the costs included in the total bid price for the Project:

- Electrical
- Stormwater/Dewatering

**3.3.12 City Furnished Materials:** The City will furnish the following materials for the Project:

- None

**3.3.13 Project Newsletters:** A newsletter for the Project will be prepared and distributed by the City. It will include general information about the Project including interruptions in utility services, street closures, parking restrictions, project schedule, and the names and telephone numbers of the contacts for the City and Contractor. The newsletter will be mailed approximately one week before the Contractor commences work.

The Contractor will be responsible for notifying all businesses and / or residents located adjacent to the work. Door hanger notifications shall be distributed at least two (2) working days prior to the day the work is scheduled to begin.

**3.3.14 Project Sign:** Project signs, if any, will be furnished and installed by the City.

**3.3.15 Authorized Representatives of the City:** Those authorized to represent the City shall include Purchasing Agent, Engineers, and Inspectors employed by the City, only.

**3.3.16 Stockpiling Materials and Equipment:** All stockpiling/storage shall be in accordance with General Contract Condition Section 51.

**3.3.17 Traffic Control:** The Contractor shall provide and maintain traffic control in accordance with the approved Traffic Control Plan and the Manual on Uniform Traffic Control Devices. A Traffic Control Plan shall be prepared by the Contractor and reviewed by the City two days prior to the pre-construction meeting.

**3.3.18 Clean-Up:** The Contractor is responsible for cleaning up all loose materials that have been deposited or swept into gutters, and onto sidewalks and driveways as a result of sidewalk operations. The costs for all clean-up work shall be considered incidental and will not be paid for separately.

**3.3.19 Quality Control Testing:** Supplier shall perform quality control testing on concrete. Supplier shall perform quality control testing on the following items as specified in the General Contract Documents for Capital Improvement Projects as specified for Part time inspection:

- Backfill
- Class 3
- Class 6
- Concrete

The City will perform all other necessary QC, including, but not limited to:

- Backfill
- Class 3
- Class 6
- Concrete

**3.3.20 Schedule of Submittals:** Contractor shall deliver these submittals at least two days prior to the pre-construction meeting:

- Traffic Control Plans
- Project Schedule

**3.3.21 Uranium Mill Tailings:** It is anticipated that radioactive mill tailings will not be encountered on this Project.

**3.3.22 Fugitive Petroleum or Other Contamination:** It is anticipated that soil contamination from fugitive petroleum or other contaminants will not be encountered with the Project.

**3.3.23 Excess Material:** All excess materials shall be disposed in accordance with General Contract Condition Section 50.

**3.3.24 Existing Utilities and Structures:** Utilities were not potholed during design of this project. The location of existing utilities and structures shown on the Plans is approximate with the information gathered during design. It is the responsibility of the

Contractor to pothole/locate and protect all structures and utilities in accordance with General Contract Condition Section 37.

**3.3.25 Interruption of Utilities and Services:** The contractor shall notify all property owners affected by the interruption of utilities and other services caused by his operation. Such notice shall be given at least 24 hours prior to the interruption. Notice shall be given for, but not limited to the interruption of domestic water, sanitary sewer, trash pickup, mail delivery and changes in access to the property.

**3.3.26 Incidental Items:** Any item of work not specifically identified or paid for directly, but which is necessary for the satisfactory completion of any paid items of work, will be considered as incidental to those items, and will be included in the cost of those items.

**3.3.27 Survey:** The Contractor shall give the City survey crew a minimum of 72 hours' notice for all requested survey.

**3.3.28 Work to be Performed by the City (Prior to Construction):**

- N/A

**3.3.29 Existing Concrete Sidewalks, Pans, Fillets, Curbs and Gutters:** The existing sidewalks, pans, fillets, curb and gutter are in good serviceable condition. In most instances the installation of new sidewalk and pavement will be adjacent to existing concrete. The Contractor will need to protect all concrete adjacent to construction. If the concrete is damaged during construction the Contractor will be responsible for its replacement at no cost to the City. The Contractor, the City Project Inspector, and/or the City Project Manager will walk and record any concrete that is deemed to be damaged before construction has started.

**3.3.30 ACI Concrete and Flatwork Finisher and Technician:** Hand finishing concrete will be permitted only when performed under the direct supervision of a craftsman holding the following certificate: ACI Concrete Flatwork Finisher and Technician (ACICFFT) or other Flatwork Finisher certification program approved by the City Engineering Manager.

#### **3.4. SCOPE OF WORK:**

##### **STANDARD SPECIFICATIONS FOR CONSTRUCTION OF UNDERGROUND UTILITIES:**

The *City of Grand Junction Standard and Specifications for Underground Utilities* are hereby modified or supplemented for this Project with the project specifications in **Appendix A, B, and C Project Special Provisions**. The *City of Grand Junction Standards and Specifications for Road and Bridge Construction* projects are supplemented by the *Standard Specifications for Road and Bridge Construction* State Department of Highways, Division of Highways, State of Colorado where applicable.

**Operational Constraints:** Each Bid Alternate has one or more operational constraints that the Contractor must overcome in scheduling and construction methods.



Operational Constraints are as follows:

**Bid Alternate 1 – Kannah Creek Intake:**

1. The intake is located in the bottom of the Kannah Creek Valley at an elevation of approximately 6100 feet. As a result, winter time conditions include snow and ice, freezing conditions and cold temperatures much of the winter. Concrete work for the diversion dam must be completed during seasons when heating equipment (e.g. electric blankets, etc.) is not needed.
2. The Kannah Creek drainage is not controlled by dams or reservoirs. Runoff in the spring can have high flows. Precipitation can create short duration, high discharge events. A diversion dam must be in place during runoff. Reconstruction of the dam must start after September 1, following monsoon season. The Contractor is responsible for protecting the dam from isolated flood events throughout the project duration.
3. During construction, water from Kannah Creek may be sent down the creek downstream of construction activities.
4. The City owns a canal that can be used to supply the reservoir during construction. It is preferable to use this consistently during the project, rather than having repeated startup/shutdown cycles.

**Bid Alternate 2 – Purdy Mesa Flowline Replacement:**

1. Existing flowline must remain in operation during construction of new pipeline.
2. Shut down for tie in of new pipeline must be coordinated with City Water Department staff with a minimum 7-day notice.
3. Water Treatment Plant sees increased demand for water with irrigation season. Winter and spring construction is required for this Bid Alternate.

**Bid Alternate 3 – Purdy Mesa Flow Control Tank:**

1. Concrete work must be completed during seasons when heating equipment (e.g. electric blankets, etc.) is not needed.
2. Finished tank may be connected to new 20-inch flowline after it has been put into operation. Startup of tank must be before June 1 or after September 1.

**3.5. Attachments:**

Appendix A: Kannah Creek Intake Rehabilitation – Bid Alternate 1

1. Project Submittal Form
2. Special Provisions

Appendix B: Purdy Mesa Flowline Replacement at Sullivan Draw – Bid Alternate 2

1. Project Submittal Form
2. Special Provisions

Appendix C: Purdy Mesa Flowline Replacement at Sullivan Draw – Bid Alternate 3  
Pressure Control Tank

1. Project Submittal Form
2. Special Provisions

Appendix D:

Construction Drawings for: Kannah Creek Intake Rehabilitation Bid Alternate 1; and

Purdy Mesa Flowline Replacement at Sullivan Draw – Bid Alternate 2, and  
Purdy Mesa Flowline Replacement at Sullivan Draw Volume Control Tank –  
Bid Alternate 3

Appendix E:

BLM Required Mitigation Measures for Bid Alternates 2 and 3.

Appendix F:

USACE Nation Wide Permits for Bid Alternates 1 and 2.

**3.6. Contractor Bid Documents:** For Contractor's convenience, the following is a list of forms/items to be submitted with the Contractor's bid response. However, should a form/item not be listed in this section, but required in the solicitation documents, it is the Contractor's responsibility to ensure all forms/items are submitted.

- **Contractor's Bid Form**
- **Price Bid Schedules (Fillable form in MS Excel Format)**
- **References (provide 3 references of projects similar in size and scope, with contact information)**

**3.7. IFB TENTATIVE TIME SCHEDULE:**

Invitation for Bids available	October 12, 2018
Mandatory Pre-Bid Meeting	October 18, 2018
Inquiry deadline, no questions after this date	October 26 2018
Addendum Posted	October 30, 2018
Submittal deadline for proposals	November 7, 2018
City Council or Board of Commissioners Approval	November 21, 2018
Notice of Award & Contract execution	November 26, 2018
Bonding & Insurance Cert due	November 30, 2018
Preconstruction meeting	November 30, 2018
Work begins no later than	December 3, 2018
Final Completion – Bid Alternate 1, Kannah Creek Intake	November 15, 2019
Final Completion – Bid Alternate 2, PMFL Sullivan Draw Replacement	May 17, 2019
Final Completion – Bid Alternate 3, Purdy Mesa Flow Control Tank	May 17, 2019
Holidays:	N/A

- Thanksgiving Day
- Day After Thanksgiving Day
- Christmas Day
- New Year's Day
- Martin Luther King Day
- Presidents Day
- Memorial Day
- Independence Day
- Labor Day

## **4. Contractor's Bid Form**

**Bid Date:** \_\_\_\_\_

**Project:** IFB-4568-18-DH "Kannah Creek Intake and/or Purdy Mesa Flowline Rehabilitation"

**Bidding Company:** \_\_\_\_\_

**Name of Authorized Agent:** \_\_\_\_\_

**Email** \_\_\_\_\_

**Telephone** \_\_\_\_\_ **Address** \_\_\_\_\_

**City** \_\_\_\_\_ **State** \_\_\_\_\_ **Zip** \_\_\_\_\_

The undersigned Bidder, in compliance with the Invitation for Bids, having examined the Instruction to Bidders, General Contract Conditions, Statement of Work, Specifications, and any and all Addenda thereto, having investigated the location of, and conditions affecting the proposed work, hereby proposes to furnish all labor, materials and supplies, and to perform all work for the Project in accordance with Contract Documents, within the time set forth and at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this Contractor's Bid Form is a part.

The undersigned Contractor does hereby declare and stipulate that this offer is made in good faith without collusion or connection to any person(s) providing an offer for the same work, and that it is made in pursuance of, and subject to, all terms and conditions of the Instructions to Bidders, the Specifications, and all other Solicitation Documents, all of which have been examined by the undersigned.

The Contractor also agrees that if awarded the Contract, to provide insurance certificates within ten (10) working days of the date of Notification of Award. Submittal of this offer will be taken by the Owner as a binding covenant that the Contractor will be prepared to complete the project in its entirety.

The Owner reserves the right to make the award on the basis of the offer deemed most favorable, to waive any formalities or technicalities and to reject any or all offers. It is further agreed that this offer may not be withdrawn for a period of sixty (60) calendar days after closing time. Submission of clarifications and revised offers automatically establish a new thirty day (30) period.

Prices in the bid proposal have not knowingly been disclosed with another provider and will not be prior to award.

- Prices in this bid proposal have been arrived at independently, without consultation, communication or agreement for the purpose of restricting competition.
- No attempt has been made nor will be to induce any other person or firm to submit a bid proposal for the purpose of restricting competition.
- The individual signing this bid proposal certifies they are a legal agent of the offeror, authorized to represent the offeror and is legally responsible for the offer with regard to supporting documentation and prices provided.
- Direct purchases by the City of Grand Junction are tax exempt from Colorado Sales or Use Tax. Tax exempt No. 98-903544. The undersigned certifies that no Federal, State, County or Municipal tax will be added to the above quoted prices.
- City of Grand Junction payment terms shall be Net 30 days.
- Prompt payment discount of \_\_\_\_\_ percent of the net dollar will be offered to the Owner if the invoice is paid within \_\_\_\_\_ days after the receipt of the invoice.

RECEIPT OF ADDENDA: the undersigned Contractor acknowledges receipt of Addenda to the Solicitation, Specifications, and other Contract Documents.

State number of Addenda received: \_\_\_\_\_.

It is the responsibility of the Bidder to ensure all Addenda have been received and acknowledged.

*By signing below, the Undersigned agree to comply with all terms and conditions contained herein.*

**Company:** \_\_\_\_\_

**Authorized Signature:** \_\_\_\_\_

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

The undersigned Bidder proposes to subcontract the following portion of Work:

<u>Name &amp; address of Sub-Contractor</u>	<u>Description of work to be performed</u>	<u>% of Contract</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

The undersigned Bidder acknowledges the right of the City to reject any and all Bids submitted and to waive informalities and irregularities therein in the City's sole discretion.

By submission of the Bid, each Bidder certifies, and in the case of a joint Bid each party thereto certifies as to his own organization, that this Bid has been arrived at independently, without collusion, consultation, communication, or agreement as to any matter relating to this Bid with any other Bidder or with any competitor.

## **SP-1 SECTION 103 – REMOVALS, EXCAVATION, BACKFILLING AND RESTORATION**

Section 103 of the Standard Specifications is hereby revised for this project as follows:

Subsection 103.11, Rock Excavation, shall include the following:

The Contractor can expect during trenching operations that rocks/boulders 1 cubic yard and larger may be encountered and must be removed from the trench. Rocks excavated from the pipeline trench 1 cubic yard and larger will be paid for with the Rock Excavation pay item. All other rock removal that is smaller than 1 cubic yard will not be paid for separately but shall be included in the cost of the pipe installation.

During trench backfilling operations, the Contractor shall not use any rock that is larger than 12" in its largest dimension for backfill material within 1-foot of the new flow line pipe.

Rocks larger than 15" in its largest dimension shall be screened from the excavated material and set aside so it's not used in the trench backfill material.

The 15" and larger rock encountered during trench excavations on private property, the Contractor shall screen the 15" and larger rock and remove the large rock from the private property. The Contractor has the option to haul the large rock to their own secured site to stockpile, or the Contractor can haul the large rock to City property nearby for disposal. If the Contractor hauls the rock to and stockpiles the rock on City property, then the rock shall become the property of the City. The cost for screening, loading, hauling and unloading the 15" and larger rock will not be paid for separately, but shall be included in the cost of the Project.

The 15" and larger rock encountered during trench excavations on City property; the Contractor has the option to set the large rock aside and leave it in place on City property, or the Contractor can haul the rock to a secured site of their own to stockpile. The cost for screening, loading, hauling and unloading the 15" and larger rock at a Contractor secured site will not be paid for by the City, but shall be at the Contractor's expense.

## **SP- 2 SECTION 202 – REMOVAL OF STRUCTURES AND OBSTRUCTIONS**

Section 202 of the Standard Specifications is hereby revised for this project as follows:

Subsection 202.07, add the following:

All concrete removal required for installation of new will be measured and paid for separately.

Subsection 202.12, add the following:

Locations of saw cuts shall be determined and directed by the Construction Inspector or the Engineer and shall be considered incidental to the work. When removing concrete adjacent to existing asphalt the Contractor shall saw cut at the interface at full depth of concrete (6" minimum) as to not damage asphalt during concrete removal. Any damage to the existing asphalt shall be patched back by the contractor at no cost to the City. All patch work shall be at a minimum of 2' wide and 10' in length (4" Thick).

### **SP- 3 SECTION 203 – EMBANKMENT MATERIAL**

Section 203 of the Standard Specifications is hereby revised for this project as follows:

Subsection 203.03 Soil Embankment:

Embankment material shall consist of approved material acquired from excavations or borrow pits and hauled and placed in embankments. Approval of embankment material is contingent on the material meeting the Atterberg Limit and gradation requirements specified in the Contract. Approval of the embankment material in the upper 2 feet of embankment below the subgrade elevation is contingent on the material meeting one of the following as specified in the Contract:

- (1) The specified resistance value when tested by the Hveem Stabilometer or the equivalent resilient modulus.
- (2) The specified Atterberg Limit and gradation requirements.
- (3) The specified resistance value when tested by the Hveem Stabilometer or equivalent resilient modulus, and the specified Atterberg Limit and gradation requirements.

Embankment material shall be classified into one of the material groups listed below, and placed and compacted in accordance with the appropriate methods specified in subsection 203.07. If any material does not meet the criteria for one of the following classifications, it shall be processed on site to meet the requirements for one of the material groups listed below, or disposed of at the Contractor's expense.

- (1) Soil Embankment: Soil embankment shall have all particle sizes less than **4 inches**. The material shall be classified in accordance with AASHTO M 145 and placed and compacted in accordance with subsection 203.07(a).

### **SP- 4 SECTION 208 – EROSION CONTROL**

For inlet protection along Major Arterial or Collector Street sections the only approved inlet protections shall be a filter sock.

Add the following to this subsection:

208.05(n) Add the Following:

Concrete Washout Structure:

Water for clean-up of equipment used in the mixing or distribution of concrete shall not be discharged to any storm water facilities, drain ways, or deposited into any open fields. The waste water used shall either be wasted on an open excavation area or in an onsite detention facility for future disposal.

Subsection 208.08 Payment for Best Management Practices.

The disposal of wash water shall be considered incidental to the concrete and will not be measured for or paid for separately.

Add the following to this subsection:

**Pay Item**

Erosion Control (Complete in Place)

**Pay Unit**

Lump Sum

The lump sum price for Erosion Control (complete in place) shall be in full compensation for the Erosion Control Supervisor and all materials, labor and equipment required to furnish, install, maintain, remove and dispose of erosion and settlement control features and Best Management Practices (BMP's) in accordance with the Storm Water Management Plan (SWMP), State and local permits, and the contract documents.

Erosion Control (Complete in Place) shall include storm drain inlet protection and the concrete washout structure.

**SP- 5 SECTION 212 – SEEDING, FERTILIZER, SOIL CONDITIONER, AND SODDING**

Section 212.06 of the Standard Specifications is hereby revised for this project as follows:

Provide the following live seed mixtures to be used in disturbed areas:

<b>Common Name</b>	<b>Botanical Name</b>	<b>% of Mix By Qty.</b>
Galleta Grass	Hilaria James II	20%
Hard Fescue	Festuca Ovina 'Durar'	20%
Indian Ricegrass	Orizopsis Hymendoides 'Paloma'	12%
Needle & Thread Grass	Stipa Comata	1%
Sheep Fescue	Festuca Ovina 'Covar'	8%
Western Wheatgrass	Agropyron Smith II 'Arriba'	30%
Sand Dropseed	Sporobolus Cryptandrus	1%
Blue Gramma	Bouteloua Gracilis	5%
Side Oats Gramma	Bouteloua Curtipendula	3%
<b>Seed at 5 lb/acre PLS</b>		

Section 212.07 of the Standard Specifications is hereby revised for this project as follows:

Soil Conditioning will be incidental to the seeding (Lawn and/or Native).

**SP- 6 SECTION 601 – STRUCTURAL CONCRETE**

Section 601 of the Standard Specifications is hereby revised for this project as follows:

Subsection 601.02, Classification:

CONCRETE SHALL MEET THE FOLLOWING REQUIREMENTS:

- 4,500 PSI Compressive at 28 Days
- 6% air ±1.5%
- Slump 4", Loads exceeding 4 ½" shall be rejected
- Maximum Water Cement Ratio no greater than 0.45.

Subsection 601.06, Batching:

This CDOT Specification has been added to this Project:

The Contractor shall furnish a batch ticket (delivery ticket) with each load for all concrete. Concrete delivered without a batch ticket containing complete information as specified shall be rejected. The Contractor shall collect and complete the batch ticket at the placement site and deliver all batch tickets to the Engineer or his representative at the end of each day. The Engineer or his representative shall have access to the batch tickets at any time during the placement. The following information shall be provided on each ticket:

1. Suppliers name and date
2. Truck number
3. Project name and location
4. Concrete class and designation number
5. Cubic yards batched
6. Type brand and amount of each admixture
7. Type, brand, and amount of cement and fly ash
8. Weights of fine and course aggregates
9. Moisture of fine and course aggregates
10. Gallons of batch water

The contractor shall add the following information to the batch ticket at time of placement:

1. Gallons of water added by the truck operator.
2. Number of revolutions of the drum for mixing
3. Discharge time

### **SP- 7 SECTION 608 – CURBS, GUTTERS, SIDEWALKS, AND TRAILS**

Section 608 of the Standard Specifications is hereby revised for this project as follows:

Subsections 608.06, Basis of Payment shall include the following:

The Contract Unit Price for the various concrete items shall be full compensation for all equipment, labor, materials, and incidentals required for the complete installation. Incidental items include subgrade compaction, cutting and removal of asphalt in areas where concrete will be installed; disposal of excavated and removed materials; furnishing, placement and compaction of Aggregate Base Course; forming, furnishing and placement, finishing, curing and protection of the concrete; reinforcing steel and joint filler.

### **SP- 8 BLM REQUIRED MITIGATION MEASURES for BID ALTERNATIVES 2 & 3; and USACE NATION WIDE PERMIT REQUIREMENTS**

Clarification: BLM Mitigation practices required when conducting work within the pipe line easement for Bid Alternatives 2 and 3 are included in Appendix E.

Clarification: USACE Nation Wide Permit requirements when conducting work within Waters of the State or Wetland Areas for Bid Alternatives 1 and 2 are included in Appendix F.



# **Appendix A**

Kannah Creek Intake Rehabilitation Project  
Bid Alternate 1

**PROJECT SUBMITTAL FORM**

PROJECT: **Kannah Creek Intake Rehabilitation Project - Bid Alternate 1**

CONTRACTOR:

PROJECT ENGINEER: John Eklund

Description	Date Received	Resubmittal Requested	Resubmittal Received	Date Accepted
-------------	---------------	-----------------------	----------------------	---------------

**WATERLINE and STRUCTURE(S) CONSTRUCTION SUBMITTALS**

Pipe – AWWA C-900 PVC, DR-25, SDR 35, SCH 40				
Fittings – Elbows, Tees, Tapping Saddles, Coupling,				
Valves, Gate valves, slide gates check valves				
Tracing wire & splices				
Pipe Bedding Gradation (Type A)				
Electromagnetic Flow Sensors				
Combination Air Valve and Vault Assembly (Includes Butterfly Valve)				
Mechanical Joint Restraints				
Adjustable Pipe Saddle Support				
60" Concrete Vault				
Concrete Mix Design (4,500 psi and 5,000 psi) Structural, Thrust Restraint, Sidewalk, Foundations				
Embankment Fill Gradation, Proctor Curve				
Base Course Gradation, Proctor Curve				
Prefabricated Building / Components				

**CITY OF GRAND JUNCTION  
KANNAH CREEK INTAKE REHABILITATION – BID ALTERNATE 1**

**ELECTRICAL & CONTROL CONSTRUCTION SUBMITTALS**

Prefabricated Shed				
Conduit -				
Actuators				
Electrical Components				
Control Components				
Analytical Components				
Heater				
Ancillary Components				
Pull Boxes				

**EROSION CONTROL / STORMWATER MANAGEMENT**

Concrete Washout				
Riprap Gradation				
Biodegradable Soil Retention Blanket				
Seed Mix – Native and lawn				

**PERMITS, PLANS, OTHER**

Construction Schedule				
CDPHE Dewatering Permit (if necessary)				

**PROJECT SPECIAL PROVISIONS**

Kannah Creek Intake Rehabilitation Project  
Bid Alternate 1

**SP- 1 REMOVAL OF EXISTING STEEL APPURTENANCES AND ABOVE GROUND  
CONCRETE REMOVAL FOR EXISTING ABANDONED SCREEN**

**Clarification:**

The existing steel pipe, existing abandoned steel screen components, and other steel associated with demolition or removal of existing facilities, is to be salvaged by the contractor. Salvage value of the steel shall be considered when determining the lump sum value of this pay item.

The existing concrete structure supporting the abandoned screen is to be removed to one foot above adjacent ground level. The interior of the structure is to be filled with a self-compacting material to two feet below the top of the removed structure. The remainder of the structure material is to be filled with native soil materials produced during construction of this project. Removal of the concrete structure to one foot above the adjacent ground surface shall be accomplished using methods that do not disturb the adjacent raw water filter components, or cause vibration of the surrounding ground. Concrete that is removed may be used to fill the interior of the abandoned screen structure. The work described above shall be paid as a lump sum.

**SP- 2 INTAKE STRUCTURE AND APPERTENANCES - TECHNICAL SPECIFICATIONS**

**CITY OF GRAND JUNCTION**  
**KANNAH CREEK INTAKE REHABILITATION – BID ALTERNATIVE 1**

SECTION 00010  
**TECHNICAL SPECIFICATIONS**  
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Concrete Reinforcement ..... Section 03200  
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END OF SECTION

**CITY OF GRAND JUNCTION  
KANNAH CREEK INTAKE REHABILITATION – BID ALTERNATIVE 1**

SECTION 01250

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

1. Schedule of Bid Items

1.2 SCHEDULE OF BID ITEMS

A. REMOVE EXISTING STEEL APPURTENANCES AND SALVAGE TO THE CITY OF GRAND JUNCTION (BID ITEM 1)

1. Measurement: Lump sum.
2. Payment: Includes all equipment, material, and labor necessary to remove all steel items that are shown in areas of demolition on the plans, and salvage these items to the City of Grand Junction. These items include, but are not limited to:
  1. The existing screen as indicated on the plans
  2. Valve post and wheel at existing valve
  3. Steel grate at existing intake
  4. Steel grating, railing, and other miscellaneous steel items at existing intake

B. DEMOLITION OF EXISTING CONCRETE INTAKE STRUCTURE (BID ITEM 2)

1. Measurement: Lump sum.
2. Payment: Includes all equipment, material, and labor necessary to remove and dispose of the existing Kannah Creek Intake structure to the extents shown on the plans.

Remove existing steel appurtenances and salvage to the City is included in a separate pay item.

C. INTAKE STRUCTURE EXCAVATION (BID ITEM 3)

1. Measurement: Lump Sum
2. Payment: Includes all equipment, material, and labor necessary to excavate the existing Kannah Creek Intake site to the lines and grades shown on the plans. Includes creek diversion, dewatering, removal of rock or boulders, and stockpiling excavated material for use as backfill or riprap.

D. KANNAH CREEK INTAKE STRUCTURE (BID ITEMS 4)

1. Measurement: Lump Sum
2. Payment: Includes all equipment, material, and labor necessary to construct the Kannah Creek Intake Structure as shown on the plans including: concrete, reinforcing steel, stop log embeds, stop logs, debris screen embeds, debris screen, fixed galvanized railing, removable galvanized railing, galvanized steel grating, 24" slide gate, geotextile,



**CITY OF GRAND JUNCTION  
KANNAH CREEK INTAKE REHABILITATION – BID ALTERNATIVE 1**

placement of imported materials, backfill, compaction, grading, and all other incidental items necessary to complete construction of the structure.

Imported materials, PVC pipe, and riprap are included in separate pay items.

**E. FURNISH IMPORTED MATERIALS (BID ITEMS 5 & 6)**

1. Measurement: By the ton as measured by weigh tickets.
2. Payment: Includes furnishing of imported material for use as structure backfill material, free draining gravel, trench backfill material when excavated native material is determined to be unsuitable by engineer, subgrade preparation for structures, or soil stabilization material as indicated on the plans. (Installation, moisture control, compaction of material, and haul off of unsuitable material is included with PVC pipe or structure bid items.)

**F. RIPRAP PROTECTION (BID ITEM 7)**

1. Measurement: Cubic Yard
2. Payment: Includes all labor, materials, and equipment necessary to furnish and install riprap (12" D50 CDOT Gradation) to the lines and grades indicated on the plans. Includes placement of suitable riprap stockpiled from Intake Structure Excavation.

**G. FURNISH AND INSTALL TURBIDITY METER (BID ITEM 8)**

1. Measurement: Lump Sum
2. Payment: Includes all labor, materials, and equipment necessary to furnish and install the turbidity meter as indicated on the plans. Includes the turbidity meter, HDPE pipe, pipe supports, Unistrut fittings, junction box, conduit, and all other incidental items necessary to complete the installation of the meter.

**H. FURNISH AND INSTALL 24" GATE VALVE (BID ITEM 9)**

1. Measurement: Lump Sum
2. Payment: Includes all labor, materials, and equipment necessary to furnish and install the 24" gate valve. Includes precast concrete manhole base, risers, and lid, cast iron manhole ring and cover, ductile iron gate valve, actuator, flange coupling adapters, grout, joint sealant, excavation, subgrade preparation, placement of imported materials, backfill, compaction, grading, and all other incidental items necessary to complete construction of the actuated valve and vault.

Imported materials and PVC pipe are included in separate pay items.

END OF SECTION

**CITY OF GRAND JUNCTION  
KANNAH CREEK INTAKE REHABILITATION – BID ALTERNATIVE 1**

SECTION 02055

SOILS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Subsoil materials
  - 2. Topsoil materials
  
- B. Related Sections:
  - 1. Section 02060 - Aggregate.
  - 2. Section 02324 - Trenching.

1.2 REFERENCES

- A. ASTM International:
  - 1. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>)).
  - 2. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).
  - 3. ASTM D2922 – Test Methods for Density of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth).
  - 4. ASTM D3017 – Test Methods for Moisture Content of Soil and Soil Aggregate Mixtures in Place by Nuclear Methods (Shallow Depth).

1.3 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Requirements for submittals.
  
- B. Materials Source: Submit name of imported materials source. Provide materials from same source throughout the course of the project.
  
- C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

- A. Furnish each material from single source throughout the Work.

PART 2 PRODUCTS

2.1 SUBSOIL MATERIALS

- A. Subsoil Type S1: Excavated and reused material;

2.2 TOPSOIL MATERIALS

- A. S3 (Topsoil): Select, graded, free of roots larger than ½ inch, subsoil, debris, large weeds and foreign matter.
  - 1. Imported borrow.
  - 2. Friable loam.

**CITY OF GRAND JUNCTION**  
**KANNAH CREEK INTAKE REHABILITATION – BID ALTERNATIVE 1**

3. Reasonably free of roots, rocks larger than 1 inch, subsoil, debris, large weeds, and foreign matter.
4. Acidity range (pH) of 5.5 to 7.5
5. Containing minimum of 4 percent and maximum of 25 percent inorganic matter.

2.3 SOURCE QUALITY CONTROL

- A. Testing and Analysis of Topsoil Material: Perform in accordance with ASTM D1557.
- B. When tests indicate materials do not meet specified requirements, change material and retest.
- C. Furnish materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.1 EXCAVATION

- A. Excavate topsoil from areas designated. Strip topsoil to full depth of topsoil in designated areas.
- B. Stockpile excavated material meeting requirements for topsoil materials.
- C. Remove excess excavated materials not intended for reuse, from site.
- D. Remove excavated materials not meeting requirements for topsoil materials from site.

3.2 STOCKPILING

- A. Stockpile materials on site.
- B. Stockpile in sufficient quantities to meet Project schedule and requirements.
- C. Separate differing materials with dividers or stockpile apart to prevent mixing.
- D. Stockpile topsoil 8 feet high maximum.
- E. Prevent intermixing of soil types or contamination.
- F. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

3.3 STOCKPILE CLEANUP

- A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

3.4 NATURAL GROUND SURFACE RESTORATION

- A. Unimproved areas not otherwise classified as Bituminous Surface, Gravel Surface, Gravel Shoulder or Sod Surface.
- B. Restore disturbed surfaces along trench in accordance with surface repair details of the project plans.

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- C. Grade disturbed area to match previously existing terrain.

END OF SECTION

**CITY OF GRAND JUNCTION  
KANNAH CREEK INTAKE REHABILITATION – BID ALTERNATIVE 1**

SECTION 02060

AGGREGATE

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Coarse aggregate materials.
  - 2. Fine aggregate materials.
  
- B. Related Sections:
  - 1. Section 02055 - Soils: Fill and grading materials.
  - 2. Section 02324 - Trenching.
  - 3. Section 02721 - Aggregate Base Course.

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials:
  - 1. AASHTO M147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses.
  
- B. ASTM International:
  - 1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - 2. ASTM D1557 – Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>))
  - 3. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).
  - 4. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.3 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Requirements for submittals.
  
- B. Materials Source: Submit name of imported materials suppliers with proctor and gradation test data for each imported material.
  
- C. Samples: Submit, in air-tight containers, 45 lb. sample of each type of aggregate material used for fill to testing laboratory.

1.4 QUALITY ASSURANCE

- A. Furnish each aggregate material from single source throughout the Work.

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**PART 2 PRODUCTS**

**2.1 COURSE AGGREGATE MATERIAL TYPES**

- A. Imported Granular Backfill Type A1: Natural stone or crushed rock; free of clay, shale, organic matter; graded in accordance with ANSI/ASTM C136, ASTM D2487 Group Symbol GW; to the following limits:

<u>Sieve Size</u>	<u>Percent Passing</u>
6 inch	100
4 inch	98-100
3 inch	98-100
2 inch	75-100
1 inch	40-80
No. 4	25-60
No. 200	5

- B. Onsite Backfill Type A2: Excavated and reused material; free of lumps larger than 8", rocks larger than 8", and debris; graded in accordance with ANSI/ASTM C136, to the following limits:

<u>Sieve Size</u>	<u>Percent Passing</u>
4 inch	100
No. 200	60

- C. Imported Embedment Type A3: Natural stone or crushed rock conforming to Class I, II, or III material as defined by ASTM D2487 or D2321; free of clay, shale, organic matter; graded in accordance with ANSI/ASTM C136, ASTM D2487 Group Symbol GW GP; to the following limits:

<u>Sieve Size</u>	<u>Percent Passing</u>
1 inch	100
No. 200	5

- D. Onsite Embedment Type A4: Excavated and reused material conforming to Class I, II, or III material as defined by ASTM D2487 or D2321; free of clay, shale, organic matter lumps larger than 1.5", rocks larger than 1", and debris; graded in accordance with ANSI/ASTM C136 to the following limits:

<u>Sieve Size</u>	<u>Percent Passing</u>
1 inch	100
No. 200	25

- E. Imported Foundation Type A5: Angular stone or crushed rock; washed, free of clay, shale, organic matter; graded in accordance with ANSI/ASTM C136, ASTM D2487 Group Symbol GP; to the following limits: (Alternative gradations will be considered)

<u>Sieve Size</u>	<u>Percent Passing</u>
2 inch	100
No. 200	5

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- F. 3/4" Rock Type A6: Angular stone or crushed rock; washed, free of clay, shale, organic matter; graded in accordance with ANSI/ASTM C136: (Alternative gradations will be considered)

<u>Sieve Size</u>	<u>Percent Passing</u>
3/4 inch	100
No. 4	5

2.2 FINE AGGREGATE MATERIALS

- A. Aggregate Base Course Type A7: Free of shale, clay, friable material and debris; graded in accordance with ANSI/ASTM C136, ASTM D2487 Group Symbol GW; within the following limits: (Alternative gradations will be considered)

<u>Sieve Size</u>	<u>Percent Passing</u>
¾ inch	100
½ inch	70 to 100
No. 4	41 to 68
No. 16	21 to 41
No. 40	10 to 27
No. 200	5

2.3 SOURCE QUALITY CONTROL

- A. Coarse Aggregate Material - Testing and Analysis: Perform in accordance with, ASTM D1557, ASTM D4318, ASTM C136.
- B. Fine Aggregate Material - Testing and Analysis: Perform in accordance with, ASTM D1557, ASTM D4318, ASTM C136.
- C. When tests indicate materials do not meet specified requirements, change material, moisture condition or dry as necessary and retest.

PART 3 EXECUTION

3.1 EXCAVATION

- A. Stockpile excavated material meeting requirements for fine aggregate materials.
- B. Remove excess excavated materials from site or move and incorporate into canal fill areas.
- C. Remove unsuitable materials containing too much moisture and/or organic matter or move and incorporate into canal fill areas by mixing and locating outside of access roads.

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- D. Separate material that is suitable for pipe embedment from unsuitable material.
- E. When no excavated material is suitable for pipe embedment obtain authorization from engineer to use onsite imported embedment material or pit imported embedment material.

**3.2 STOCKPILING**

- A. Stockpile materials on site at locations designated by Engineer.
- B. Stockpile in sufficient quantities to meet Project schedule and requirements.
- C. Separate different aggregate materials with dividers or stockpile individually to prevent mixing.
- D. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

**3.3 STOCKPILE CLEANUP**

- A. Remove unused stockpile materials.
- B. When borrow area is indicated, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION



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SECTION 02140

TRENCH AND STRUCTURE DEWATERING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Dewatering plan submittal requirements.
- B. Permits for dewatering activities.
- C. Performance requirements for trench and structure dewatering.
- D. Verification of dewatering performance.
- E. Dewatering discharge and monitoring requirements
- F. Termination of dewatering.
- G. Measurement and payment for trench dewatering.

1.2 RELATED SECTIONS

- A. Section 02315 - Excavation
- B. Section 02324 - Trenching

1.3 SUBMITTALS

- A. Submit per Section 01300.
- B. Prior to the preconstruction conference the Contractor shall submit their dewatering plan to the Engineer and Owner to communicate the Contractors intent in regards to dewatering to achieve the required performance contained in these specifications. Submittal of a dewatering plan shall not be interpreted as an acceptance or approval by the Owner or Engineer of the Contractors dewatering plan. The dewatering plan shall include at a minimum:
  - 1. Major components of the dewatering system including size, location, spacing and details of major dewatering features the Contractor anticipates utilizing.
  - 2. Contingency plans for equipment or power failure.
  - 3. Procedures for verification that water levels have been lowered to the specified levels prior to trench or structure excavation and installation.
  - 4. Location of dewatering disposal or discharge locations and the capacity to accept dewatering discharge. Provide a contingency plan for higher than anticipated flows when capacity of planned discharge and disposal locations may conceivably be exceeded.
  - 5. Location and details of Best Management Practices (BMP's)
  - 6. Agreements with entities accepting discharges
  - 7. All permits obtained by the Contractor including any permit conditions and approvals for the discharge of water generated during the execution of the Work.

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- 8. Other permits required for construction or operation of the dewatering system including the drilling of wells, temporary power drops, etc.

1.4 REFERENCES

- A. Colorado Department of Public Health & Environment, Water Quality Control Division.

1.5 PERMITS

- A. Submit a short-term activity exemption application and plan.
- B. Dewatering discharge to or across adjacent canals, drains, right-of-way, and private property outside of the designated limits of construction shall not be allowed unless the Contractor has obtained written approval from agency or property owner having jurisdiction. Provide Agreements with dewatering plan submittal as described in Part 1.3 of this section.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 PREPARATION

- A. Furnish, install and prepare for operation, all necessary machinery, appliances and equipment to maintain all excavations free from water during construction.
- B. Contractor shall provide temporary power sources for all dewatering equipment that requires a power source.

3.2 TRENCH AND STRUCTURE DEWATERING

- A. Dewater and dispose of water in such a manner that it does not cause injury to public or private property, or to cause a nuisance or a menace to the general public.
- B. Comply with Colorado Water Quality Standards, latest edition, for discharge of water to surface water.
- C. The Contractor will be responsible for devising a system to achieve the required level of dewatering. In addition, design and provide dewatering conveyance system to an approved disposal location. The Contractor shall submit details of this plan as described in Part 1.3 of this Section.
- D. Perform necessary dewatering activities so that the hydrostatic pressure in the trench or structure excavations is reduced to or near zero in the immediate vicinity of the bottom of the excavation as necessary to maintain the undisturbed nature of the native soils.
- E. Remove all groundwater, seepage, stormwater and other water that accumulates in the excavation during construction. All excavations shall be kept free of water during construction or until otherwise requested by the Contractor and approved by the Engineer.

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- F. Prevent softening of the bottom of excavations and the formation of "quick" conditions or "boils" during excavation. The occurrence of such conditions will require over-excavation and subsequent backfilling to soils meeting the requirements of Section 02324, Trenching, at no additional cost to the Owner.
- G. Additional cost for bottom stabilization resulting from inadequate dewatering and non-compliance with the performance specifications included herein, as determined by the Engineer, will be incidental to the work.
- H. Maintain hydrostatic pressures in the excavation at or near zero during installation of the bedding and pipes or structures and continue dewatering operations until backfill is placed to finished grade or as necessary to prevent floatation of constructed improvements.
- I. Control surface runoff to prevent entry or collection of water in excavations.
- J. Install and operate a dewatering system so that adjacent structures or property are not endangered by the reduction in the groundwater level.
- K. Monitor discharge from dewatering operations for changes in visual or odor components indicating the presence of contaminants including, but not limited to, gasoline and pesticides and other hazardous materials and toxins.
- L. Cease dewatering operations and notify Engineer and regulatory agencies immediately upon observation of conditions that may indicate the presence of hazardous contaminants in the dewatering discharge or excavation.

**3.3 VERIFICATION**

- A. Contractor's superintendent shall routinely observe conditions in excavations where dewatering is being performed on a daily basis to verify performance requirements are being met and that conditions in the excavation are in accordance with the Contract Documents.
- B. Notify Engineer of any observations that may jeopardize the Work or is not in accordance with the Contract Documents.
- C. Based on the verification performed by the Contractor and observations made by the Engineer in accordance with the General Conditions, the Engineer will determine if the performance requirements of the specifications as they relate to dewatering and construction of the improvements are generally being met. If the Engineer determines that the dewatering related Work is not being performed in accordance with the Contract Documents, the Contractor will be notified in accordance with the General Conditions and required to cease construction of the affected Work and revise and resubmit the described dewatering plan with appropriate adjustments to meet the requirements of the Contract Documents and implement any necessary changes to Contractor's dewatering approach and activities at no additional cost to the Owner.

**3.4 DEWATERING DISCHARGE**

- A. Comply with all State & Federal requirements, including (at a minimum):
  - 1. Dewatering discharge water quality and quantity.

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2. Dewatering discharge monitoring and sampling daily, weekly, continuous as stipulated in the permits, at any locations required therein.
  3. Submit monitoring and sampling report to the appropriate agencies.
- B. The Contractor shall be fully responsible for complying with State and Federal water quality requirements. Contractor shall design a dewatering discharge system to achieve such requirements. It is anticipated that stilling basins, geotextile dams, straw bales, silt fences, or siltation channels will be required to meet performance stipulations of the reference permits. Such temporary facilities may be constructed on-site, and will be required to be removed after completion of the Work. Captured sediment must be retained and disposed of at a site furnished by the Contractor. Discharging directly into adjacent surface waters without treatment shall not be permitted.
- C. Contractor will not be allowed to utilize the constructed pipeline to convey dewatering flows. Dewatering down the pipe is prohibited.
- D. Work required to comply with water quality and permit requirements are considered incidental and additional payment will not be made for this Work.

3.5 TERMINATION

- A. Allow groundwater to return to static level after excavations are backfilled as necessary to prevent floatation of constructed improvements.
- B. Prevent disturbance of the compacted backfill and prevent flotation or movement of installed pipelines and structures.
- C. Remove or abandon all temporary improvements associated with the dewatering system in accordance with these specifications and any applicable state and federal rules and regulations.
- D. Provide surface restoration as required to repair/replace any surface impacted by dewatering activities to a condition as good or better than preconstruction conditions at no additional cost to the Owner. Surface rehabilitation performed as a result of dewatering activities is considered incidental and no additional payment will be made.
- E. Comply with any dewatering termination requirements of any State and Federal permits.

3.6 MEASUREMENT AND PAYMENT

- A. Separate measurement and payment for the performance of trench dewatering as described in the Contract Documents will not be made. Performance of this work is considered incidental to other pay items and must be included therein.

END OF SECTION

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SECTION 02221

STRUCTURE DEMOLITION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Demolishing designated structures.
  - 2. Demolishing designated foundations.
  - 3. Demolishing designated slabs-on-grade.
  - 4. Protecting items designated to remain.
  - 5. Removing demolished materials.
  
- B. Related Sections:
  - 1. Section 02055 - Soils: Backfill materials.
  - 2. Section 02060 - Aggregate: Backfill materials.
  - 3. Section 02230 - Site Clearing: Clearing outside periphery of structures.
  - 4. Section 02320 - Backfill.

1.2 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Requirements for submittals.

1.3 QUALITY ASSURANCE

- A. Conform to applicable code for demolition of structures, safety of adjacent structures, dust control, runoff control, and disposal.
  
- B. Conform to applicable code for procedures when hazardous or contaminated materials are discovered.
  
- C. Obtain required permits from authorities having jurisdiction.

1.4 PROJECT CONDITIONS

- A. Owner assumes no responsibility for actual condition of structures to be demolished.
  
- B. Notify Engineer upon discovery of hazardous materials.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 EXISTING BUILDING DOCUMENTATION

- A. Document condition of adjacent structures indicated to remain.

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3.2 EXAMINATION

- A. Examine existing structures indicated to be demolished before demolition.
- B. Determine where removals may result in structural deficiency or unplanned collapse during demolition. Coordinate demolition sequence and procedures to prevent structures from becoming unstable.
- C. Determine where demolition may affect structural integrity of adjacent structures indicated to remain.
  - 1. Identify measures required to protect structures from damage.
  - 2. Identify remedial work including patching, repairing, bracing, and other work required to leave structures indicated to remain in structurally sound and watertight condition.
- D. Verify hazardous material abatement is complete before beginning demolition.

3.3 PREPARATION

- A. Call Local Utility Line Information service not less than three working days before performing Work.
  - 1. Request underground utilities to be located and marked within and surrounding construction areas.
- B. Notify affected utility companies before starting work and comply with utility's requirements.
- C. Erect, and maintain temporary barriers and security devices, including warning signs and lights, and similar measures, for protection of the Owner, and existing improvements indicated to remain.
- D. Protect existing structures indicated to remain.
- E. Prevent movement or settlement of adjacent structures. Provide bracing and shoring.

3.4 DEMOLITION REQUIREMENTS

- A. Use of explosives is not permitted.
- B. Conduct demolition to minimize interference with adjacent structures.
- C. Cease operations immediately when adjacent structures appear to be in danger. Notify Engineer. Do not resume operations until directed.
- D. Obtain written permission from adjacent property owners when demolition equipment will traverse, infringe upon or limit access to their property.
- E. Sprinkle Work with water to minimize dust. Provide hoses and water connections required for this purpose.

3.5 DEMOLITION

- A. Remove foundation walls and footings as indicated on plan.

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- B. Remove concrete slabs-on-grade.
- C. Rough grade and compact areas affected by demolition to accommodate subsequent construction operations.
- D. Continuously clean-up and remove demolished materials from site. Do not allow materials to accumulate on site.
- E. Do not burn or bury materials on site. Leave site in clean condition.
- F. Salvage existing metal items to the City of Grand Junction.

END OF SECTION

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SECTION 02230

SITE CLEARING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Removing surface debris.
  - 2. Removing designated paving, curbs, and sidewalk.
  - 3. Removing designated trees, shrubs, and other plant life.
  - 4. Removing abandoned utilities.
  - 5. Excavating topsoil.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01300 - Administrative Requirements: Verification of existing conditions before starting work.

3.2 PREPARATION

- A. Call Local Utility Line Information service not less than two working days before performing Work.
  - 1. Request underground utilities to be located and marked within and surrounding construction areas.

3.3 PROTECTION

- A. Locate, identify, and protect utilities indicated to remain, from damage.
- B. Protect trees, plant growth, and features designated to remain, as final landscaping.
- C. Protect bench marks, survey control points, and existing structures from damage or displacement.

3.4 REMOVAL

- A. Remove debris, rock, and extracted plant life from site.
- B. Partially remove paving, curbs, and sidewalk, as indicated on Drawings. Neatly saw cut edges at right angle to surface 6 inches past the edge of disturbed soil.
- C. Remove abandoned utilities as required for installation of new system. Indicate removal termination point for underground utilities on Record Documents.



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- D. Continuously clean-up and remove waste materials from site. Do not allow materials to accumulate on site.
- E. Do not burn or bury materials on site. Leave site in clean condition.
- F. Remove roots and branches of trees, restore disturbed grounds to existing or better condition.

END OF SECTION

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SECTION 02311

ROUGH GRADING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Excavating topsoil.
  - 2. Excavating subsoil.
  - 3. Cutting, grading, filling, rough contouring, and compacting for site structures.
  
- B. Related Sections:
  - 1. Section 02055 - Soils.
  - 2. Section 02060 - Aggregate.
  - 3. Section 02221 - Structure Demolition.
  - 4. Section 02230 - Site Clearing: Excavating topsoil.
  - 5. Section 02315 - Excavation and Fill: Building excavation.
  - 6. Section 02320 - Backfill: General building area backfilling.
  - 7. Section 02324 - Trenching: Trenching and backfilling for utilities.

1.2 REFERENCES

- A. ASTM International:
  - 1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - 2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
  - 3. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
  - 4. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>)).
  - 5. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
  - 6. ASTM D2419 - Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
  - 7. ASTM D2434 - Standard Test Method for Permeability of Granular Soils (Constant Head).
  - 8. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
  - 9. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.3 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Requirements for submittals.
  
- B. Materials Source: Submit name of imported materials suppliers. Provide materials from same source throughout the course of the project.
  
- C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

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1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with ASTM C136, ASTM D2419, and ASTM D2434.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Topsoil: Type S3 as specified in Section 02055.
- B. Subsoil Fill: Type S1 as specified in Section 02055.
- C. Structural Fill: Type A1 as specified in Section 02060.
- D. Granular Fill: Type A6 as specified in Section 02060.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01300 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify survey bench mark and intended elevations for the Work are as indicated on Drawings.

3.2 PREPARATION

- A. Call Local Utility Line Information service not less than three working days before performing Work.
  - 1. Request underground utilities to be located and marked within and surrounding construction areas.
- B. Identify required lines, levels, contours, and datum.
- C. Notify utility company to remove and relocate utilities.
- D. Protect utilities indicated to remain from damage.
- E. Protect bench marks, survey control point, and existing structures from excavating equipment and vehicular traffic.

3.3 SUBSOIL EXCAVATION

- A. Stockpile excavated material in area designated on site in accordance with Section 02055.
- B. Benching Slopes: Horizontally bench existing slopes greater than 1: 4 to key placed fill material to slope to provide firm bearing.
- C. Stability: Replace damaged or displaced subsoil as specified for fill.

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3.4 FILLING

- A. Place material in continuous layers as follows:
  - 1. Subsoil Fill: Maximum 8 inches compacted depth.
  - 2. Structural Fill: Maximum 8 inches compacted depth.
  - 3. Granular Fill: Maximum 6 inches compacted depth.
- B. Maintain optimum moisture content of fill materials to attain required compaction density.
- C. Slope grade away from structure minimum 2 inches in 10 ft unless noted otherwise.
- D. Make grade changes gradual. Blend slope into level areas.
- E. Repair or replace items indicated to remain damaged by excavation or filling.

3.5 TOLERANCES

- A. Section 01400 - Quality Requirements: Tolerances.
- B. Top Surface of Subgrade: Plus or minus 1/10 foot from required elevation.

3.6 FIELD QUALITY CONTROL

- A. Section 01400 - Quality Requirements: Testing and inspection services.
- B. Perform laboratory material tests in accordance with ASTM D1557.
- C. Perform in place compaction tests in accordance with the following:
  - 1. Density Tests: ASTM D1556, ASTM D2167, or ASTM D2922.
  - 2. Moisture Tests: ASTM D3017.
- D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

3.7 SCHEDULES

- A. Structural Fill:
  - 1. Compact uniformly to minimum 95 percent of maximum density.
- B. Previous Structural Fill:
  - 1. Compact uniformly to minimum 95 percent of maximum density.
- C. Subsoil Fill:
  - 1. Compact uniformly to minimum 95 percent of maximum density.
- D. Topsoil Fill:
  - 1. Compact uniformly to minimum 90 percent of maximum density.

END OF SECTION

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SECTION 02315

EXCAVATION AND FILL

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Soil densification.
  - 2. Excavating for building foundations.
  - 3. Excavating for slabs-on-grade.
  - 4. Excavating for site structures.
  
- B. Related Sections:
  - 1. Section 02140 - Dewatering
  - 2. Section 02311 - Rough Grading: Topsoil and subsoil removal from site surface.
  - 3. Section 02320 - Backfill.
  - 4. Section 02324 - Trenching: Excavating for utility trenches.

1.2 REFERENCES

- A. ASTM International:
  - 1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
  - 2. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
  - 3. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
  - 4. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
  
- B. Local utility standards when working within 24 inches of utility lines.

1.3 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Requirements for submittals.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 PREPARATION

- A. Call Local Utility Line Information service not less than three working days before performing Work.
  - 1. Request underground utilities to be located and marked within and surrounding construction areas.

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- B. Identify required lines, levels, contours, and datum.

**3.2 EXCAVATION**

- A. Excavate subsoil to accommodate structure foundations, slabs-on-grade, and construction operations.
- B. Compact disturbed load bearing soil in direct contact with foundations to original bearing capacity; perform compaction in accordance with Section 02320 and 02324.
- C. Slope banks with machine to angle of repose or less until shored.
- D. Do not interfere with 45degree bearing splay of foundations.
- E. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- F. Trim excavation. Remove loose matter.
- G. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd measured by volume.
- H. Notify Engineer of unexpected subsurface conditions.
- I. Correct areas over excavated with structural fill Type A1 specified in Section 02360.
- J. Stockpile excavated material in area designated on site in accordance with Section 02055.
- K. Repair or replace items indicated to remain damaged by excavation.

**3.3 FIELD QUALITY CONTROL**

- A. Section 01400 - Quality Requirements: Testing and Inspection Services.
- B. Request visual inspection of bearing surfaces by Engineer before installing subsequent work.

**3.4 PROTECTION**

- A. Prevent displacement or loose soil from falling into excavation; maintain soil stability.
- B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.
- C. Protect structures, utilities and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth operations.

END OF SECTION

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SECTION 02320

BACKFILL

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Backfilling site structures to subgrade elevations.
  - 2. Fill under slabs-on-grade.
  - 3. Fill for over-excavation.
  
- B. Related Sections:
  - 1. Section 02055 - Soils.
  - 2. Section 02060 - Aggregate.
  - 3. Section 02311 - Rough Grading: Site filling.
  - 4. Section 02315 - Excavation and Fill.
  - 5. Section 02324 - Trenching: Backfilling of utility trenches.
  - 6. Section 02371 - Riprap and Rock Lining.
  - 7. Section 03300 - Cast-in-Place Concrete: Concrete materials.

1.2 REFERENCES

- A. ASTM International:
  - 1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
  - 2. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
  - 3. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>)).
  - 4. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
  - 5. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
  - 6. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
  - 7. ASTM D4253 - Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.

1.3 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Requirements for submittals.
  
- B. Materials Source: Submit name of imported materials suppliers. Provide materials from same source throughout the course of the project.
  
- C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

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**PART 2 PRODUCTS**

**2.1 FILL MATERIALS**

- A. Subsoil Fill: Type S1 as specified in Section 02055.
- B. Structural Fill: Type A1 as specified in Section 02060.
- C. Granular Fill: Type A6 as specified in Section 02060.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. Section 01300 - Administrative Requirements: Coordination and project conditions.
- B. Verify structural ability of unsupported walls to support loads imposed by fill.

**3.2 PREPARATION**

- A. Compact subgrade to density requirements for subsequent backfill materials.
- B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with structural fill and compact to density equal to or greater than requirements for subsequent fill material.
- C. Scarify subgrade surface to depth of 6 inch.
- D. Proof roll to identify soft spots; fill and compact to density equal to or greater than requirements for subsequent fill material.

**3.3 BACKFILLING**

- A. Backfill areas to contours and elevations with unfrozen materials.
- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.
- C. Place material in continuous layers as follows:
  - 1. Subsoil Fill: Maximum 8 inches compacted depth.
  - 2. Structural Fill: Maximum 8 inches compacted depth.
  - 3. Granular Fill: Maximum 6 inches compacted depth.
- D. Employ placement method that does not disturb or damage other work.
- E. Maintain optimum moisture content of backfill materials to attain required compaction density.
- F. Slope grade away from building minimum 2 inches in 10 ft, unless noted otherwise.
- G. Make gradual grade changes. Blend slope into level areas.
- H. Remove surplus backfill materials from site.



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I. Leave fill material stockpile areas free of excess fill materials.

3.4 TOLERANCES

A. Section 01400 - Quality Requirements: Tolerances.

3.5 FIELD QUALITY CONTROL

A. Section 01400 - Quality Requirements: Testing and inspection services.

B. Perform laboratory material tests in accordance with ASTM D1557.

C. Perform in place compaction tests in accordance with the following:

1. Density Tests: ASTM D1556, ASTM D2167, or ASTM D2922.
2. Moisture Tests: ASTM D3017.

D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

E. Proof roll compacted fill surfaces under slabs-on-grade.

3.6 PROTECTION OF FINISHED WORK

A. Section 01700 - Execution Requirements: Protecting finished work.

B. Reshape and re-compact fills subjected to vehicular traffic.

3.7 SCHEDULE

A. Exterior Side of Foundation Walls:

1. Fill Type S1, to subgrade elevation, compact uniformly to 90 percent of maximum density.

B. Fill to Correct Over-excavation:

1. Fill Type A1, flush to required elevation, compact uniformly to 95 percent of maximum density.

END OF SECTION

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SECTION 02324

TRENCHING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Excavating trenches for utilities.
  - 2. Compacted fill from top of utility embedment to subgrade elevations.
  - 3. Backfilling and compaction.
  
- B. Related Sections:
  - 1. Section 01400 - Quality Requirements
  - 2. Section 02055 - Soils.
  - 3. Section 02060 - Aggregate.
  - 4. Section 02140 - Dewatering
  - 5. Section 02513 - Water Distribution System.
  - 6. Section 03300 - Cast-in-Place Concrete: Flowable Fill.

1.2 REFERENCES

- A. ASTM International:
  - 1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - 2. ASTM D1557 – Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>))
  - 3. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
  - 4. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.3 DEFINITIONS

- A. Utility: Any buried pipe, duct, conduit, or cable.
  
- B. Common Excavation: all excavation that is not defined as “Rock Removal” or “Boulder Removal”
  
- C. Rock Removal: Removal of all materials which, by actual demonstration, cannot in the Engineer’s opinion, be reasonably excavated with a  $\frac{3}{4}$  yard 225 Caterpillar Backhoe equipped with a 30-foot boom, general dipper and rock points, or similar approved equipment and which is in fact, systematically drilled or blasted. The term refers to a method of removal and not a geological material.
  
- D. Boulder Removal: Removal of masses of igneous, sedimentary or metamorphic material which have one or more dimensions of 36” or greater or boulders with a displacement of one cubic yard, or more, which is removed without drilling, blasting or splitting as specified for rock excavation. Solid masses other than rock or of lesser dimension shall be considered as cobble or debris and shall be removed as common excavation.

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1.4 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Requirements for submittals.
- B. Materials Source: Submit name of imported fill materials suppliers.
- C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 COORDINATION

- A. Section 01300 - Administrative Requirements: Coordination and project conditions.
- B. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.

PART 2 PRODUCTS

2.1 FILL MATERIALS

- A. Subsoil Fill: Type S1, S2 as specified in Section 02055.
- B. Granular Fill: Type A1, A2, A3, A4, A5 as specified in Section 02060.

PART 3 EXECUTION

3.1 LINES AND GRADES

- A. Lay pipes to lines and grades indicated on Drawings.
  - 1. Engineer Owner reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.

3.2 PREPARATION

- A. Make written request to Engineer for construction staking. Allow for a minimum of 7 days from the time written request is received by Engineer to the time of actual construction staking in the field.
- B. Call Local Utility Line Information service at 800-662-4111 at least two working days before performing Work.
  - 1. Request underground utilities to be located and marked within and surrounding construction areas.
- C. Maintain and protect above and below grade utilities indicated to remain.
- D. Notify Engineer of existing structures or utilities that will prevent construction before continuing with construction to allow Engineer time to make field revisions as necessary to avoid conflict with the existing utility or structure.
- E. Identify required lines, levels, contours, and datum locations.
- F. Protect plant life, lawns, and other features remaining as portion of final landscaping.

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- G. Protect bench marks, construction staking, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- H. Establish temporary traffic control and detours when trenching is performed in public right-of-way. Relocate controls and reroute traffic as required during progress of Work.

**3.3 TRENCHING**

- A. Perform excavation within 24 inches of existing utility service in accordance with utility's requirements.
- B. Provide temporary support of existing structures, as necessary, to protect the structures from settlement or other disturbances caused by construction activities.
- C. Return disturbed structures to original condition, or better.
- D. Do not advance open trench more than 1000 feet ahead of installed pipe near roadways.
- E. Remove materials that interfere with Work to a depth of no more than 6 inches below the flow line of the pipe unless directed by Engineer.
- F. Excavate bottom of trenches to minimum widths as identified on plans.
- G. Excavate trenches to depth indicated on Drawings. Provide uniform and continuous bearing and support for bedding material and utilities.
- H. Do not interfere with 45 degree bearing splay of foundations.
- I. When Project conditions permit, slope side walls of excavation starting according to OSHA requirements. When side walls can not be sloped, provide sheeting and shoring to protect excavation as specified in this section.
- J. In roadways minimize disturbed areas by utilizing a trench shield and minimizing trench widths.
- K. Remove lumped subsoil, boulders, and rock up to a cu yd, measured by volume.
- L. When conditions requiring Rock Removal or Boulder Removal are encountered notify engineer.
- M. When subsurface materials at bottom of trench are loose or soft, excavate to greater depth as directed by Architect/Engineer until suitable material is encountered.
- N. Cut out soft areas of subgrade not capable of compaction in place. Backfill with Onsite Embedment Type A4, Onsite Backfill Type A2, or Imported Foundation Type A5, and compact to density equal to or greater than requirements for subsequent backfill material.
- O. Trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.
- P. Correct over-excavated areas with compacted backfill as specified for authorized excavation as directed by Architect/Engineer.
- Q. Remove excess subsoil not intended for reuse, from site or dispose of material in locations approved by engineer.

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- R. Separate materials that are suitable for use as embedment or trench backfill from materials that are unsuitable
- S. When excavated material is too wet for reuse as trench backfill, spread out on the surface and moisture condition until it can be used as trench backfill somewhere in the project outside of roadways.
- T. Stockpile excavated material in areas located within the site to depth not exceeding 8 and protect from erosion.

**3.4 SHEETING AND SHORING**

- A. Sheet, shore, and brace excavations to prevent danger to persons, structures and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.
- B. Slope trench sides or support trenches more than 5 feet deep excavated through unstable, loose, or soft material. Provide sheeting, shoring, bracing, or other protection to maintain stability of excavation.
- C. Design sheeting and shoring to be removed at completion of excavation work.
- D. Repair damage caused by failure of the sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.
- E. Repair damage to new and existing Work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.

**3.5 PIPE FOUNDATION**

- A. Foundation Material: Onsite Backfill Type A2, Onsite Embedment Type A4, or Imported Foundation Type A5
- B. Use when soil unsuitable for a proper foundation is encountered at or below trench grade, such as muck or other deleterious material.
- C. Remove unsuitable material for the full width of trench and to a depth required to reach suitable foundation material
- D. Obtain Engineer verification that imported or transported material is required prior to use.

**3.6 PIPE EMBEDMENT**

- A. Embedment Material: Onsite Embedment Type A4, or Imported Embedment Type A3
- B. Bedding depth: 4 inches below bottom of pipe typical; extend to 6 inches if rock or other non-cushioning material is encountered at the bottom of trench
- C. Remove stones and lumps which will interfere with smooth and complete bedding of the pipe.
- D. Level material to provide continuous firm support along the full length of pipe.
- E. Hand dig holes for bells and fittings to assure uniform support along pipe barrel.

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- F. Place and compact in layers not exceeding an uncompacted height of eight inches, to 12 inches above top of pipe.
- G. Place material evenly on both sides of the pipe with care for the full width of the trench to displacement of or damage to the pipe.
- H. Prevent material with rocks larger than 1 inch or containing clay, deleterious or frozen material from entering the pipe embedment area.
- I. Use suitable excavated native and sorted native material before transported or imported materials.
- J. Obtain Engineer verification that imported embedment material is required prior to use.
- K. Place material and compact in accordance with the Backfill Schedule at the end of this section.

**3.7 TRENCH BACKFILLING**

- A. Trench Backfill Material: Onsite Backfill Type A2, or Subsoil Type S1
- B. Trench Backfill Material in Roadways: Onsite Backfill Type A2, or Imported Granular Backfill Type A1
- C. Do not place backfill in standing water; pump ground water or dewater see Section 02140 Dewatering.
- D. Backfill trenches to contours and elevations with unfrozen fill materials.
- E. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.
- F. Place fill material in continuous layers and compact in accordance with the Backfill Schedule at the end of this section.
- G. Employ placement method that does not disturb or damage, utilities in trench.
- H. Maintain optimum moisture content of fill materials to attain required compaction density.
- I. Do not leave more than 1000 feet of trench open at end of working day.
- J. Protect open trench to prevent danger to Owner and the public.
- K. Backfill with native material if suitable;
- L. Obtain Engineer verification that imported material is required prior to use
- M. If suitable native material, as determined by the Engineer, is not used for backfill then imported material will not be paid for.
- N. Native material with excessive or deficient moisture content will not be considered as unsuitable if the moisture content can be reasonably adjusted onsite to a level that will allow specified compaction.

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- O. Unsuitable and excess material must be hauled offsite or to a location onsite where it can be incorporated into the project.

**3.8 SURFACE RESTORATION**

- A. Natural Ground
  - 1. Material: Onsite Backfill Type 2
  - 2. Minimum Depth: 12 inches
  - 3. Install to lines and grades indicated on plans
- B. General
  - 1. Cut and fill volumes are intended to balance over the entire site.
  - 2. Material hauling will be required to construct final grades per plans, and to balance cut and fill volumes.
  - 3. To facilitate the balancing of cut and fill volumes some flexibility in the finished ground cross sections will be allowed.
  - 4. Most canal fill areas can be used to treat excavated material requiring moisture treatment before use as trench backfill.

**3.9 TOLERANCES**

- A. Top surface of backfilling under paved areas: Plus or minus 1 inch from required elevations.
- B. Top surface of general backfilling: Plus or minus 1 inch from required elevations.

**3.10 FIELD QUALITY CONTROL**

- A. Field review and testing will be performed under provisions of Section 01400.
- B. Perform laboratory material tests in accordance with ASTM D1557
- C. Perform in place compaction tests in accordance with the following:
  - 1. Density Tests: ASTM D1556, ASTM D2167, or ASTM D2922.
  - 2. Moisture Tests: ASTM D3017.
- D. When tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest at no cost to the Owner.
- E. The initial density test at any location will be paid for by the Owner. If the initial test shows that the material compaction is not as specified, the Contractor shall modify the compaction methods used, as approved by the Engineer, and have the material retested until the tests show that the compaction method meets with the Specification requirements. If the Contractor's compaction methods are not consistent and/or do not meet the requirements of these Specifications, the Owner reserves the right to undertake additional compaction tests as necessary to determine the extent of substandard compaction, and to charge the Contractor for all such tests.
- F. Frequency of compaction tests:
  - 1. At commencement of project to establish a compaction pattern
  - 2. Horizontal Locations: Start of trench with subsequent tests at every 1000' along the trench length.
  - 3. Vertical Locations: One at spring line, one at half the depth of the trench, one test at the top of the trench.
  - 4. At locations where materials or construction procedures change.

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5. At additional locations and frequencies as directed by Engineer or Owner to verify to Engineer and Owner's satisfaction that the compaction density requirements have been met.

3.11 PROTECTION OF FINISHED WORK

- A. Section 01700 - Execution Requirements: Protecting finished work.
- B. Reshape and re-compact fills subjected to vehicular traffic during construction.

3.12 BACKFILL SCHEDULE

- A. Trenching – inside other roadways and roadway shoulders:
  1. Embedment: Onsite Embedment Type A4, or Imported Embedment Type A3
  2. Embedment Compaction: **90 percent** of maximum density (ASTM 1557).
  3. Trench Backfill: Onsite Backfill Type A2, or Imported Granular Backfill Type A1
  4. Trench Backfill Compaction: **95 percent** of maximum density (ASTM 1557).
  5. Surface Restoration: Aggregate Base Course Type A7
  6. Surface Restoration Compaction: **95 percent** of maximum density (ASTM 1557).
  - 7.
- B. Trenching – inside of natural ground areas:
  1. Embedment: Onsite Embedment Type A4
  2. Embedment Compaction: **90 percent** of maximum density (ASTM 1557).
  3. Trench Backfill: Onsite Backfill Type A2, or Subsoil Type S1
  4. Trench Backfill Compaction: **85 percent** of maximum density (ASTM 1557).
  5. Surface Restoration: Subsoil Type S1
  6. Surface Restoration Compaction: **85 percent** of maximum density (ASTM 1557).

END OF SECTION



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SECTION 02371

RIPRAP AND ROCK LINING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Riprap placed loose.
- B. Related Sections:
  - 1. Section 02311 - Rough Grading.

1.2 REFERENCES

- A. AASHTO M 288: Geotextile Specification for Highway Applications

1.3 QUALITY ASSURANCE

- A. Furnish each aggregate material from single source throughout the Work.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Dmax=24" Riprap: solid and nonfriable; 6 inch minimum size, 24 inch maximum size. With D<sub>50</sub> of 12 inch minimum.
  - 1. 

Size of Stone	Percent of total weight smaller than the given size
18" to 24"	100
16" to 22"	85
12" to 18"	50
6" to 8"	15
  - 2. Riprap Durability
    - a. L.A. Abrasion: 35% maximum
    - b. Soundness (Sodium Sulfate 5 cycles): 5% maximum
- B. Separation Geotextile Fabric: Class II fabric as specified in AASHTO M 288, with Apparent Opening Size of 0.22 mm maximum average roll value.

PART 3 EXECUTION

3.1 PLACEMENT

- A. Place geotextile fabric over substrate.
- B. Overlap geotextile edges 1 foot.
- C. Extend geotextile beyond fill material 1 foot.

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- D. Repair: Place patch over damaged area and extend 1 foot beyond the perimeter of the tear or damage.
- E. Place riprap at culvert pipe ends, diversion structure and drain locations as indicated on Drawings to thicknesses indicated on Drawings.

END OF SECTION

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SECTION 03100

CONCRETE FORMS AND ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Formwork for cast-in place concrete.
  - 2. Shoring, bracing, and anchorage.
  - 3. Form accessories.
  - 4. Form stripping.
  
- B. Related Sections:
  - 1. Section 03200 - Concrete Reinforcement.
  - 2. Section 03300 - Cast-in-Place Concrete.
  - 3. Section 05500 - Metal Fabrications: Product requirements for metal fabrications for placement by this Section.

1.2 REFERENCES

- A. American Concrete Institute:
  - 1. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials.
  - 2. ACI 301 - Specifications for Structural Concrete.
  - 3. ACI 318 - Building Code Requirements for Structural Concrete.
  - 4. ACI 347 - Guide to Formwork for Concrete.
  - 5. ACI 350 – Code Requirements for Environmental Engineering Concrete Structures
  
- B. American Forest and Paper Association:
  - 1. AF&PA - National Design Specifications for Wood Construction.
  
- C. The Engineered Wood Association:
  - 1. APA/EWA PS 1 - Voluntary Product Standard for Construction and Industrial Plywood.
  
- D. ASTM International:
  - 1. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
  
- E. West Coast Lumber Inspection Bureau:
  - 1. WCLIB - Standard Grading Rules for West Coast Lumber.

1.3 DESIGN REQUIREMENTS

- A. Design, engineer and construct formwork, shoring and bracing to conform to design and code requirements to achieve concrete shape, line and dimension as indicated on Drawings.

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1.4 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Requirements for submittals.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 347.
- B. For wood products furnished for work of this Section, comply with AF&PA.

1.6 COORDINATION

- A. Section 01300 - Administrative Requirements: Coordination and project conditions.
- B. Coordinate this Section with other sections of work, requiring attachment of components to formwork.

**PART 2 PRODUCTS**

2.1 WOOD FORM MATERIALS

- A. Form Materials: At discretion of Contractor.

2.2 PREFABRICATED FORMS

- A. Manufacturers:
  - 1. Aluma-Systems Inc., Burke Co.
  - 2. Economy Forms Corp.
  - 3. Molded Fiber Glass Concrete Forms Co.
  - 4. Perma Tubes.
  - 5. Sonoco Products Co.
  - 6. Symons Corp.
  - 7. Western Forms, Inc.
  - 8. Substitutions: Section 01600 - Product Requirements

2.3 FORMWORK ACCESSORIES

- A. Form Ties: Removable or Snap-off type, galvanized metal, adjustable length, cone type, with waterproofing washer, free of defects capable of leaving holes larger than 1 inch in concrete surface.
- B. Spreaders: Standard, non-corrosive metal form clamp assembly, of type acting as spreaders and leaving no metal within 1 inch (25 mm) of concrete face. Wire ties, wood spreaders or through bolts are not permitted.
- C. Form Anchors and Hangers:
  - 1. Do not use anchors and hangers exposed concrete leaving exposed metal at concrete surface.
  - 2. Symmetrically arrange hangers supporting forms from structural steel members to minimize twisting or rotation of member.
  - 3. Penetration of structural steel members is not permitted.

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- D. Form Release Agent: Colorless mineral oil that will not stain concrete, or absorb moisture, or impair natural bonding or color characteristics of coating intended for use on concrete.
  - 1. Manufacturers:
    - a. Arcal Chemical Corporation Arcal-80.
    - b. Industrial Synthetics Company Synthex.
    - c. Nox-Crete Company Nox-Crete Form Coating.
    - d. Substitutions: Section 01600 - Product Requirements.
- E. Corners: Chamfer corners and edges  $\frac{3}{4}$  x  $\frac{3}{4}$  inch
- F. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Size, strength and character to maintain formwork in place while placing concrete.
- G. Plastic Water Stops: Polyvinyl chloride, minimum 1,750 psi tensile strength, minimum 50 degrees F to plus 175 degrees F working temperature range, 4 inch wide, maximum possible lengths, ribbed profile, preformed corner sections, heat welded jointing.
  - 1. Manufacturers:
    - a. Greenstreak Plastic Products Model 03150/GRD.
    - b. Vinylex Corp. Model 03250.
    - c. Four Seasons Industries Durajoint Model CSP-162
    - d. Substitutions: Section 01600 - Product Requirements.
- H. Hydrophilic Waterstop: Flexible strip of nonbentonite hydrophilic compound in coil form for joints in concrete construction.
  - 1. Greenstreak Plastic Products, Hydrotite Model CJ-1020-2D with Leakmaster LV-1 adhesive and sealant.
  - 2. JLM Associates, Adeka Ultra Seal Model MC-2010M with 3M-2141 adhesive and P-121 sealant.
  - 3. Substitutions: Section 01600 - Product Requirements.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. Section 01300 - Administrative Requirements: Coordination and project conditions.
- B. Verify lines, levels, and centers before proceeding with formwork. Verify dimensions agree with Drawings.
- C. When formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement before proceeding, request instructions from Architect/Engineer.

**3.2 INSTALLATION**

- A. Earth Forms:
  - 1. Earth forms are not permitted.
- B. Formwork - General:
  - 1. Provide top form for sloped surfaces steeper than 1.5 horizontal to 1 vertical to hold shape of concrete during placement, unless it can be demonstrated that top forms can be omitted.

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2. Construct forms to correct shape and dimensions, mortar-tight, braced, and of sufficient strength to maintain shape and position under imposed loads from construction operations.
  3. Camber forms where necessary to produce level finished soffits unless otherwise shown on Drawings.
  4. Carefully verify horizontal and vertical positions of forms. Correct misaligned or misplaced forms before placing concrete.
  5. Complete wedging and bracing before placing concrete.
- C. Forms for Smooth Finish Concrete:
1. Use steel, plywood or lined board forms.
  2. Use clean and smooth plywood and form liners, uniform in size, and free from surface and edge damage capable of affecting resulting concrete finish.
  3. Install form lining with close-fitting square joints between separate sheets without springing into place.
  4. Use full size sheets of form lines and plywood wherever possible.
  5. Tape joints to prevent protrusions in concrete.
  6. Use care in forming and stripping wood forms to protect corners and edges.
  7. Level and continue horizontal joints.
  8. Keep wood forms wet until stripped.
- D. Framing, Studding and Bracing:
1. Space studs at 16 inches on center maximum for boards and 12 inches on center maximum for plywood.
  2. Size framing, bracing, centering, and supporting members with sufficient strength to maintain shape and position under imposed loads from construction operations.
  3. Construct beam soffits of material minimum of 2 inches thick.
  4. Distribute bracing loads over base area on which bracing is erected.
  5. When placed on ground, protect against undermining, settlement or accidental impact.
- E. Erect formwork, shoring, and bracing to achieve design requirements, in accordance with requirements of ACI 301.
- F. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
- G. Obtain Engineer's approval before framing openings in structural members not indicated on Drawings.
- H. Install chamfer strips on external corners of walls.
- I. Do not reuse wood formwork more than 2 times for concrete surfaces to be exposed to view. Do not patch formwork.
- 3.3 APPLICATION - FORM RELEASE AGENT
- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
  - B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

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- C. Do not apply form release agent where concrete surfaces are indicated to receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.
- D. Reuse and Coating of Forms: Thoroughly clean forms and reapply form coating before each reuse. For exposed work, do not reuse forms with damaged faces or edges. Apply form coating to forms in accordance with manufacturer's specifications. Do not coat forms for concrete indicated to receive "scored finish". Apply form coatings before placing reinforcing steel.

3.4 INSTALLATION - INSERTS, EMBEDDED PARTS, AND OPENINGS

- A. Install formed openings for items to be embedded in or passing through concrete work.
- B. Locate and set in place items required to be cast directly into concrete.
- C. Coordinate with Work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.
- D. Install accessories straight, level, and plumb. Ensure items are not disturbed during concrete placement.
- E. Install water stops continuous without displacing reinforcement.
- F. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
- G. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.
- H. Form Ties:
  - 1. Use sufficient strength and sufficient quantity to prevent spreading of forms.
  - 2. Place ties at least 1 inch (25 mm) away from finished surface of concrete.
  - 3. Leave inner rods in concrete when forms are stripped.
  - 4. Space form ties equidistant, symmetrical and aligned vertically and horizontally unless otherwise shown on Drawings.
- I. Arrangement: Arrange formwork to allow proper erection sequence and to permit form removal without damage to concrete.
- J. Construction Joints:
  - 1. Install surfaced pouring strip where construction joints intersect exposed surfaces to provide straight line at joints.
  - 2. Just prior to subsequent concrete placement, remove strip and tighten forms to conceal shrinkage.
  - 3. Show no overlapping of construction joints. Construct joints to present same appearance as butted plywood joints.
  - 4. Arrange joints in continuous line straight, true and sharp.
- K. Embedded Items:
  - 1. Make provisions for pipes, sleeves, anchors, inserts, reglets, anchor slots, nailers, water stops, and other features.
  - 2. Do not embed wood or uncoated aluminum in concrete.
  - 3. Obtain installation and setting information for embedded items furnished under other Specification sections.

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4. Securely anchor embedded items in correct location and alignment prior to placing concrete.
  5. Verify conduits and pipes, including those made of coated aluminum, meet requirements of ACI 318, Section 6.3.
- L. Openings for Items Passing Through Concrete:
1. Frame openings in concrete where indicated on Drawings. Establish exact locations, sizes, and other conditions required for openings and attachment of work specified under other sections.
  2. Coordinate work to avoid cutting and patching of concrete after placement.
  3. Perform cutting and repairing of concrete required as result of failure to provide required openings.
- M. Screeds:
1. Set screeds and establish levels for tops of concrete slabs and levels for finish on slabs.
  2. Slope slabs to drain where required or as shown on Drawings.
  3. Before depositing concrete, remove debris from space to be occupied by concrete and thoroughly wet forms. Remove freestanding water.
- N. Cleanouts and Access Panels:
1. Provide removable cleanout sections or access panels at bottoms of forms to permit inspection and effective cleaning of loose dirt, debris and waste material.
  2. Clean forms and surfaces against which concrete is to be placed. Remove chips, saw dust and other debris. Thoroughly blow out forms with compressed air just before concrete is placed.

**3.5 FORM CLEANING**

- A. Clean forms as erection proceeds, to remove foreign matter within forms.
- B. Clean formed cavities of debris prior to placing concrete.
- C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
- D. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

**3.6 FORM REMOVAL**

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads and removal has been approved by Architect/Engineer.
- B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
- C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.
- D. Leave forms in place for minimum number of days as specified in ACI 347.



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3.7 ERECTION TOLERANCES

- A. Construct formwork to maintain tolerances required by ACI 301.
- B. Tolerances: Construct formwork to produce completed concrete surfaces within construction tolerances specified in ACI 117.

3.8 FIELD QUALITY CONTROL

- A. Section 01400 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.
- C. Notify Engineer after placement of reinforcing steel in forms, but prior to placing concrete.
- D. Schedule concrete placement to permit formwork inspection before placing concrete.

END OF SECTION

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SECTION 03200

CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Reinforcing bars.
  - 2. Reinforcement accessories.
  
- B. Related Sections:
  - 1. Section 03100 - Concrete Forms and Accessories.
  - 2. Section 03300 - Cast-in-Place Concrete.

1.2 REFERENCES

- A. American Concrete Institute:
  - 1. ACI 301 - Specifications for Structural Concrete.
  - 2. ACI 318 - Building Code Requirements for Structural Concrete.
  - 3. ACI 350 – Code Requirements for Environmental Engineering Concrete Structures.
  - 4. ACI SP-66 - ACI Detailing Manual.
  
- B. ASTM International:
  - 1. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
  - 2. ASTM A184/A184M - Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
  - 3. ASTM A497 - Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
  - 4. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
  - 5. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
  - 6. ASTM A704/A704M - Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement.
  - 7. ASTM A706/A706M - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
  - 8. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
  - 9. ASTM A775/A775M - Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
  - 10. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement.
  - 11. ASTM A934/A934M - Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars.
  - 12. ASTM A996/A996M - Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement.
  - 13. ASTM D3963/D3963M - Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Reinforcing Steel Bars.
  
- C. American Welding Society:

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1. AWS D1.4 - Structural Welding Code - Reinforcing Steel.

- D. Concrete Reinforcing Steel Institute:
1. CRSI - Manual of Standard Practice.
  2. CRSI - Placing Reinforcing Bars.

1.3 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate bar sizes, spacings, locations, and quantities of reinforcing steel, bending and cutting schedules, and supporting and spacing devices.
- C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.
- D. Submit certified copies of mill test report of reinforcement materials analysis.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with CRSI - Manual of Standard Practice.

1.5 COORDINATION

- A. Section 01300 - Administrative Requirements: Coordination and project conditions.
- B. Coordinate with placement of formwork, formed openings and other Work.

PART 2 PRODUCTS

2.1 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M, 60 ksi yield grade; deformed billet steel bars, unfinished.

2.2 ACCESSORY MATERIALS

- A. Tie Wire: Minimum 16 gage annealed type.
- B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions.

2.3 FABRICATION

- A. Fabricate concrete reinforcement in accordance with CRSI Manual of Practice.
- B. Locate reinforcement splices not indicated on Drawings, at point of minimum stress. Review location of splices with Engineer.

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**PART 3 EXECUTION**

**3.1 PLACEMENT**

- A. Place, support and secure reinforcement against displacement. Do not deviate from required position.
- B. Do not displace or damage vapor retarder.
- C. Accommodate placement of formed openings.
- D. Maintain concrete cover around reinforcement as follows:

Item	Coverage
Walls (exposed to weather or backfill)	2 inch
Footings and Concrete Formed Against Earth	3 inch
Slabs on Fill	3 inch

- E. Splice reinforcing where indicated on Drawings.

**3.2 FIELD QUALITY CONTROL**

- A. Section 01400 - Quality Requirements: Testing and Inspection Services.

END OF SECTION

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SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes cast-in-place concrete for the following:
  - 1. Foundation walls.
  - 2. Slabs on grade.
  - 3. Control, expansion and contraction joint devices.
  - 4. Site Structures.
  
- B. Related Sections:
  - 1. Section 03100 - Concrete Forms and Accessories: Formwork and accessories.
  - 2. Section 03200 - Concrete Reinforcement.
  - 3. Section 03390 - Concrete Curing.

1.2 REFERENCES

- A. American Concrete Institute:
  - 1. ACI 301 - Specifications for Structural Concrete.
  - 2. ACI 305 - Hot Weather Concreting.
  - 3. ACI 306.1 - Standard Specification for Cold Weather Concreting.
  - 4. ACI 318 - Building Code Requirements for Structural Concrete.
  - 5. ACI 350 – Code Requirements for Environmental Engineering Concrete Structures.
  
- B. ASTM International:
  - 1. ASTM C33 - Standard Specification for Concrete Aggregates.
  - 2. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
  - 3. ASTM C150 - Standard Specification for Portland Cement.
  - 4. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
  - 5. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
  - 6. ASTM C595 - Standard Specification for Blended Hydraulic Cements.
  - 7. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
  - 8. ASTM C1017/C1017M - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
  - 9. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
  - 10. ASTM D994 - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
  - 11. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
  - 12. ASTM D1752 - Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
  - 13. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.

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1.3 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit data on joint devices, attachment accessories, and admixtures.
- C. Design Data:
  - 1. Submit concrete mix design for each concrete strength. Submit separate mix designs when admixtures are required for the following:
    - a. Hot and cold weather concrete work.
    - b. Air entrained concrete work.
  - 2. Identify mix ingredients and proportions, including admixtures.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 301.
- B. Acquire cement and aggregate from one source for Work.
- C. Conform to ACI 305 when concreting during hot weather.
- D. Conform to ACI 306.1 when concreting during cold weather.

1.5 COORDINATION

- A. Section 01300 - Administrative Requirements: Coordination and project conditions.
- B. Coordinate placement of joint devices with erection of concrete formwork and placement of form accessories.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

- A. Cement: ASTM C150, Type II - Moderate Portland type.
- B. Fine and Coarse Aggregates: ASTM C33.
- C. Water: Clean and not detrimental to concrete.

2.2 ADMIXTURES

- A. Air Entrainment: ASTM C260.
- B. Chemical: ASTM C494/C494M Type A - Water Reducing, or Type D - Water Reducing and Retarding.
- C. Fly Ash: ASTM C618 Class C or F.
- D. Plasticizing: ASTM C1017/C1017M Type I, plasticizing, or Type II, plasticizing and retarding.

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2.3 ACCESSORIES

- A. Bonding Agent: Two component modified epoxy resin.
  - 1. Manufacturers:
    - a. Edoco Technical Prod. Model Edoco 2118 Epoxy Adhesive.
    - b. Sika Chemical Corp. Model Sikadur Hi-Mod.
    - c. Euclid Chemical Corp. Model Euco Epoxy 463 or 615.
    - d. Substitutions: Section 01600 - Product Requirements.
  
- B. Non-Shrink Grout: ASTM C1107, Grade A; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of **2,400 psi** in 48 hours and **7,000 psi** in 28 days.
  - 1. Manufacturers:
    - a. Master Builders Co. Model SET nonshrink grout
    - b. L&M Construction Chemicals Model Crystex.
    - c. Euclid Chemical Co. Model EUCO NS grout.
    - d. Substitutions: Section 01600 - Product Requirements

2.4 CONCRETE MIX

- A. Mix concrete in accordance with ACI 301. Deliver concrete in accordance with ASTM C94/C94M.
  
- B. Provide concrete for Liquid Retaining Concrete Structural Walls and Slabs to the following criteria:

<u>Unit</u>	<u>Measurement</u>
Compressive Strength (28 day)	4,500 psi
Water/Cement Ratio	Maximum 0.45 by weight (mass)
Air Entrained	6 percent +/- 1.5 percent
Fly Ash Content:	Maximum 20 percent of cement content.
Slump	4 inches (plus or minus 1 inch).
  
- C. Provide concrete for all other structural concrete to the following criteria:

<u>Unit</u>	<u>Measurement</u>
Compressive Strength (28 day)	4,000 psi
Water/Cement Ratio	Maximum 0.50 by weight (mass)
Air Entrained	6 percent +/- 1.5 percent
Fly Ash Content:	Maximum 20 percent of cement content.
Slump	4 inches (plus or minus 1 inch).
  
- D. Admixtures: Include admixture types and quantities indicated in concrete mix designs approved through submittal process.
  - 1. Use accelerating admixtures in cold weather. Use of admixtures will not relax cold weather placement requirements.
  - 2. Use set retarding admixtures during hot weather.
  - 3. Add air entraining agent to normal weight concrete mix for work exposed to exterior.

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**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. Section 01300 - Administrative Requirements: Coordination and project conditions.
- B. Verify requirements for concrete cover over reinforcement.
- C. Verify anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with placing concrete.

**3.2 PREPARATION**

- A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent.
- B. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

**3.3 PLACING CONCRETE**

- A. Place concrete in accordance with ACI 301.
- B. Notify /Engineer minimum 24 hours prior to commencement of operations.
- C. Ensure reinforcement, inserts, embedded parts, and formed expansion and contraction joints are not disturbed during concrete placement.
- D. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- E. Place concrete continuously between predetermined expansion, control, and construction joints.
- F. Saw cut joints within 12 hours after placing. Use 3/16 inch thick blade, cut into 1/4 depth of slab thickness.
- G. Screed slabs on grade level, maintaining surface flatness of maximum 1/4 inch in 10 ft.

**3.4 CURING AND PROTECTION**

- A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- C. Cure concrete surfaces to requirements of Section 03390.

**3.5 FIELD QUALITY CONTROL**

- A. Section 01400 - Quality Requirements: Testing and Inspection Services
- B. Field inspection and testing will be performed in accordance with ACI 301 and under provisions of Section 01400.



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- C. Provide free access to Work and cooperate with appointed firm.
- D. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of Work.
- E. Tests of cement and aggregates may be performed to ensure conformance with specified requirements.
- F. Three concrete test cylinders will be taken for every 75 or less cu yds of each class of concrete placed.
- G. One additional test cylinder will be taken during cold weather concreting, cured on job site under same conditions as concrete it represents.
- H. One slump test will be taken for each set of test cylinders taken.
- I. One air content test will be made for each set of test cylinders taken.
- J. Maintain records of concrete placement. Record date, location, quantity, air temperature and test samples taken.

**3.6 PATCHING**

- A. Allow Engineer to inspect concrete surfaces immediately upon removal of forms.
- B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Engineer upon discovery.
- C. Patch imperfections in accordance with ACI 301.

**3.7 DEFECTIVE CONCRETE**

- A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
- B. Repair or replacement of defective concrete will be determined by Engineer.
- C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Engineer for each individual area.

**3.8 SCHEDULE - CONCRETE TYPES AND FINISHES**

- A. Liquid Retaining Concrete Structures: 4,500 psi 28 day concrete
  - 1. Interior surfaces from top of wall to floor slab, exterior and top surfaces exposed to view to 6 inches below grade. Provide a Grout-cleaned finish per ACI 301.
  - 2. Surfaces below grade and not exposed to view. Provide a "Smooth-rubbed finish" per ACI 301.
- B. Unformed Concrete Surfaces: 4,000 psi 28 day concrete
  - 1. Top surfaces of walls. Provide a "Scratched finish" per ACI 301.
  - 2. Exterior surfaces. Provide a Nonslip finish per ACI 301.

END OF SECTION

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SECTION 03390

CONCRETE CURING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes initial and final curing of horizontal and vertical concrete surfaces.
- B. Related Sections:
  - 1. Section 03300 - Cast-In-Place Concrete.

1.2 REFERENCES

- A. American Concrete Institute:
  - 1. ACI 301 - Specifications for Structural Concrete.
  - 2. ACI 302.1 - Guide for Concrete Floor and Slab Construction.
  - 3. ACI 308 - Standard Practice for Curing Concrete.
- B. ASTM International:
  - 1. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.
  - 2. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
  - 3. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
  - 4. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting.

1.3 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Submittal procedures.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 301 and ACI 302.1.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Section 01600 - Product Requirements: Product storage and handling requirements.
- B. Deliver curing materials in manufacturer's packaging including application instructions.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Membrane Curing Compound: ASTM C309 dissipating resin.
- B. Waterproof Paper: ASTM C171, treated to prevent separation during handling and placing, standard.
- C. Polyethylene Film: ASTM C171

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**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. Section 01300 - Administrative Requirements: Coordination and project conditions.
- B. Verify substrate surfaces are ready to be cured.

**3.2 INSTALLATION - HORIZONTAL SURFACES**

- A. Cure floor surfaces in accordance with ACI 308.
- B. Membrane Curing Compound: Apply curing compound in one coat.
- C. Polyethylene Film: Spread over floor slab areas, lap edges and sides, seal with pressure sensitive tape and cover with plywood; maintain in place for 7 days.

**3.3 INSTALLATION - VERTICAL SURFACES**

- A. Cure surfaces in accordance with ACI 308.
- B. Membrane Curing Compound: Apply compound in one coat.

**3.4 PROTECTION OF FINISHED WORK**

- A. Section 01700 - Execution Requirement: Protecting finished Work.
- B. Do not permit traffic over unprotected floor surface.

**3.5 SCHEDULES**

- A. Retaining Walls: Membrane curing compound, acrylic type, clear color.

END OF SECTION

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SECTION 05120

STRUCTURAL STEEL

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Structural shapes.
  - 2. Channels and angles.
  - 3. Structural pipe.
  - 4. Structural plates and bars.
  - 5. Fasteners, connectors, and anchors.
  - 6. Grout.
  
- B. Related Sections:
  - 1. Section 05500 - Metal Fabrications: Steel fabrications affecting structural steel work.

1.2 REFERENCES

- A. American Institute of Steel Construction:
  - 1. AISC Code of Standard Practice for Steel Buildings and Bridges.
  - 2. AISC Load and Resistance Factor Design (LRFD) Specification for Structural Steel Buildings.
  - 3. AISC Load and Resistance Factor Design Specification for Single-Angle Members.
  - 4. AISC Seismic Provisions for Structural Steel Buildings.
  - 5. AISC Specification for Allowable Stress Design of Single-Angle Members.
  - 6. AISC Specification for the Design of Steel Hollow Structural Sections.
  - 7. AISC Specification for Structural Steel Buildings Allowable Stress Design, and Plastic Design.
  
- B. ASTM International:
  - 1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
  - 2. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
  - 3. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
  - 4. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - 5. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
  - 6. ASTM A193/A193M - Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.
  - 7. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
  - 8. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
  - 9. ASTM A354 - Standard Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners.

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10. ASTM A449 - Standard Specification for Quenched and Tempered Steel Bolts and Studs.
  11. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
  12. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
  13. ASTM A514/A514M - Standard Specification for High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding.
  14. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality.
  15. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.
  16. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
  17. ASTM A588/A588M - Standard Specification for High-Strength Low-Alloy Structural Steel with 50 ksi (345 Mpa) Minimum Yield Point to 4-in. (100-mm) Thick.
  18. ASTM A618 - Standard Specification for Hot-Formed Welded and Seamless High-Strength Low-Alloy Structural Tubing.
  19. ASTM A786/A786M - Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates.
  20. ASTM A847 - Standard Specification for Cold-Formed Welded and Seamless High Strength, Low Alloy Structural Tubing with Improved Atmospheric Corrosion Resistance.
  21. ASTM A852/A852M - Standard Specification for Quenched and Tempered Low-Alloy Structural Steel Plate with 70 ksi (485 MPa) Minimum Yield Strength to 4 in. (100 mm) Thick.
  22. ASTM A913/A913M - Standard Specification for High-Strength Low-Alloy Steel Shapes of Structural Quality, Produced by Quenching and Self-Tempering Process (QST).
  23. ASTM A992/A992M - Standard Specification for Structural Steel Shapes.
  24. ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
  25. ASTM E94 - Standard Guide for Radiographic Examination.
  26. ASTM E164 - Standard Practice for Ultrasonic Contact Examination of Weldments.
  27. ASTM E165 - Standard Test Method for Liquid Penetrant Examination.
  28. ASTM E709 - Standard Guide for Magnetic Particle Examination.
  29. ASTM F436 - Standard Specification for Hardened Steel Washers.
  30. ASTM F959 - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners.
  31. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
  32. ASTM F1852 - Standard Specification for Twist Off Type Tension Control Structural Bolt/Nut/Washer Assemblies, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
- C. American Welding Society:
1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
  2. AWS D1.1 - Structural Welding Code - Steel.
- D. Research Council on Structural Connections:
1. RCSC - Specification for Structural Joints Using ASTM A325 or A490 Bolts.
- E. SSPC: The Society for Protective Coatings:
1. SSPC - Steel Structures Painting Manual.

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2. SSPC Paint 15 - Steel Joist Shop Paint.
3. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).
4. SSPC SP 3 - Power Tool Cleaning.
5. SSPC SP 6 - Commercial Blast Cleaning.
6. SSPC SP 10 - Near-White Blast Cleaning.

**1.3 SUBMITTALS**

- A. Section 01330 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings:
  1. Indicate profiles, sizes, spacing, locations of structural members, attachments, and fasteners.
  2. Connections.
  3. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Mill Test Reports: Submit indicating structural strength, destructive and non-destructive test analysis.
- D. Manufacturer's Mill Certificate: Certify products meet or exceed specified requirements.
- E. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within previous 12 months.

**1.4 QUALITY ASSURANCE**

- A. Perform Work in accordance with the following:
  1. AISC Code of Standard Practice for Steel Buildings and Bridges.
  2. AISC Code of Standard Practice for Steel Buildings and Bridges. Section 10.
  3. AISC Seismic Provisions for Structural Steel Buildings.
  4. AISC Specification for Structural Steel Buildings Allowable Stress Design, and Plastic Design.

**1.5 QUALIFICATIONS**

- A. Fabricator: Company specializing in performing Work of this section with minimum 2 years documented experience.
- B. Erector: Company specializing in performing Work of this section with minimum 2 years documented experience with the following current AISC Certification:
  1. Certified Steel Erector (CSE).
  2. Advanced Certified Steel Erector (ACSE).
- C. Shop Painter: Company specializing in performing Work of this section with minimum 2 years documented experience with the following current AISC Certification:
  1. Sophisticated Paint Endorsement - Enclosed (P1).
  2. Sophisticated Paint Endorsement - Covered (P2).
  3. Sophisticated Paint Endorsement - Outside (P3).
- D. Welders and Welding Procedures: AWS D.1 qualified within previous 12 months.

**1.6 COORDINATION**

- A. Section 01300 - Administrative Requirements: Requirements for coordination.

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- B. Coordinate work with the following:
  - 1. Section 05500 for miscellaneous steel supports other than structural steel.

**PART 2 PRODUCTS**

**2.1 STRUCTURAL STEEL**

- A. Structural W-Shapes: ASTM A992/A992M or ASTM A572/A572M; Grade 50.
- B. Channels and Angles: ASTM A36/A36M.
- C. Square and Rectangular Hollow Structural Sections: ASTM A500, Grade B.
- D. Structural Pipe: ASTM A53/A53M, Grade B.
- E. Structural Plates and Bars: ASTM A36/A36M.
- F. Structural Plates: ASTM A36/A36M.

**2.2 FASTENERS, CONNECTORS, AND ANCHORS**

- A. High Strength Bolts: ASTM A325; Type 1
  - 1. Finish: Unfinished.
- B. Nuts: ASTM A563 heavy hex type.
  - 1. Finish: Unfinished.
- C. Washers: ASTM F436; Type 1, circular. Furnish clipped washers where space limitations require.
  - 1. Finish: Unfinished.
- D. Anchor Rods: ASTM F1554; Grade 36.
  - 1. Shape: Hooked.
  - 2. Plate Washers: ASTM A36/A36M.
- E. Threaded Rods: ASTM A36/A36M.
  - 1. Finish: Unfinished.

**2.3 WELDING MATERIALS**

- A. Welding Materials: AWS D1.1; type required for materials being welded.

**2.4 ACCESSORIES**

- A. Grout: Non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing minimum compressive strength of 7,000 psi at 28 days;
- B. Shop and Touch-Up Primer: SSPC Paint 15, Type 1, red oxide.
- C. Touch-Up Primer for Galvanized Surfaces: SSPC Paint 20 Type I Inorganic

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2.5 FABRICATION

- A. Continuously seal joined members by continuous welds. Grind exposed welds smooth.
- B. Fabricate connections for bolt, nut, and washer connectors.

2.6 FINISH

- A. Prepare structural component surfaces in accordance with SSPC SP 3.
- B. Shop prime structural steel members. Do not prime surfaces that will be field welded, in contact with concrete, or high strength bolted.
- C. Galvanizing for Structural Steel Members: ASTM A123/A123M; galvanize after fabrication.
- D. Galvanizing for Fasteners, Connectors, and Anchors:
  - 1. Hot-Dipped Galvanizing: ASTM A153/A153M.
  - 2. Mechanical Galvanizing: ASTM B695; Class 50 minimum.

2.7 SOURCE QUALITY CONTROL AND TESTS

- A. Section 01400 - Quality Requirements: Testing, inspection and analysis requirements.
- B. Shop test bolted and welded connections as specified for field quality control tests.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01300 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify bearing surfaces are at correct elevation.
- C. Verify anchors rods are set in correct locations and arrangements with correct exposure for steel attachment.

3.2 PREPARATION

- A. Furnish templates for installation of anchor rods and embedments in concrete work.

3.3 ERECTION

- A. Allow for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in alignment until completion of erection and installation of permanent bracing.
- B. Field weld components indicated on Drawings.
- C. Field connect members with threaded fasteners; tighten to snug tight for bearing type connections.
- D. Do not field cut or alter structural members without approval of Engineer.



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E. After erection, touch up welds and abrasions to match shop finishes.

3.4 ERECTION TOLERANCES

A. Section 01400 - Quality Requirements: Tolerances.

B. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

C. Maximum Offset From Alignment: 1/4 inch.

3.5 FIELD QUALITY CONTROL

A. Section 01400 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Bolted Connections: Inspect in accordance with AISC specifications.

1. Visually inspect all bolted connections.

C. Welding:

1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.

2. Visually inspect all welds.

D. Correct defective bolted connections and welds.

END OF SECTION

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SECTION 05500

METAL FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes shop fabricated metal items.
  - 1. Structural supports for miscellaneous attachments.
  - 2. Trash rack.
  
- B. Related Sections:
  - 1. Section 05120 - Structural Steel: Structural steel bearing plates, including anchorage.
  - 2. Section 05520 - Handrails and Railings.
  - 3. Section 03300 - Cast-In-Place Concrete: Execution requirements for embedded anchors and attachments for metal fabrications specified by this section in concrete.

1.2 REFERENCES

- A. ASTM International:
  - 1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
  - 2. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
  - 3. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - 4. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
  - 5. ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
  - 6. ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes.
  - 7. ASTM A297/A297M - Standard Specification for Steel Castings, Iron-Chromium and Iron-Chromium-Nickel, Heat Resistant, for General Application.
  - 8. ASTM A283/283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
  - 9. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
  - 10. ASTM A312/A312M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipes.
  - 11. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
  - 12. ASTM A354 - Standard Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners.
  - 13. ASTM A479/A479M - Standard Specification for Stainless Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels.
  - 14. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
  - 15. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
  - 16. ASTM A554 - Standard Specification for Welded Stainless Steel Mechanical Tubing.
  - 17. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.

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18. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
  19. ASTM B26/B26M - Standard Specification for Aluminum-Alloy Sand Castings.
  20. ASTM B85 - Standard Specification for Aluminum-Alloy Die Castings.
  21. ASTM B177 - Standard Guide for Chromium Electroplating on Steel for Engineering Use.
  22. ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
  23. ASTM F436 - Standard Specification for Hardened Steel Washers.
  24. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
- B. American Welding Society:
1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
  2. AWS D1.1 - Structural Welding Code - Steel.
- C. National Ornamental & Miscellaneous Metals Association:
1. NOMMA Guideline 1 - Joint Finishes.
- D. SSPC: The Society for Protective Coatings:
1. SSPC - Steel Structures Painting Manual.
  2. SSPC SP 1 - Solvent Cleaning.
  3. SSPC SP 10 - Near-White Blast Cleaning.
  4. SSPC Paint 15 - Steel Joist Shop Paint.
  5. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).

1.3 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Submittal requirements.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable. Indicate welded connections using standard AWS A2.0 welding symbols. Indicate net weld lengths.
- C. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within previous 12 months.

1.4 QUALITY ASSURANCE

- A. Finish joints in accordance with NOMMA Guideline 1.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Section 01600 - Product Requirements: Product storage and handling requirements.
- B. Accept metal fabrications on site in labeled shipments. Inspect for damage.
- C. Protect metal fabrications from damage by exposure to weather.

1.6 FIELD MEASUREMENTS

- A. Verify field measurements are as indicated on shop drawings.

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**PART 2 PRODUCTS**

**2.1 MATERIALS - STEEL**

- A. Steel Sections: ASTM A36/A36M.
- B. Steel Plate: ASTM A36/A36M.
- C. Steel Pipe: ASTM A53/A53M, Grade B
- D. Sheet Steel: ASTM A653/A653M, Grade 33 Structural Quality with galvanized coating.
- E. Bolts: ASTM A325; Type 1
  - 1. Finish: Unfinished.
- F. Nuts: ASTM A563 heavy hex type.
  - 1. Finish: Unfinished.
- G. Washers: ASTM F436; Type 1.
  - 1. Finish: Unfinished.
- H. Welding Materials: AWS D1.1; type required for materials being welded.
- I. Shop and Touch-Up Primer: SSPC Paint 15, Type 1, red oxide.
- J. Touch-Up Primer for Galvanized Surfaces: SSPC Paint 20 Type I Inorganic.

**2.2 STRUCTURAL SUPPORTS**

- A. Structural Supports: Steel sections, shape and size as indicated on Drawings; prime paint, one coat mill finish.

**2.3 ANCHOR BOLTS**

- A. Anchor Rods: ASTM F1554 or ASTM A307; Grade A.
  - 1. Shape: Hooked.
  - 2. Furnish with nut and washer; unfinished.

**2.4 FABRICATION**

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.

**2.5 FACTORY APPLIED FINISHES - STEEL**

- A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- B. Do not prime surfaces in direct contact with concrete or where field welding is required.
- C. Prime paint items with one coat except where galvanizing is specified.
- D. Galvanizing: ASTM A123/A123M; galvanize after fabrication.
- E. Galvanizing for Fasteners, Connectors, and Anchors:

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1. Hot-Dipped Galvanizing: ASTM A153/A153M.
2. Mechanical Galvanizing: ASTM B695; Class 50 minimum.

2.6 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01300 - Administrative Requirements: Coordination and project conditions.
- B. Verify field conditions are acceptable and are ready to receive Work.

3.2 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply steel items required to be cast into concrete with setting templates to appropriate sections.

3.3 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Make provisions for erection stresses. Install temporary bracing to maintain alignment, until permanent bracing and attachments are installed.
- C. Field weld components indicated on Drawings.
- D. Perform field welding in accordance with AWS D1.1.
- E. Obtain approval of Engineer prior to site cutting or making adjustments not scheduled.
- F. After erection, touch up welds, abrasions, and damaged finishes with prime paint or galvanizing repair paint to match shop finishes.

3.4 ERECTION TOLERANCES

- A. Section 01400 - Quality Requirements: Tolerances.
- B. Maximum Variation From Plumb: 1/4 inch per story or for every 12 ft in height whichever is greater, non-cumulative.
- C. Maximum Offset From Alignment: 1/4 inch.

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- D. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

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SECTION 05520

HANDRAILS AND RAILINGS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes pipe railings, balusters, and fittings; and handrails.
- B. Related Sections:
  - 1. Section 03300 - Cast-In-Place Concrete: Execution requirements for placement of anchors specified in this section in concrete.

1.2 REFERENCES

- A. ASTM International:
  - 1. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
  - 2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - 3. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
  - 4. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
  - 5. ASTM B177 - Standard Guide for Chromium Electroplating on Steel for Engineering Use.
  - 6. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.
  - 7. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings.
- B. National Ornamental & Miscellaneous Metals Association:
  - 1. NOMMA Guideline 1 - Joint Finishes.
- C. SSPC: The Society for Protective Coatings:
  - 1. SSPC - Steel Structures Painting Manual.
  - 2. SSPC Paint 15 - Steel Joist Shop Paint.
  - 3. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).

1.3 DESIGN REQUIREMENTS

- A. Railing assembly, wall rails, and attachments to resist lateral force of 75 lbs at any point without damage or permanent set.

1.4 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Submittal requirements.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

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1.5 QUALITY ASSURANCE

- A. Finish joints in accordance with NOMMA Guideline 1.

1.6 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 STEEL RAILING SYSTEM COMPONENTS

- A. Pipe: ASTM A53/A53M, Grade B Schedule 40
- B. Galvanizing: ASTM A123/A123M; galvanize after fabrication.
  - 1. Touch-Up Primer for Galvanized Surfaces: SSPC Paint 20 Type I Inorganic

2.2 FABRICATION

- A. Fit and shop assemble components in largest practical sizes for delivery to site.
- B. Fabricate components with joints tightly fitted and secured. Furnish spigots and sleeves to accommodate site assembly and installation.
- C. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
- E. Exterior Components: Continuously seal joined pieces by continuous welds. Drill condensate drainage holes at bottom of members at locations not encouraging water intrusion.
- F. Interior Components: Continuously seal joined pieces by continuous welds.
- G. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01300 - Administrative Requirements: Coordination and project conditions.
- B. Verify field conditions are acceptable and are ready to receive work.
- C. Verify concealed blocking and reinforcement is installed and correctly located to receive wall mounted handrails.



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3.2 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply items required to be cast into concrete and with setting templates, to appropriate sections.

3.3 INSTALLATION

- A. Install components plumb and level, accurately fitted, free from distortion or defects.
- B. Anchor railings to structure with anchors, plates.
- C. Field weld anchors as indicated on Drawings. Touch-up welds with primer. Grind welds smooth.
- D. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.
- E. Assemble with spigots and sleeves to accommodate tight joints and secure installation.

3.4 ERECTION TOLERANCES

- A. Section 01400 - Quality Requirements: Tolerances.

END OF SECTION

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SECTION 05530

GALVANIZED STEEL GRATINGS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes formed floor tread gratings;
- B. Related Sections:
  - 1. Section 05500 - Metal Fabrications.

1.2 REFERENCES

- A. ASTM International:
  - 1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
  - 2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - 3. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - 4. ASTM A666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
  - 5. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
- B. American Welding Society:
  - 1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
  - 2. AWS D1.1 - Structural Welding Code - Steel.
- C. National Association of Architectural Metal Manufacturers:
  - 1. NAAMM MBG 531 - Metal Bar Grating Manual.
  - 2. NAAMM MBG 532 - Heavy Duty Metal Bar Grating Manual.
- D. SSPC: The Society for Protective Coatings:
  - 1. SSPC - Steel Structures Painting Manual.
  - 2. SSPC SP 1 - Solvent Cleaning.
  - 3. SSPC SP 10 - Near-White Blast Cleaning.
  - 4. SSPC Paint 15 - Steel Joist Shop Paint.
  - 5. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).

1.3 PERFORMANCE REQUIREMENTS

- A. Design Live (Pedestrian) Load: Uniform load of 100 lb/sq ft minimum; concentrated load of force 300 lb.
- B. Maximum Allowable Deflection Under Live Load: 1/240 of span; size components for single span.

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1.4 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Submittal requirements.
- B. Shop Drawings: Indicate details of gratings, component supports, anchorage, openings, perimeter construction details, and tolerances. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Welders' Certificates: Submit under provisions of Section 01300, certifying welders employed on the Work, verifying AWS qualification within previous 12 months.

1.5 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.6 COORDINATION

- A. Section 01300 - Administrative Requirements: Coordination and project conditions.
- B. Coordinate Work with placement of frames, tolerances for placed frames, and openings.

PART 2 PRODUCTS

2.1 COMPONENTS

- A. Formed Steel For Welding: ASTM A36/A36M, of shapes indicated.
- B. Cross Bars: ASTM B211
- C. Welding Materials: AWS D1.1, AWS D1.2, type required for materials being welded.
- D. Touch-Up Primer for Galvanized Surfaces: SSPC Paint 20 Type I Inorganic.

2.2 ACCESSORIES

- A. Fasteners and Saddle Clips: Stainless steel.
- B. Perimeter Closure: Same material as grating.

2.3 FABRICATION

- A. Fabricate grates and plates to sizes indicated.
- B. Weld joints of intersecting metal sections.
- C. Fabricate support framing for openings.

2.4 SHOP FINISHING

- A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- B. Do not prime surfaces in direct contact with concrete or where field welding is required.
- C. Galvanizing: ASTM A123/A123M; galvanize after fabrication.

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**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. Section 01300 - Administrative Requirements: Coordination and project conditions.
- B. Verify opening sizes and dimensional tolerances are acceptable.
- C. Verify supports are correctly positioned.

**3.2 INSTALLATION**

- A. Place frames in correct position, plumb and level.
- B. Mechanically cut galvanized finish surfaces. Do not flame cut.
- C. Anchor by bolting through saddle clips.
- D. Set perimeter closure flush with top of grating and surrounding construction.
- E. Secure to prevent movement.

**3.3 ERECTION TOLERANCES**

- A. Section 01400 - Quality Requirements: Tolerances.
- B. Conform to NAAMM MBG 531.

**3.4 CLEANING**

- A. Section 01700 - Execution Requirements: Final cleaning.
- B. Clean welds and damaged coatings and apply one coats of touch-up primer.

END OF SECTION

**SP-3 PREFABRICATED BUILDING**

Prefabricated shed shall consist of the following:

- Interior dimensions: 10' x 12'
- 4" Concrete foundation with thickened edge meeting Mesa County Building Department Standards, including 12" minimum Class 6 Aggregate Base Course subgrade (all ground preparation, placement and compaction of basecourse materials, forming, steel reinforcing bars, and grading to provide positive flow away from the foundation is included).
- 2" x 4" studs 16" o.c.
- 7'-0" minimum interior wall height
- 4/12 Pitch gable roof
- OSB under Metal siding
- 7/16" OSB roof
- Metal roof w/ ridge vent
- 2 – 2' x 3' Single Hung Vinyl Windows
- Insulate Ceiling (R-19)
- Insulate walls (R-11)
- OSB interior walls and ceiling
- 36" x 80" 6-panel O/S exterior door (Includes commercial grade knob and deadbolt lock)
- Necessary conduit/conduit penetrations to facilitate installation of equipment identified on the project drawings.
- Other appurtenances as needed to provide a complete functional structure.
- Temporary relocation and housing of domestic water filter system and ancillary components for caretakers home.

The prefabricated building as described and shown on the project drawings shall be measured as a lump sum.

Add the following to this subsection:

**Pay Item**

Prefabricated Building (Complete in Place)

**Pay Unit**

Lump Sum

**SP- 4 KANNAH CREEK REHABILITATION TECHNICAL SPECIFICATIONS**

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**SECTION 16050 BASIC ELECTRICAL MATERIALS AND METHODS**

**PART 1 GENERAL**

**1.1 SUMMARY**

- A. This section includes basic electrical requirements for materials and methods applicable to electrical equipment specified under this section and other related sections.
  - 1. Conduit
  - 2. Boxes
  - 3. Wire and Cable
  - 4. Wiring Devices and Device Plates
  - 5. Maintenance Materials
  - 6. Grounding Materials
  - 7. Luminaries
  - 8. Power Panels

**1.2 REFERENCES**

- A. UL – All applicable standards
- B. IEEE – All applicable standards
- C. IPCEA – All applicable standards
- D. NEMA – All applicable standards
- E. ANSI/NFPA 70 – National Electrical Code
- F. ANSI C2 – National Electrical Safety Code

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- G. ANSI/NEMA FB 1 – Fittings and Supports for Conduit and Cable Assemblies
- H. ANSI/NEMA OS 1 – Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports
- I. ANSI/NEMA OS 2 – Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports
- J. NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum)

**1.3 SUBMITTALS**

- A. Information covering all material that is to be used on this project shall be submitted.
- B. Each sheet of descriptive literature shall be clearly marked to identify the material or equipment for which it pertains.
- C. Equipment on submitted sheets that is not for this project shall be crossed out.
- D. As a minimum the following information shall be submitted:
  - 1. Lamp fixture descriptive sheets identified by the fixture schedule letter
  - 2. Equipment sheets shall identify what the equipment refers to by calling out the name of the equipment on the sheet.
  - 3. Schematics and connection diagrams for all electrical equipment shall be submitted.
  - 4. Submit all types of conduit and cables with manufacturer and sizes as well as all appurtenances.

**1.4 QUALITY ASSURANCE**

- A. Supplier's qualifications
  - 1. The entire system shall be designed, coordinated, and supplied by a qualified Electrical Contractor who is regularly engaged in the business of building electrical systems for water and wastewater projects. The Electrical Contractor shall provide a "Statement of Qualifications" indicating that they have successfully provided similar work for at least 5 years.
- B. Coordination
  - 1. The electrical equipment shall be designed and coordinated for proper operation with related equipment and materials furnished by other suppliers under other sections of these specifications. All devices shall be applied in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the instrument or device manufacturer and the manufacturer of related equipment.
  - 2. Installation drawings shall be prepared for interconnecting wiring and piping between the related equipment and the equipment furnished under this section. All interconnecting wiring shall be appropriate for the service and shall result in a properly functioning system.

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3. The Contractor shall provide coordination with other contractors and supervision of installation as required during construction.
4. All service entrance work shall be in accordance with the local utility standards.
5. The electrical contractor shall coordinate all service entrance work with the local utility.
6. The electrical contractor shall NOT pay for the utility's work. That shall be billed directly to the owner.
7. Accurately record actual locations of conduit, duct banks, panels, and accessories.

#### 1.5 REGULATORY REQUIREMENTS

- A. Conform to applicable Building Code.
- B. Electrical: Conform to latest version of NFPA 70.
- C. Coordinate, obtain and pay for all permits, inspections and approvals of authority having jurisdiction.
- D. Comply with local electrical codes in force or in the absence of local electrical code, the latest edition of the National Electrical Code, ANSI C1.

#### 1.6 WARRANTY

- A. The electrical contractor shall warrant the supplied equipment and labor for a period of one year from the date of system acceptance.

### PART 2 PRODUCTS

#### 2.1 GENERAL REQUIREMENTS

- A. The work for this project is at a functioning municipal water diversion facility and private residence. All new work shall be done in a way that allows the existing facilities to maintain its operation.
- B. All equipment furnished under this Section shall be selected by the Contractor for its superior quality and intended performance. Unless indicated otherwise, all equipment and material shall be new, undamaged, and meet the requirements of UL. Where UL requirements are not applicable, equipment and material shall be identified as such by the supplier and approved by the Engineer before purchase and installation. Equipment and materials used shall be subject to review and shall comply with the following requirements.
  1. Conduit
    - a. Minimum Size:  $\frac{3}{4}$  inch unless otherwise specified, or  $\frac{1}{2}$  inch for luminaries pendants.
    - b. Underground Installations:



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- i) Over 100V: More than five feet from foundation wall: Use thick wall nonmetallic conduit.
- ii) Within five feet from foundation wall: Use rigid steel conduit
- iii) Under 100V: Use rigid steel conduit
- iv) Minimum size: 1 inch.
- c. Outdoor Locations, Above Grade: Use PVC-Coated rigid steel conduit.
  - i) This shall include all conduits in the UV area.
- d. In chemical rooms: Use PVC-Coated rigid steel conduit.
- e. In Slab Above Grade:
  - i) Use rigid steel conduit for circuits that are 24V or less.
  - ii) Use rigid thick wall non-metallic conduit for 120V to 480V circuits.
  - iii) Maximum Size Conduit in Slab: 2 inch, 1 inch for conduits that cross over each other, or with structural engineer's approval.
  - iv) Conduits shall not be spaced closer than 3 conduit widths on center.
  - v) Aluminum conduit shall not be embedded in concrete.
  - vi) Conduits shall not pass through a structural concrete beam without the structural engineer's approval.
- f. In or under slab on grade:
  - i) Use rigid steel conduit for circuits that are 24V or less.
  - ii) Use rigid thick wall non-metallic conduit.
- g. Wet and damp locations: Use rigid steel conduit or aluminum conduit.
- h. Dry locations:
  - i) Concealed: In walls or above ceilings, use rigid steel or aluminum conduit.
  - ii) Exposed: Use rigid steel conduit or aluminum conduit.
- i. Rigid Steel Conduit.
  - i) Rigid steel conduit shall be heavy wall, hot-dipped galvanized, and shall conform to Fed Spec WW-C-581 and ANSI C80.1, and shall be manufactured in accordance with UL 6.
- j. Rigid Nonmetallic Conduit (PVC).
  - i) PVC conduit shall be heavy wall, schedule 40, shall be UL labeled for aboveground and underground uses.
- k. PVC-Coated Rigid Steel Conduit.
  - i) The conduit shall be rigid steel and before the PVC coating is applied, the hot-dipped galvanized surfaces shall be coated with a primer to ensure a bond between the steel substrate and the coating. The PVC coating shall be bonded to the primed outer surface of the conduit at a thickness of at least 40 mils. A two part urethane chemically cured coating shall be applied at a nominal 2 mil thickness to the interior of all conduit and fittings.
  - ii) Manufacturers: Ocal, PermaCote, or Robroy Industries.
- l. Rigid Aluminum Conduit.
  - i) Rigid aluminum conduit shall be heavy wall and shall conform to Fed Spec WW-C-581 and ANSI C80.1, and shall be manufactured in accordance with UL 6.
- m. Flexible connections

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- i) Conduit: Moisture proof vinyl jacketed, liquid-tight, hot-dipped galvanized flexible steel and shall be UL labeled.
  - ii) Connectors: Watertight, Appleton Type ST or STB, Crouse-Hinds Type LT or LTC, or equal.
2. Outlet Boxes
- a. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, Galvanized.
    - i) Luminaries and equipment supporting boxes: rated for weight of equipment supported.
    - ii) Concealed installations.
  - b. Nonmetallic outlet boxes: ANSI/NEMA OS 2.
  - c. Cast Boxes: NEMA FB 1, Type FD, Cast Ferroalloy.
    - i) Provide gasketed cover by box manufacturer.
    - ii) Provide threaded hubs.
    - iii) Models VXF, GRFX as manufactured by Crouse-Hinds.
    - iv) Models SEH, JBDX, with mounting lugs as manufactured by Appleton.
3. Pull and Junction
- a. Sheet Metal Boxes: NEMA OS 1, Galvanized Steel.
  - b. Surface-Mounted Cast Metal Box: NEMA 250, Type 4 flat-flanged, surface-mounted junction box.
    - i) Material: Galvanized cast iron Cast aluminum in corrosive areas.
    - ii) Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.
    - iii) Model: WCB as manufactured by Crouse-Hinds.
  - c. In-Ground Cast Metal Box: NEMA 250, Type 6, outside flanged, recessed cover box for flush mounting.
    - i) Material: Galvanized cast iron.
    - ii) Cover: Nonskid cover with neoprene gasket and stainless steel cover screws.
    - iii) Cover Legend: ELECTRIC.
    - iv) Model: WPD as manufactured by Crouse-Hinds.
4. Large Junction Boxes and Wiring Gutters
- a. Indoor Locations:
    - i) Steel, NEMA 12.
  - b. Outdoors:
    - i) Stainless steel.
    - ii) Weather-tight NEMA 4.
  - c. Construction.
    - i) Provide rigid handles for box covers larger than 9 sq. ft. or heavier than 25 lbs.
    - ii) Provide split covers for covers larger than 12 sq. ft.
    - iii) Aluminum boxes in concrete not allowed.
5. Seal Fittings
- a. Model ESU with Apelco sealing cement and fiber, as manufactured by Appleton.

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- b. Model EZS with Chico X Fiber and Chico A compound as manufactured by Crouse-Hinds.
- 6. Deflection Fittings
  - a. Locations:
    - i) Underground conduit runs.
    - ii) Runs between concrete sections subject to relative movement.
  - b. Material:
    - i) Ferroalloy hubs.
    - ii) Neoprene outer jacket.
    - iii) Stainless steel jacket clamps.
    - iv) Molded plastic inner sleeve.
    - v) Tinned copper braid grounding strap.
  - c. Model XD as Manufactured by Crouse-Hinds.
- 7. Expansion Fittings
  - a. Locations:
    - i) In long conduit runs, to permit linear movement caused by thermal expansion and contraction.
    - ii) In long conduit runs to prevent conduit from buckling.
    - iii) Indoors and outdoors, where conduit expansion occurs or where there is a wide temperature range.
    - iv) At structural expansion joints.
  - b. Material:
    - i) End fittings: Ferroalloy.
    - ii) Body: Steel conduit.
  - c. Provide Bonding Strap When Used Outdoors.
  - d. Model XJ, as Manufactured by Appleton and Crouse-Hinds.
- 8. Flexible Sealing Compound
  - a. "Duxseal" as Manufactured by Johns-Manville.
  - b. "Permagum" as Manufactured by In mount.
- 9. Coal Tar Epoxy Paint
- 10. Wire and Cable
  - a. 600 Volt Power Cable
    - i) General Use:
      - a) Conductors: Single, copper, 12 AWG minimum.
      - b) All conductors shall be stranded.
      - c) Insulation: 600V thermoplastic, UL Type THWN/THHN.
      - d) Suitability: Wet or dry locations at 75° C and 90° C copper temperature.
      - e) Or as specified for service entrances.
    - ii) Service entrance and 4 AWG and above:
      - a) Conductors: Single, stranded, copper.
      - b) Insulation: 600V cross-linked polyethylene, UL Type XHHW/USE or THHN.
      - c) Suitability: Wet or dry locations at 75°C and 90° C copper temperature.
    - iii) Terminations

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- a) Lugs, cup washers or pressure type; do not use wire nuts on stranded cable or wrap standard cable around screw type terminals
- b. Lighting Circuits
  - i) General Use:
    - a) Conductors: Single, copper, 12 AWG minimum.
    - b) Conductors may be solid or stranded.
    - c) Insulation: 600V thermoplastic, UL Type THWN/THHN.
    - d) Suitability: Wet or dry locations at 75° C and 90° C copper temperature.
  - ii) Terminations:
    - a) Lugs, cup washers or pressure type; do not use wire nuts on stranded cable or wrap stranded cable around screw type terminals.
- c. Control circuits
  - i) General Use:
    - a) Conductors: Single, tinned copper, 14 AWG
    - b) All conductors shall be stranded
    - c) Insulation: 600V thermoplastic, UL Type THWN/THHN.
  - ii) Millivolt or Milliampere Instrumentation and Control.
    - a) Conductors: 18 AWG stranded copper, 2 or 3 as required.
    - b) Insulation: 15 mils, minimum, 90°C PVC.
    - c) Shield: Mylar aluminum tape with 20 AWG copper drain wire, fully covering conductors.
    - d) Jacket: 20 mils, minimum, 80°C PVC.
    - e) Suitability: Wet or dry steel conduit.
  - iii) Manufacturers: Belden "UL Instrumentation Cable – 1032A", Samuel Moore "Dekoron ICMX" No. 1852-686 and 1862-686, or equal.
- d. Telephone and Networking
  - i) Cable.
    - a) The cables shall be rated for use in communications circuits.
    - b) The cables shall be rated for riser applications.
    - c) The cables shall be rated for 75 degrees Celsius applications.
    - d) The cables shall be free of defects and splices.
    - e) The cables shall be rated for outdoor applications.
    - f) The cables shall be rated for P-MSHA applications.
    - g) The cables shall pass a -40 degree Celsius cold bend test per UL 1581.
    - h) The cables must be UL third party verified to ANSI/TIA/EIA-586-B.2 Category 5e.
    - i) The cable shall be ROHS compliant.
    - j) The cable shall be CE compliant.
    - k) Conductors
      - 1) The conductors shall be solid, bare copper per ASTM B-3.
      - 2) The conductors shall be #24 AWG (.20 sq mm).
    - l) Insulation
      - 1) The insulation shall be polyolefin.
      - 2) The insulation shall be free of defects and splices.

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- m) Pairs
  - 1) The cable shall contain four pairs.
  - 2) The insulated conductors shall be bonded together down the entire length of the pair.
  - 3) The pairs shall be marked with a permanent, extruded stripe identification of tip and ring insulated conductors.
  - 4) Each pair shall have a unique twist length to minimize pair to pair coupling.
- n) Shielding
  - 1) Shielding shall be an aluminized foil with the foil facing inward, where required.
  - 2) Unshielded cables shall be acceptable except where shielding is required for the system.
- o) Jacket.
  - 1) All cables shall have a continuous jacket of Polyvinyl Chloride (PVC).
  - 2) Jacket thickness: The jackets shall be .030" (.75 mm) nominal thickness.
  - 3) The jackets shall be ultraviolet (UV) radiation and sunlight resistant per UL 1581.
  - 4) The jackets shall be oil resistant per UL 1581 Class 43.
- p) Manufacturer: Belden "Industrial Data Solutions – 7923A" or equal.
- ii) Arc-Proofing Tape: Irvingon "77 Arc-Proofing Tape", Slipknot No. 50 or Slipknot No. 3, or approved equal.
- e. Fiber-Optic Cabling System
  - i) The optical fiber cabling system should use matched components from a single manufacturer, and the cabling system should be certified to deliver system performance over the lifetime of the applications for which the cabling system was originally designed to support.
  - ii) The optical fiber cabling system should comply with the following standards:
    - a) ANSI/TIA-EIA-568-C.0
    - b) ANSI/TIA-EIA-568-C.1
    - c) ANSI/TIA-EIA-568-C.3
  - iii) All cables and termination hardware should be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements of ANSI/TIA/EIA-568-C.0, C.1 and C.3. All fibers of every installed cable should be verified prior to system acceptance. Any defect in the cabling system installation including, but not limited to, cable, patch panels, and connectors should be repaired or replaced in order to ensure 100% useable conductors in all cables installed.
  - iv) Cable
    - a) The optical fiber cable should be designed for outdoor applications such as lashed aerial or underground conduit installations as well as for indoor applications.

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- b) The optical fiber cable should have a waterblocking tape to protect from water migration.
- c) The optical fiber cable should be fully dielectric, with no metallic elements in the cable.
- d) The optical fiber cable should have fiber tubes that are color coded for easy identification.
- e) The optical fiber cable shall have an indoor and outdoor operating temperature of -40°C to +70°C.
- f) The optical fiber cable should be UL/cUL rated type OFNR/OFN FT4 as per the flame resistance standard UL 1666 and a Low Smoke Zero Halogen (LSZH) versions.
- g) The length of the optical fiber cable shall be determined on site by the contractor.
- h) The optical fiber cable shall be Multimode OM-1, 62.5 μm, 12 fibers, indoor/outdoor, as manufactured by Belden or approved equal.
- v) Brilliance Fiber Optic Connectors
  - a) Brilliance Optical Fiber Field Installable Connectors shall provide rapid mechanism for the field-connectorization of multimode 62.5/125-micron, fiber horizontal cabling with SC connectors, and a connection point for optical fiber cord assemblies linking to Work Area station equipment.
    - 1) The optical fiber field-installable connector shall be available in SC format, for installation onto either multimode 62.5/125-micron fiber.
    - 2) The optical fiber field-installable connector shall be field installable, without requiring epoxy or polishing.
    - 3) The optical fiber field-installable connector shall be compatible with 900-micron buffered fibers and 250-micron loose-tube fibers with breakout/fanout kit.
    - 4) The optical fiber field-installable connector shall have a minimum Reflectance of -35 dB for multimode and -55 dB for single mode.
    - 5) The optical fiber field-installable connector shall have a tensile strength of 1.2 lb. (0.5 kg).
    - 6) The optical fiber field-installable connector shall have a durability rating of less than 0.2 dB for multimode and 0.3dB for single mode change after 500 cycles.
    - 7) The optical fiber field-installable connector shall be capable of re-termination up to 5 times with no performance degradation.
    - 8) The optical fiber field-installable connector shall be capable of re-termination up to 5 times without additional parts or tooling in order to un-terminate the connector.
    - 9) The optical fiber field-installable connector shall be part number AX104244-S1 as manufactured by Belden, or approved equal.

11. Wiring Devices

a. General:

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- i) Industrial Specification grade.
  - ii) White.
  - b. Receptacles:
    - i) 120 V duplex outlets: NEMA 5-20R, 3 wire, grounding, 20A, 125 V, Leviton 5362, or approved equal.
    - ii) 120 V duplex GFCI outlets: NEMA 5-20R, 3 wire, grounding, 20A, 125 V, Leviton 7899, or approved equal.
    - iii) 240 V duplex outlets: NEMA 6-20R, 3 wire, grounding, 20A, 250 V, Leviton 5462, or approved equal.
    - iv) Welding outlets: 50A, 125/250V, 3 pole, 4 wire, grounding, NEMA 14-50R, Leviton 55050, or approved equal.
  - c. Light Switches:
    - i) 277 V lighting circuits: 20 amp, 120/277 V, Leviton 1221-2W to 1224-2W, or approved equal.
12. Device Plates
- a. General:
    - i) Mounting hardware countersunk and finished to match plate.
    - ii) Provide over-sized plates where standard plates do not cover wall opening.
    - iii) Provide engraving as indicated on drawings.
  - b. Indoors:
    - i) Surface mounted devices: Galvanized or cadmium-plated steel.
    - ii) Flush mounted devices in other finished areas: Phenolic plastic, white.
    - iii) All other flush mounted devices: Type 302 stainless steel.
  - c. Outdoors and Indoors when identified on Drawings as Weatherproof:
    - i) Weatherproof with spring doors for receptacles and with provisions for padlocking switches on and off.
    - ii) Provide an adaptor plate for flush mounted device plates, Crouse-Hinds FS031, or equal.
13. Grounding and Bonding
- a. Provide rod electrodes, exothermic connections and mechanical connections.
  - b. Building perimeter ground cable shall be minimum of 4/0 AWG bare copper.
  - c. Duct bank ground cable shall be minimum of 4/0 AWG bare copper.
  - d. Other ground cable shall be as noted on the drawings.
14. Luminaries
- a. Furnish products as specified on drawings.
  - b. Install ballasts, lamps, and specified accessories at factory.
  - c. Accessories:
    - i) Provide swivel-type box covers.
    - ii) Provide threaded conduit pendants.
  - d. Provide all lamps and required mounting hardware.
15. Power Panels
- a. General:
    - i) Circuit breaker panel board.
    - ii) With neutral.
    - iii) Dead front.

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- b. Enclosure:
    - i) NEMA 12, surface in unfinished areas, NEMA 1 flush in finished areas or as indicated on the drawings.
    - ii) Door with latch and lock.
    - iii) Typewritten circuit directory.
    - iv) Ground stud bolt through cabinet with removable 1/0 AWG bond to the panel ground bus and an external clamp connector for a station ground conductor.
  - c. Circuit Breakers:
    - i) Molded case thermal magnetic.
    - ii) Multiple pole breakers shall be common trip.
    - iii) Bolt-in.
    - iv) Individually front replaceable.
    - v) Indicating "On", "Off", and "Tripped".
    - vi) RMS symmetrical interrupting capacity shall be as indicated on the drawings.
    - vii) Breakers, trip ratings, and number of poles as indicated on the drawings.
  - d. Buses:
    - i) Three phase and neutral bus insulated from cabinet.
    - ii) Ground bus.
      - a) Connected to cabinet.
      - b) Clamp type lug for supply circuit and each load circuit.
      - c) Removable bond to neutral bus.
    - iii) Copper bussing.
    - iv) Ampere and voltage ratings as indicated on the drawings.
    - v) Bracing coordinated with circuit breakers interrupting capacity.
16. Lighting Panels
- a. General:
    - i) Circuit breaker panel board.
    - ii) With neutral.
    - iii) Dead front.
  - b. Enclosure:
    - i) NEMA 1 or as indicated on the drawings.
    - ii) Door with latch and lock.
    - iii) Typewritten circuit directory.
    - iv) Ground stud bolt through cabinet with removable 1/0 AWG bond to the panel ground bus and an external clamp connector for a station ground conductor.
  - c. Circuit Breakers:
    - i) Molded case thermal magnetic.
    - ii) Multiple pole breakers shall be common trip.
    - iii) Bolt-in or plug-in.
    - iv) Individually front replaceable.
    - v) Indicating "On", "Off", and "Tripped".
    - vi) 10,000 amp RMS symmetrical interrupting capacity at 240 V.



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- vii) Handle clips to prevent casual operation for circuit breakers indicated on drawings.
  - viii) Ground fault interrupting breakers with a sensitivity of 5mA for receptacle branch circuit and where indicated on drawings.
  - ix) Breakers, trip ratings, and number of poles as indicated on the drawings.
  - d. Buses:
    - i) Two phase and neutral bus insulated from cabinet.
    - ii) Ground bus.
      - a) Connected to cabinet.
      - b) Clamp type lug for supply circuit and each load circuit.
      - c) Removable bond to neutral bus.
    - iii) Copper.
    - iv) Ampere and voltage ratings as indicated on the drawings.
    - v) Bracing coordinated with circuit breakers interrupting capacity.
17. Dry-Type Specialty Transformers.
- a. Phase, voltage current ratings as indicated on drawings.
  - b. Two 2½% full capacity taps below normal voltage.
  - c. Dry type, wall floor or MCC mounted as indicated on the drawings, enclosed for wiring in conduit.
  - d. Self air-cooled.
  - e. Suitable for indoor NEMA 4.
  - f. Insulation system and average winding temperature rise for rated KVA as follows:
    - i) 1-15 KVA: Class 185 with 115°C rise.
    - ii) 16-500 KVA: Class 220 with 115°C rise.
  - g. Sound Levels: NEMA ST20.
  - h. Ground core and coil assembly to enclose by means of a visible flexible copper grounding strap.
  - i. Nameplate: Include transformer connection data and overload capacity based on rated allowable temperature rise
18. Control Stations.
- a. Enclosures:
    - i) Indoors: NEMA 4X.
    - ii) Outdoors: NEMA 4X
  - b. Pilot Devices:
    - i) Refer to specification section 16900.
  - c. Nameplates:
    - i) Pilot devices: Laminated plastic nameplates, white surface with a black core, engraved to identify controlled motor or equipment.
    - ii) Control station: Laminated plastic nameplates, white surface with a black core, engraved to identify controlled motor or equipment.
19. Equipment Disconnects
- a. General:
    - i) Heavy-duty safety switches.
    - ii) Square D or Cutler-Hammer.
  - b. Enclosure:

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- i) Indoor dry areas: NEMA 12.
  - ii) Outdoor: NEMA 4X.
  - iii) Corrosive Areas: NEMA 4X.
  - iv) Use above guidelines unless otherwise noted on drawings.
  - v) Padlocked external operating handle.
- c. Switch:
- i) 25,000 amp symmetrical withstand.
  - ii) Poles to match equipment served.
  - iii) 600 VAC.
  - iv) Continuous current rating not less than the serving branch circuit over current protection.
  - v) Non-fusible except where fusing is required by the served equipment or as noted on the drawings.
20. Surge Protective Device (SPD).
- a. General:
- i) SPD units shall be installed as shown on the drawings.
  - ii) SPD units shall be appropriate for the voltages indicated on the drawings.
  - iii) Approved manufacturers: Cutler Hammer, Square D, LEA, or equal.
  - iv) SPD units shall comply with UL 1449 and 1283.
  - v) SPD units shall comply with IEEE C62.41 and IEEE C62.45.
  - vi) SPD units shall have a 30 amp disconnect directly before the TVSS unit.
  - vii) SPD units shall have indication for trouble alarms and surge count.
  - viii) For assembled equipment, the SPD unit shall be of the same manufacturer as the assembled equipment.
- b. Ratings:
- i) Maximum let through voltage shall be:

Mode	120/208	277/480
L-N or L-G	400V	800V
L-L	800V	1800V
  - ii) Minimum total surge current capability:

Location	Per Phase	Per Mode
Switchgear	250 KA	125KA
MCC	160KA	80KA
Panelboards	120KA	60KA

**PART 3 EXECUTION**

**3.1 INSTALLATION REQUIREMENTS**

**A. General Requirements**

- 1. The instrumentation equipment shall be installed by the Contractor or his subcontractors in accordance with the manufacturers' instructions. The services of the system supplier's technical representative shall be provided as necessary to calibrate, test, and advise others of procedures for adjustment and operation.

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**B. Inspection**

1. Inspect materials and equipment for signs of damage, deterioration or other deleterious effects of storage, transportation, handling, or defects in manufacture or assembly.
  - a. Replace with identical new materials or equipment or repair to like new condition any materials or equipment showing such effects to the satisfaction of the Engineer and Owner.

**C. Equipment Installation**

1. Handle, install, connect, clean, condition, align and adjust products and equipment in strict accordance with manufacturer's instructions and in conformity with specification requirements.
  - a. Separate sheet metal junction boxes, equipment enclosures, sheet metal raceways, etc., mounted on water or earth-bearing walls or wall-mounted outdoors  $\frac{1}{4}$ " from wall be corrosion resistant spacer.
  - b. Seal the base of all outdoor switchgear, motor control center, and similar equipment with grout.
  - c. Screen or seal with flexible sealing compound all openings into outdoor equipment to prevent the entrance of rodents, wasps, and mud-daubers.
  - d. Electrical work shall conform to the construction schedule and progress of other trades.
  - e. Maintain one complete set of manufacturer's installation instructions at the jobsite during installation and until installation is accepted by the Engineer and Owner.
  - f. Perform all work in accordance with manufacturer's instructions.
    - i) Do not omit any preparatory step or installation procedure unless specifically modified or exempted by contract documents.
    - ii) Should job conditions or specification requirements conflict with manufacturer's instructions, consult with Engineer prior to proceeding.
  - g. Field Wiring. Field wiring materials and installation shall conform to the requirements of the electrical section.

**D. Identification:**

1. Conduit. All conduits shall be provided with identification tags. Tags shall be brass nameplates with  $\frac{3}{8}$ " high lettering and attached to the conduits by means of stainless steel wire. Conduits shall be identified at both ends with the same identification number.
2. Cable. Except for lighting and receptacle circuits, each individual wire in power, control, indication, and instrumentation circuits shall be provided with identification markers at the point of termination. Power wires without individualized identification numbers shall be color coded with electrical tape or colored wire jacket. The wire markers shall be of the heat-shrinkable tube type.
3. Control Stations. Control stations shall be provided with nameplates identifying the related equipment. Pilot controls and indicating lights shall have engraved or etched legends ("start", "stop", etc.) as indicated on the drawings. Nameplates shall be laminated plastic, with  $\frac{1}{8}$  inch engraved letters, and shall be securely fastened to the control stations.

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4. Circuit Breakers. Circuit breakers shall be provided with nameplates identifying related equipment. Nameplates shall be laminated plastic, with 1/8 inch engraved letters, and shall be securely fastened to the circuit breakers.
- E. Raceways:
1. General:
    - a. Except as otherwise indicated on drawings, conduit shall be concealed in finished areas and exposed in unfinished areas.
    - b. Rigid steel conduit and aluminum conduit connections and terminations shall be reamed, de-burred, threaded and provided with bushings.
    - c. Securely fasten conduit connections to sheet metal enclosures with locknuts inside and out. Conduit hubs outdoors and in wet locations.
    - d. Provide deflection fittings across structural joints where structural movement is allowed.
    - e. Keep conduit clear of structural openings and indicated future openings.
    - f. Provide flashing and seal watertight conduits through roofs and metal walls.
    - g. Neatly grout conduit into any opening cut into structure.
    - h. Cap or plug conduits during construction to prevent the entrance of trash, dirt and water.
    - i. Minimum conduit size shall be  $\frac{3}{4}$ " , except  $\frac{1}{2}$ " for luminaries pendants or as noted on drawings.
    - j. Seal conduits with flexible sealing compound forced to a minimum depth equal to the conduit diameter after cable is installed.
      - i) At handholes, manholes, and vaults.
      - ii) Building entrance junction boxes.
      - iii) One inch or larger connections to equipment.
      - iv) All conduits exiting the UV area.
      - v) All conduits exiting chemical rooms.
    - k. Provide flexible conduit where flexible connections are necessary, including each motor without flexible cord.
      - i) Keep length to a minimum, not to exceed 6' maximum.
      - ii) No sharp bends.
    - l. Provide suitable pull string in each empty or spare conduit.
  2. Conduit exposed in structures:
    - a. Install parallel to structural members and surface.
    - b. Install conduits of the same general routing parallel with symmetrical bends.
    - c. Arrange supports to prevent misalignment during wiring installation.
    - d. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
    - e. Group related conduits; support using conduit rack. Construct rack using steel channel provide space on each for 25 percent additional conduits.
    - f. Install no more than equivalent of three 90° bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use factory elbows for bends in metal conduit larger than 2 inch size.
    - g. Provide suitable pull string in each empty conduit except sleeves and nipples.
    - h. Maintain 6" clearance to ducts, piping and flues.

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- i. Support rigidly with galvanized or cadmium-plated hardware and framing materials, including nuts and bolts.
  - j. Provide expansion fittings at 100' centers outdoors, 200' centers indoors; in each conduit run longer than 100' outdoors, 200' indoors.
  - k. Provide galvanized pipe caps on conduit stubs for future use.
  - l. Allow 7' headroom for horizontal conduit runs, except along structures, piping equipment or where not possible.
  - m. Except as otherwise indicated, do not install exposed conduit in water chambers.
  - n. Where allowed, coat conduit exposed in water chambers with 2 coats of coal tar paint with paint injuries repaired or use PVC coated conduit.
3. Conduit concealed in structure:
- a. Install between reinforcing steel in slabs with reinforcing in both faces.
  - b. Install under reinforcing steel in slabs where only a single layer is provided.
  - c. Terminate conduit for future use in equipment or by galvanized couplings and conduit plugs flush with structural surfaces. Seal plugs with self-leveling caulk.
  - d. Maximum of two conduits crossing each other in slab.
4. Underground:
- a. One inch minimum.
  - b. Encased in concrete.
    - i) Two inches between conduits.
    - ii) Three inches over conduit where not reinforced.
    - iii) Three inches over reinforcing.
    - iv) Reinforced at and 5' past portion on disturbed earth or subject to traffic.
    - v) Reinforced within 5' of a structure, manhole or vault.
    - vi) Reinforced for entire length and 2' beyond each adapter to steel conduit if non-metallic is used in duct bank.
    - vii) Where capped underground, reinforce the last 2' and extend steel and conduit 2' past end of duct bank. Paint all un-encased metal with 2 coats of coal tar paint.
    - viii) Continue encasement on outdoor risers to 3" above grade and crown and chamfer top.
  - c. Two foot minimum bend radius at vertical risers, 3 foot elsewhere.
  - d. Install underground conduit so that it does not drain to cable pulling access in buildings; where necessary, provide a handhole or manhole near or adjacent to building.
  - e. Provide 3 foot minimum earth cover.
  - f. Install underground conduits through buildings, manhole, handhole and vault walls in box outs as indicated on the drawings.
  - g. All steel inside manholes, handholes and vaults shall be galvanized with bared spots treated with zinc rich paint.
  - h. Provide ¾" galvanized steel pulling eyes on opposite walls below the centerline of each duct bank.
  - i. Provide end bells at wall terminations and adapters for steel conduit continuations for non-metallic duct systems.

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- j. Isolate intercommunication and milliampere level instrumentation circuits from all power wiring raceways, conduits, boxes, vaults, manhole and handhole.
  - k. Provide a full-size extension for each underground conduit entering a building.
  - l. Rigid nonmetallic conduit (PVC) shall be fastened no less than every 4 feet.
5. Junction boxes and wiring gutters:
- a. Install electrical boxes as shown on drawings and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.
  - b. Install pull boxes and junction boxes to maintain headroom and to present neat mechanical appearance.
  - c. Install level and plumb.
  - d. Where indicated, provide a removable side opposite underground duct banks.
  - e. At least code size including space for full size continuation of any conduit not originally continued.
  - f. Arrange conduit for maximum space for future conduits.
  - g. Support boxes independently of conduit except cast box that is connected to rigid metal conduits both supported within 12 inches of box.
- F. Wire and Cable
1. General:
- a. Protect the cable and avoid kinking conductors, cutting or puncturing jackets, contaminating by oil or grease or damaging in any manner.
  - b. Terminate stranded cable with lugs, cup washers, or pressure type connectors; do not wrap stranded cable around screw type terminals.
  - c. Splice stranded cable with pressure type connectors; do not use wire nut type connectors on stranded cable.
  - d. Splice cables only at readily accessible locations.
  - e. Do not pull cable tight against bushings or press heavily against enclosures.
  - f. Use cable pulling lubricants as recommended by the cable manufacturer.
  - g. Use swab to clean conduits and ducts before pulling cables.
  - h. Install cable and accessories in accordance with manufacturer's instructions.
  - i. Where necessary to prevent heavy loading of cable connectors due to cable weight, support cables in vertical risers with woven cable grips.
  - j. Coil and tape spare cable ends.
  - k. Support each 250 MCM or larger cable, and each conduit group of smaller cables from manholes, handholes or vault walls.
  - l. Use Stranded conductor for feeders and branch circuits.
  - m. Use stranded conductors for control circuits.
  - n. Use conductor not smaller than 12 AWG for power and lighting circuits.
  - o. Use conductor not smaller than 16 AWG for control circuits.
  - p. Use 10 AWG conductors for 20 ampere, 120 Volt branch circuits longer than 100 feet.
  - q. Pull all conductors into raceway at same time.
  - r. Use suitable wire pulling lubricant for building wire 8 AWG and larger.
  - s. Protect exposed cable from damage.
  - t. Neatly train and lace wiring inside boxes, equipment, and panel boards.

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- u. Clean conductor surfaces before installing lugs and connectors.
- v. Make splices, taps, and terminations to carry full ampacity of conductors.
- 2. Special cables:
  - a. Isolate networking and milliampere level instrumentation cables from all power circuits.
  - b. Isolate telephone cables from all other circuits.
- 3. Conductor identification:
  - a. Color code all service, feeder, and branch circuit conductors, 277/480 VAC and above as follow:
    - i) Phase A: Brown
    - ii) Phase B: Orange
    - iii) Phase C: Yellow
    - iv) Neutral: White
    - v) Ground: Bare or Green
  - b. Color code all feeder, and branch circuit conductors, 120/208 VAC as follows:
    - i) Phase A: Red.
    - ii) Phase B: Black.
    - iii) Phase C: Blue.
    - iv) Neutral: White.
    - v) Ground: Bare or Green.
  - c. Identify single control conductors by color coding orange and by labeling each end of conductors by color coding orange and by labeling each end of conductor with heat shrink-tube type wire markers.
  - d. Identify multi-conductor instrumentation and control cables with heat shrink-tube type wire markers.
  - e. Contractor shall establish a control and instrumentation conductor and cable identification system acceptable to Engineer.
- G. Wiring Devices:
  - 1. Flush mount wiring devices in concealed conduit system.
  - 2. Surface mount wiring devices in exposed conduit systems.
  - 3. Provide extension rings to bring outlet boxes flush with finished surface.
  - 4. Clean debris from outlet boxes.
  - 5. Install products in accordance with manufacturer's instructions.
  - 6. Install devices plumb and level.
  - 7. Install switches with OFF position down.
  - 8. Install receptacles with grounding pole on bottom.
  - 9. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.
  - 10. Connect wiring devices by wrapping conductor around screw terminal.
  - 11. Use jumbo size plates for outlets installed in masonry walls.
  - 12. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.
  - 13. Install wall switch 48 inches above finished floor.
  - 14. Install convenience receptacle 24 inches above finished floor.
  - 15. Inspect each wiring device for defects.
  - 16. Operate each wall switch with circuit energized and verify proper operation.

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17. Verify that each receptacle device is energized.
18. Test each receptacle device for proper polarity.
19. Test each GFCI receptacle device for proper operation.
20. Adjust devices and wall plates to be flush and level.

H. Grounding Materials:

1. Coordinate installation with other disciplines.
2. Verify that final backfill and compaction has been completed before driving rod electrodes.
3. Install Products in accordance with manufacturer's instructions.
4. Install rod electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground.
5. Provide grounding electrode conductor and connect to reinforcing steel in foundation footing.
6. Provide bonding to meet Regulatory Requirements.
7. Install ground cable through building walls within 3' below finish grade and prepare a water stop.
8. Install ground rods and cables as deep in earth as possible and as far from structure as possible, not closer than 6".
9. All branch circuit and feeder circuits to include a copper ground conductor in addition to the conduit ground connection.
10. Connect ground conductors to equipment by ground lugs or clamps.
  - a. If no ground bus or terminal is provided and enclosure is not explosion-proof or submersible provide a clamp type lug under a permanent assembly bolt or by grounding locknuts or bushings.
  - b. If an explosion-proof or submersible enclosure is not provided with grounding means, provide an adjacent junction box with a ground lug.
  - c. Bond grounding system to station piping by connection to the first flange inside the building on either a suction or discharge pipe which will form a good ground connection:
    - i) Drill and tap the flange.
    - ii) Provide a bolted connection.
    - iii) Bond with a copper bar or strap.
  - d. Form ground conductors on equipment to the contours of the equipment.
  - e. Install main ground cables with encased underground conduit banks in earth at least 3" below 1 corner of the duct bank.
  - f. Bond ground cables in underground circuits to main ground cables at each manhole, handhole, and vault.

I. Luminaries

1. Install in the general locations and arrangement indicated on drawings.
2. Align luminaries in rows vertically and horizontally except as otherwise required.
3. Install clear of pipes, mechanical equipment, structural openings, indicated future equipment and structural openings, and other obstructions.
4. Adjust luminaries location as required by field conditions.
5. Examine each luminaries to determine suitability for lamps specified.
6. Install in accordance with manufacturer's instructions.



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7. Install suspended luminaries using pendants supported from swivel hangers. Provide pendant length required to suspend luminaries at indicated height.
8. Support luminaries larger than 2x4 foot size independent of ceiling framing.
9. Locate recessed ceiling luminaries as indicated on reflected ceiling plan.
10. Install surface mounted luminaries and exit signs plumb and adjust to align with building lines and with each other. Secure to prohibit movement.
11. Install recessed luminaries to permit removal from below.
12. Install accessories furnished with each luminaire.
13. Bond products and metal accessories to branch circuit equipment grounding conductor.
14. Install specified lamps in each luminaire emergency lighting unit and exit sign.
15. Operate each luminaire after installation and connection. Inspect for proper connection and operation.
16. Aim and adjust luminaries as directed.
17. Relamp luminaries that have failed lamps at Substantial Completion.
18. Clean electrical parts to remove conductive and deleterious materials.
19. Remove dirt and debris from enclosure.
20. Clean photometric control surfaces as recommended by manufacturer.
21. Clean finishes and touch-up damage.

J. Lighting Panel

1. Wall mount in unfinished areas, flush mount in finished areas.
2. Install lighting panel in accordance with NEMA PB 1.1.
3. Install lighting panel plumb. Provide supports. Height: 6 ft. to top of lighting panel; install lighting panel taller than 6 ft. (2M) with bottom no more than 4 in. above floor.
4. Provide filler plates for unused spaces in lighting panels.
5. Provide typed circuit directory for each branch circuit in lighting panel. Revise directory to reflect circuiting changes required to balance phase loads.
6. Measure steady state load currents at each lighting panel feeder; rearrange circuits in the lighting panel to balance the phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.
7. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.

K. Networking – EtherNet/IP cabling

1. Install sufficient networking cable, as shown in the contract drawings, to provide a complete networked system.
2. Terminate all wiring with RJ-45 connectors rated for Cat 5e cable transmissions.
3. Test every communication cable, and provide a testing certificate with the results.

3.2 FIELD QUALITY CONTROL

A. Low Voltage Cable Testing

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1. Test 600 V power cables for continuity and freedom from short circuits and ground, except where grounding is intentional immediately after installation.
2. Test all circuits with a 500 V megger or its equivalent.
3. Replace conductors which read less than 1.5 Megaohms between conductors and ground.

**3.3 PROTECTION AND STORAGE**

**A. Protection of equipment during storage:**

1. During construction, all electrical equipment shall be protected against absorption of moisture, and metallic components shall be protected against corrosion. This protection shall be provided immediately upon receipt of the equipment and shall be maintained continuously. Any means necessary shall be used to protect the equipment at the Contractor's expense.

END OF SECTION

**SECTION 16900 INSTRUMENTATION AND CONTROLS**

**PART 1 GENERAL**

**1.1 SUMMARY**

- A. This section covers the furnishing and installation of metering and control equipment which shall include the following principal items:
  - 1. Metering and Control Systems. Principal components of the metering and control systems shall be as listed on the “Instrument List” at the end of this section and shall include modification to the existing PLC system.
  
- B. Related Sections
  - 1. Section 01600 – Materials and Equipment
  - 2. Section 16050 – Basic Electrical Materials & Methods
  - 3. Section 16150 – Variable Frequency Drives
  - 4. Section 16480 – Motor Control Centers
  - 5. Section 16950 - PLCs

**1.2 REFERENCES**

- A. Codes & Permits
  - 1. All work and materials shall comply with the National Electrical Code, the National Electrical Safety Code, and applicable local regulations and ordinances. All panels shall be listed by Underwriters Laboratories or other testing organizations acceptable to the governing authority. The Contractor shall, at his own expense, arrange for and obtain all necessary permits, inspections, and approval by the proper authorities in local jurisdiction of such work.

**1.3 SUBMITTALS**

- A. Complete fabrication, assembly, and installation drawings: wiring and schematic diagrams: and details, specifications, and data covering the materials used and the parts, devices, and accessories forming a part of the equipment furnished shall be submitted in accordance with the submittals section. Submittal data shall be grouped and submitted in two separate stages. The submittal for each stage shall be substantially complete. Individual drawings and data sheets submitted at random intervals will not be accepted for review. Instrument tag numbers indicated on the contract drawings shall be referenced where applicable. Submittal data for multifunctional instruments shall include complete descriptions of the intended functions and configurations of the instruments.
  - 1. First-stage Submittal. The first-stage submittal shall include the following items.
    - a. Product catalog cut sheets clearly marked to show the applicable model number, operational features, and intended service of the device.
    - b. A detailed list of any exceptions, functional differences, or discrepancies between the Supplier’s proposed system and the contract requirements.

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- c. Complete panel fabrication drawings and details of panel wiring, piping, and painting. Panel and subpanel drawings shall include overall dimensions, metal thickness, door swing, mounting details, and front of panel arrangement to show general appearance, with spacing and mounting height of instruments and control devices.
  - d. System wiring and installation drawings for all interconnecting wiring between components of the systems furnished and for all interconnecting wiring between the related equipment and the equipment furnished under this section. Wiring diagrams shall show complete circuits and indicate all connections.
  - e. If panel terminal designations, interdevice connections, device features and options, or other features are modified as a result of the fabrication process or factory testing, revised drawings shall be resubmitted.
  - f. A total of seven (7) copies for the submittal shall be provided.
2. Second-stage Submittal. Complete system documentation, in the form of operation and maintenance manuals, shall be provided. Manuals shall include complete product instruction books for each item of equipment furnished.
- a. Where instruction booklets cover more than one specific model or range of instrument, product data sheets shall be included which indicate the instrument model number, calibrated range, and all other special features. A complete set of “as-built” wiring, fabrication, and interconnection drawings, calibration and startup sheets shall be included with the manuals.
  - b. A copy of all final O&M manuals shall be provided in PDF format in a CD-ROM or DVD. All AutoCAD drawings shall be provided in PDF and DWG formats.
  - c. A total of five (5) printed copies, and ten (10) softcopies of final O&M manuals shall be provided.

#### 1.4 QUALITY ASSURANCE

##### A. Supplier's qualifications

- 1. The entire system shall be designed, coordinated, and supplied by a qualified system integrator (Integrator) who is regularly engaged in the business of designing and building instrument and control systems for water and wastewater projects. The Contractor's intended Integrator shall meet the following qualifications.
  - a. The Integrator shall have and shall maintain a qualified technical staff and design office. The qualifications and experience of key project personnel shall be acceptable to the Engineer.
  - b. The Integrator shall have the physical plant and fabricating personnel to complete the work specified. The Integrator's fabrication capabilities and arrangements shall be acceptable to the Engineer.
  - c. The Integrator shall employ competent service personnel to service the equipment furnished. The Integrator shall have a minimum of 5 service personnel that are full time employees of the company that reside within the state of Colorado.

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- d. The Integrator shall provide a “Statement of Qualifications” indicating that they have successfully provided similar work for at least 5 years.

**B. Coordination.**

1. Instrument and control systems shall be designed and coordinated for proper operation with related equipment and materials furnished by other suppliers under other sections of these specifications. All instruments and control devices shall be applied in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the instrument or device manufactured and the manufacturer of related equipment.
2. Installation drawings shall be prepared for interconnecting wiring and piping between the related equipment and the equipment furnished under this section. All interconnecting wiring shall be appropriate for the service and shall result in a properly functioning system.
3. The Integrator shall provide coordination with other contractors and supervision of installation as required during construction.
4. Coordination shall be provided between the Integrator and the process system supplier.
5. Instrument and control systems shall be designed and coordinated for proper operation with other sections of these specifications. These shall include but not be limited to Materials and Equipment – Section 01600, Electrical – Section 16050, Variable Frequency Drives – Section 16150, and Programmable Logic Controllers – Section 16950.

**1.5 WARRANTY**

- A. All suppliers shall warrant their hardware for a period of one year from the date of system acceptance.

**PART 2 PRODUCTS**

**2.1 GENERAL REQUIREMENTS**

- A. All equipment furnished under this section shall be selected by the system supplier for its superior quality and intended performance. Unless indicated otherwise, all equipment and material shall be new, undamaged and meet the requirements of UL. Where UL requirements are not applicable, equipment and material shall be identified as such by the supplier and approved by the Engineer before purchase and installation. Equipment and materials used shall be subject to review and shall comply with the following requirements.
  1. Power and Instrument Signals. Unless specified otherwise, electrical power supply to the instrumentation equipment will be unregulated 120 VAC at the locations noted on the one-line and functional diagrams. All transmitted electronic analog instrument signals shall be 4-20 mA DC and shall be linear with the measured variable.

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2. Metering Accuracy. System metering accuracy, as compared to the actual process value, shall be determined from the value read at the principal readout device such as the recorder or totalizer. System requirements shall not preclude any requirements specified herein for individual devices.
  - a. For systems where the primary measuring device, transmitter, and receiver are furnished under this section, the accuracies shall be within the following limits:
    - i) Level: 1.0% percent of measured span.
    - ii) Flow Rate: magnetic or transit time ultrasonic metering: 1.5 percent of full scale between 1.0 and 100 percent of scale.
3. Appurtenances. Signal converters, signal boosters, amplifiers, special power supplies, special cable, special grounding, and isolation requirements shall be furnished and installed as required for proper performance of the equipment.
4. Interchangeability and Appearance. Instruments used for the same types of functions and services shall be of the same brand and model line insofar as possible. Similar components of different instruments shall be from the same manufacturer to facilitate maintenance and stocking of repair parts. Whenever possible, identical units shall be furnished. Recorders, process indicators, control stations, and similar panel-mounted instruments shall be of the same style and shall be products of the same major instrument manufacturer.
5. Programming Devices. A programming or system configuring device shall be provided for systems that contain any equipment which required such a device for routine calibration, maintenance, and troubleshooting. The programming device shall be complete and in like-new condition and shall be turned over to the Owner at completion of the startup.
6. Device Tag Numbering System. All devices shall be provided with permanent identification tags. The tag numbers shall agree with the instrument device schedules and with the supplier's equipment drawings. All field-mounted transmitters and devices shall have stamped stainless steel identification tags. Panel, subpanels, and rack-mounted devices shall have laminated plastic identification tags securely fastened to the device. Hand lettered labels or tape labels will not be acceptable.
7. Special Tools and Accessories. Equipment requiring periodic repair and adjustment shall be furnished complete with all special tools, instruments, and accessories required for proper maintenance. Equipment requiring special devices for lifting or handling shall be furnished complete with those devices.

## 2.2 PANEL FABRICATION

- A. General Fabrication Requirements. All panels furnished hereunder shall conform to the requirements of NEMA ICS-6-1988. The following paragraphs describe general fabrication requirements for the instrument panels, consoles, enclosures, and subpanels:
  1. Wiring.
    - a. All internal instrument and component device wiring shall be as normally furnished by the manufacturer. With the exception of electronic circuits, all interconnecting wiring and wiring to terminals for external connection shall be

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- stranded tinned copper, insulated for not less than 600 volts, with a moisture-resistant and flame-retardant covering rated for not less than 90°C.
- b. The power entrance to each panel shall be provided with a surge protection device. Surge protectors shall be nominal 120 VAC. Surge protectors shall be of a non-faulting and non-interrupting design, with a response time of not more than 5 nanoseconds. Surge protectors shall be Cutler Hammer AEGIS Powerline Filters, or equal.
  - c. Panels that are over 15 cubic feet in total volume shall have panel lighting above each door of the panel.
  - d. Power distribution wiring on the line side of the panel's protective devices shall be minimum 12 AWG. Secondary power distribution wiring shall be minimum 16 AWG. Wiring for control circuits shall be minimum 16 AWG. Electronic analog circuits shall be 18 AWG twisted and shielded pairs rated not less than 300 volts. Analog circuits shall be separated from ac power circuits. Wiring for ac power distribution, dc power distribution, and control circuits shall have different colors and shall agree with the color coding legend on the system supplier's panel wiring diagrams.
  - e. Terminal blocks for external connections shall be suitable for 12 AWG wire and shall be rated 30 amperes at not less than 300 volts. Terminal blocks shall be fabricated complete with a marking strip, covers, and pressure connectors. Terminals shall be labeled to agree with identification shown on the supplier's submittal circuits, plus one ground for each shielded cable. Not less than 8 inches of clearance shall be provided between the terminal strips and the base of vertical panels for conduit and wiring space. Not less than 20% percent spare terminals shall be provided. Each control loop or system shall be individually fused, and all fused or circuit breakers shall be clearly labeled and located for easy maintenance. Terminal block shall be Phoenix Contact UT 4-MTD series.
  - f. All wiring shall be grouped and firmly supported inside the panel. Wiring shall be routed in nonmetallic slotted wire duct or similar. Ducts shall be readily accessible within the panel with removable covers and shall have a space of at least 40 percent of the depth of the duct available for future use after installation is complete and all field wiring installed. Sufficient space shall be provided between cable groups or ducts and terminal blocks for easy installation or removal of cables. Wire duct shall be Thomas & Betts Ty Duct or approved equal.
  - g. Where signal or loop wiring must be routed to more than one panel or device, the required circuit routing shall be as indicated on the one-line diagrams.
  - h. All analog input signals coming from external from the building where the panel is located shall have surge protection.
  - i. The panel fabricator shall provide such additional circuits as may be indicated on the electrical schematic drawings.
  - j. All wires in the panel shall be identified at both ends of the wire. These labels shall agree with the labels shown on the wiring diagrams. The wire labels shall be of the heat-shrink tube type of wire marker as manufactured by Brady thermal labels.

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- k. All instruments that require 120vac power that have the signal from the instrument going to a panel, shall be provided 120vac from that panel. The 120vac circuit to these instruments shall be individually fused.
2. Nameplates. Nameplates shall be provided on the face of the panel or on the individual device as required. Panel nameplates shall have approximate dimensions and legends, as indicated on the drawings, letters approximately 3/16 inch high extending through the black face into the white layer. Nameplates shall be secured firmly to the panel. Panel face nameplates do not replace the requirement for device identification tags as specified herein under the Device Tag Numbering System paragraph.
3. Painting. Interior and exterior surfaces of all panels shall be thoroughly cleaned and painted with rust-inhibitive primer. The panel interior shall be painted white with the manufacturer's standard coating. All pits and blemishes in the exterior surface shall be filled. Exterior surfaces shall be painted with one or more finish coats of the manufacturer's standard coating. Finish coats shall have a dry film thickness of at least 4 mils.
4. Factory test. Panels shall be factory tested electrically by the panel fabricator before shipment.

### 2.3 METERING & CONTROL SYSTEMS

- A. Principal components for the metering and control systems are indicated on the "Instrument List" at the end of this specification.

### 2.4 MATERIALS & EQUIPMENT

#### A. Panel Front-Mounted Devices

1. SELECTOR SWITCHES. Selector switches shall be a minimum 30 mm, heavy-duty, oil-tight type with gloved-hand or wing lever operators. Position legends shall be engraved on the switch faceplate. Switches for electric circuits shall have silver butting or sliding contacts, rated 10 amperes continuous at 120 volts ac. Contact configuration shall be as indicated on the drawings or as required for the application. Switches used in electronic signal circuits shall have contacts suitable for that duty. Switches shall be Cutler-Hammer "Series 10250T", Square D "Class 9001", or approved equal.
2. INDICATING LIGHTS. Indicating lights shall be a minimum 30 mm, heavy-duty, oil-tight type, Push-to-Test, which uses a low voltage lamp. A built-in transformer shall be used for AC service. Legends shall be engraved on the lens or on a legend faceplate. Lamps shall be easily replaceable from the front of the indicating light. Indicating lights shall be Cutler-Hammer "Series 10250T", Square D "Class 9001", or approved equal.
3. PUSH BUTTONS. Push buttons shall be a minimum 30 mm, heavy-duty, oil-tight type. Legends shall be engraved on push button faceplate. Contacts shall be rated 10 amperes continuous at 120 VAC. Push buttons shall be Cutler-Hammer "Series 10250T", Square D "Class 9001", or approved equal.
4. RUN TIME METERS. Run time meters shall have miniature, rectangular, semi-flush counters. The counter shall contain not less than seven digits, with a



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nameplate plainly engraved on the face of the counter, or below the counter identifying it as a run time meter. Run time meters shall not reset upon power failure. Run time meters shall be as manufactured by Red Lion "CUB7" series or Action Instruments.

5. **DIGITAL PANEL DISPLAYS.** Digital panel displays shall be designed for semi-flush mounting in a panel. The display shall be a 3-1/2 digit LED or gas-discharged type, with digit height of not less than 0.5 inch. The display shall be easily read at a distance of 10 feet in varying control room lighting environments. Operating temperature range shall be 0 to 40 C. Accuracy shall be plus or minus 0.1 percent. The display shall be scaled in engineering units, with the units engraved on the display face or on the associated nameplate. The display shall have selectable decimal point and shall provide red indication. Digital displays shall be as manufactured by Red Lion "PAXP" series or Action Instruments.

**B. Panel Interior-Mounted Devices**

1. **POWER SUPPLIES.** Regulated DC power supplies for instrument loops shall be provided as needed. Power supplies shall be suitable for input voltage variation of plus or minus 10 percent. The DC power supplies shall be Idec "PS5R Slim line", or Phoenix Contact "Quint".
2. **RELAYS.** Relays indicated to be provided in panels, enclosures, or systems furnished under this section shall be of the plug-in socket base type with dustproof plastic enclosures unless noted otherwise. Relays shall be UL listed. Relays shall have a minimum rating of 10 amperes at 120 VAC. Time-delay relays shall have dials or switch settings engraved in seconds and shall have timing repeatability of +/- 2.0 percent of setting. Latching and special purpose relays shall be as required for the specific application. Relays shall have a light to indicate when coil is energized. Relays shall be Idec "RH or RTE Series" or approved equal.
3. **ELECTRONIC SIGNAL BOOSTERS AND ISOLATORS.** Electronic Signal Boosters and Isolators shall have all solid-state circuitry and complete electrical isolation between the power supply and the input and output signals. Accuracy shall be +/-0.15 percent of span. Isolators shall be manufactured by Acromag, Moore, or Phoenix Contact.

**C. Flow Instrumentation**

1. **Magnetic Flow Meters**
  - a. The Magnetic Flow Meter shall be a completely obstructionless, in-line flow meter with no constrictions in the flow of fluid through the meter. The meter shall consist of a metallic tube with flanged ends and with grounding rings. Flange diameter and bolt drilling pattern shall comply with ANSI/ASME B16.5, Class 150. Meters shall be suitable for the maximum range of working pressures of the adjacent piping. Electrode materials shall be fully compatible with the process fluid and shall comply with the requirements specified in the instrument device schedules. Each meter shall be factory calibrated, and a copy of the calibration report shall be submitted as part of the operation and maintenance manual submittal.

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- b. The meter shall be capable of standing empty for extended periods of time without damage to any components. The meter housing shall be of a splash-proof and drip-proof design
  - c. Power supply to the meter shall be 120 VAC, 60 Hz, single phase.
  - d. Meters shall be Endress+Hauser L-400 Series or approved equal.
2. Magnetic Flow Meter Signal Converters
- a. Magnetic Flow Meter Signal Converters shall be separately mounted, microprocessor-based signal converters. They shall be provided for the magnetic flow meters. The signal converters shall include output dampening, self-testing, integral digital indicator, built-in calibration capability, and an “empty pipe zero” contact input. The overall accuracy of the magnetic flow meter transmitter and signal converter shall be +/-1.0 percent of actual flow rate for full-scale settings of 0.3 to 30 fps. The signal cable between the converter and the magnetic flow meter shall be furnished by the meter manufacturer. The signal converter shall be housed in NEMA Type 12 housing and shall be suitable for operation over an ambient temperature range of -30° to +140°F, and relative humidity of 10 to 100 percent. The converter shall have an analog output of 4-20 mA DC.
  - b. The signal converter shall have a seven-digit, non-reset totalizer on the face of the enclosure. Local electronic indicators shall be provided. Indicators shall be mounted on or near the flow meter signal converters in weatherproof NEMA Type 4 housings. Indicators shall be four-digit LCD type and shall read in engineering units.
3. Pressure and Level Instrumentation
- a. Pressure and Pressure Sensing Level Transmitters.
    - i) Transmitters used to measure process pressure, or inferred level from process pressure such as a bubbler system or other source, shall have all solid-state electronic circuitry and shall be of the two-wire type which requires no direct power connection to the transmitter. Transmitters shall have self-diagnostics and electronically adjustable span, zero, and damping. Transmitters shall be enclosed in a NEMA Type 4X housing and shall be suitable for operation at temperatures from 0 to 180 F. All transmitter parts shall be of a corrosion-resistant material. Vents shall be provided on the sides of the diaphragm housing body. Transmitter shall have over-range protection to maximum process line pressure. Accuracy shall be plus or minus 0.5 percent of calibrated span, with repeatability of 0.1 percent. Transmitter output shall be 4-20mA dc without the need for external load adjustments and shall have an elevated or suppressed zero as required by the application. Transmitters shall be furnished with integral indicators with 0-100 percent linear scales.
    - ii) Differential type transmitters shall be used if required to meet the input range, elevation, or suppression requirements.
    - iii) Each transmitter shall be provided with a process shutoff valve and a bracket for mounting as required. Transmitters shall be factory calibrated

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to the required range. Transmitters shall be Endress+Hauser PMP-51 Series or approved equal.

- b. Ultrasonic Level Transmitters
  - i) Each ultrasonic level transmitter shall be a microprocessor-based electronic unit consisting of a sensor assembly, a signal converter/transmitter, and an interconnecting cable. The sensor shall be encapsulated in a chemical- and corrosion-resistant material such as keener or CPVC, and shall be suitable for operation over a temperature range of -20 to +150<sup>0</sup>F and a relative humidity of 10 to 100 percent. The sensor shall be compatible with the process media being measured. The sensor shall be an explosion-proof design suitable for use in all hazardous areas. Sensors mounted in areas subject to freezing shall be provide with special transducers or protected against icing by heaters. Sensors mounted in direct sunlight shall be provided with sunshades.
  - ii) The supplier shall furnish drawings complete with dimensions and elevations for the sensor mounting.
  - iii) The ultrasonic level transmitter shall have automatic compensation for changes in air temperature at the sensor location. If separate temperature sensing probes are provided, they shall be mounted with or adjacent to the ultrasonic sensor, as recommended by the manufacturer. The transmitter shall have a four-digit LCD display scaled to read in engineering units. Digit height shall be approximately 0.5 inch. The transmitter shall be designed to ignore momentary level spikes or momentary loss-of-echo. A loss-of-echo condition shall be indicated on the transmitter unit and shall be available as an alarm contact output. The transmitter output shall be an isolated 4-20 mA dc signal linearly proportional to the measured level range. Where specified, the output shall be characterized to be proportional to the tank volume instead of to the tank level. Calibration parameters shall be entered through a keypad on the unit and shall be stored in nonvolatile EEPROM memory. Accuracy of the transmitted signal shall be +/-0.5 percent of the level range.
  - iv) The transmitter shall contain four independently adjustable level alarm contact outputs. Contacts shall be single-pole, double-throw, rated not less than 5 amperes at 120 volts ac.
  - v) A sufficient length of sensor-to-transmitter signal cable shall be furnished with the instrument to locate the sensor 25 to 200 feet from the signal converter. The signal converter electronics shall be housed in a NEMA Type 12 enclosure suitable for wall mounting and for operating temperatures of -15 to +125<sup>0</sup>F and a relative humidity of 10 to 100 percent. The signal converter shall be powered from 120 volts ac, 60 Hz. The ultrasonic level transmitter shall be Siemens "Multiranger", Endress Hauser, or approved equal.
- c. Weighted Float Level Switches
  - i) Each level switch shall consist of a single-pole, double-throw switch, rated not less than 3 amperes AC, sealed and housed in a chemical-resistant polypropylene casing. The switch assembly shall be weighted and

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suspended on its own cable. The flexible support cable shall be waterproof, three-conductor, synthetic covered cable with 18AWG conductors, and shall be of sufficient length so that no splice or junction box is required in the wetwell. Switches shall be suitable for operation up to 150 volts within an ambient temperature range of 0° to 60° C. Switches shall be suitable for use in a sanitary or wastewater wetwell environment. Installation hardware shall be provided as shown on the drawings or as necessary for application. Switches shall be Flygt "Type ENM-10", Siemens Water Technologies "Model 9G-EF", or approved equal.

- d. Pressure Switches
  - i) Pressure switches shall be field adjustable and shall have a trip point repeatability of better than 1 percent of actual pressure. Contact rating shall be 10 amperes at 120 volts ac.
  - ii) Switches shall have over-range protection to maximum process line pressure. Switches shall have NEMA type 4X housings.
  - iii) Switches shall be as manufactured by Ashcroft, Mercoid, United Electric, or equal.
- e. Conductance Relay Level Switch
  - i) Each level switch shall consist of a single-pole, double-throw relay with contacts rated not less than 5 amperes ac at 120 VAC. The relay primary power shall be 120 VAC. The electrodes shall be flexible wire suspension type with shielded stainless steel electrode tips. The electrode holder shall be the manufacturer's standard holder appropriate for the application. Electrodes and conductance relay shall be as manufactured by Gems Sensors (B/W Controls) or Ametek (Warrick Controls), or approved equal.

4. Analytical Instruments

- a. Analytical Analyzer
  - i) Manufacturer shall be Aquistar, Turbo Turbidity Sensor, no exceptions
  - ii) wiped turbidity sensor
  - iii) 10 meter Flying lead cable
  - iv) Modbus RS485interface

D. AUMA Modulating Electric Actuators:

**Non-Intrusive Design. Includes Integral Controls, 6 Programmable Output Contacts, Analog 4-20 mA Position Feedback, Analog 4-20 mA Positioner. Sized For Modulating Service at 1.5 Times Maximum Torque Requirement Plus Additional 10% For Voltage Variation.**

**Modulating Application Inline Valves:**

Up to 12" diameter size: 60 seconds.  
14" to 30" diameter size: 120 seconds  
Slide Gates: 12 inches Per Minute.

Motor:

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The electric motor shall be Class F insulated, with a duty rating of at least 15 minutes at 104°F (40°C) ambient temperature at an average load of at least 35% of rated actuator torque. Motor shall be specifically designed and built by the actuator manufacturer for electric actuator service characterized by high starting torque, low stall torque and low inertia. Commercially available motors shall not be acceptable. Electrical disconnection of the motor shall be by means of a plug and socket and motor removal shall be possible without loss of lubricant. The actuator must include a device to ensure that the motor runs with the correct rotation for the required direction of valve travel regardless of the connection sequence of the power supply.

**Gearing:**

The actuator gearing shall be totally enclosed in a grease-filled cast iron gearcase suitable for operation in any orientation. Oil lubrication is not permitted. The gearcase shall contain sensors capable of continuously recording temperatures and vibration within the actuator. Actuator gearing shall be hardened steel with alloy bronze worm wheel. Where required per application, electric actuators will be provided with worm gearboxes. The worm gearboxes shall be supplied with full 360 degree bronze or ductile iron worm wheels and end-of-travel mechanical stops. Designs with segmented worm gears will not be permitted.

**Valve position and torque calibration:**

Position and torque shall be sensed by absolute encoder using hall effect sensors. Incremental encoders requiring batteries to retain settings upon loss of power shall not be accepted. Position and torque settings will be stored in permanent non-volatile memory.

Torque and travel adjustment parameters are to be as follows:

1. Position setting range 1 to 500 or 10 to 5,000 turns, with resolution of 2.81 degrees and accuracy to 5.0 degrees of actuator output.
2. Torque setting: 40% to 100% of rated torque.

Torque switch bypass to be provided for the torque sensing system to inhibit torque switch trip during unseating or during starting in mid-travel against high inertia loads.

Valve manufacturer is responsible for coordination with AUMA in establishing torque value range for specific valve application.

**User Interface for Modulating or Positioning Actuators**

1. Non-Intrusive Setup & Calibration.
2. Limits and Programming Achieved By Operating Pushbuttons on Controller.
3. Programming may also be completed by using a laptop and Bluetooth connection.
4. Local/Off/Remote Selector Switch.
5. Open/Stop/Close/Reset Pushbuttons.

6. Graphic Display.
7. 6 Indication Lights.

Outputs for Modulating Actuators.

1. 6 Programmable Output Contacts.
2. 4-20 mA Analog Output Proportional to position.

Inputs For Modulating Actuators

1. 4-20 mA Analog Input for positioning and modulation.
2. Capability to Change Inputs to Discrete open/stop/close commands.

Modulating Multi Turn:

AUMA MODEL SAR/GK or SAR with AUMATIC “AC” Controller.

Factory Representative in Colorado: Pipestone Equipment in Golden, Colorado.

### **General Requirements (All Types).**

Enclosure

1. NEMA 4X/6 and submersible to IP 68-8 (26 feet for 96 hours).
2. Ambient Temperature Rating -13 to 160 degrees F.
3. Potted Double Seal Terminal Compartments To Protect Water Intrusion Via Electrical Conduit.
4. Lockable Protection Cover. (Protects from tampering and UV, AC Controllers Only).

Power Requirements:

1. Primary Power: 120V, 1 Phase, 60 Hz;
2. Secondary Power (Modulating): 24 VDC. (Available for customer use, powers internal components).

Product Support:

1. Manufacturer to have factory trained specialists based within Colorado available to provide services for startup, integration, and owner training.
  - a. Training shall include one day on site equipment commissioning and training for City of Grand Junction staff.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION REQUIREMENTS**

#### **A. General Requirements**

1. The instrumentation equipment shall be installed by the Contractor or his subcontractors in accordance with the manufacturers’ instructions. The services

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of the system Supplier's technical representative shall be provided as necessary to calibrate, test, and advise others of procedures for adjustment and operation.

**B. Inspection.**

1. Inspect materials and equipment for signs of damage, deterioration or other deleterious effects of storage, transportation, handling, or defects in manufacture or assembly.
  - a. Replace with identical new materials or equipment or repair to like new condition any materials or equipment showing such effects to the satisfaction of the Engineer and Owner.

**C. Equipment Installation.**

1. Handle, install, connect, clean, condition, align and adjust products and equipment in strict accordance with manufacturer's instructions and in conformity with specification requirements.
  - a. Maintain one complete set of manufacturer's installation instructions at the jobsite during installation and until installation is accepted by the Engineer and Owner.
  - b. Perform all work in accordance with manufacturer's instructions.
    - i) Do not omit any preparatory step or installation procedure unless specifically modified or exempted by contract documents.
    - ii) Should job conditions or specification requirements conflict with manufacturer's instructions, consult with Engineer prior to proceeding.
  - c. Field Wiring. Field wiring materials and installation shall conform to the requirements of the electrical section.
  - d. Field Piping. Field piping materials and installation shall conform to the requirements of the miscellaneous piping section.
  - e. Field-Mounted Instruments. Instruments shall be mounted so they may be easily read and serviced and all appurtenant devices are easily operated. Installation details for some instruments are indicated on the drawings. Unless otherwise indicated on the drawings, instruments which include local indicators shall be mounted approximately 5 feet above the floor, or ground, and shall be oriented for ease of viewing. Transmitters shall be mounted on corrosion-resistant pipe supports suitable for floor, wall, ground, or bracket mounting.

**D. Field Calibration.** A technical representative of the system supplier shall calibrate each instrument and shall provide a written calibration report for each instrument, indicating the results and final tuning adjustment settings. The adjustment of each calibrated instrument shall be sealed or marked, insofar as possible, to discourage tampering. Instruments shall be calibrated before checkout of the operation of the system.

**E. Systems Check.** A technical representative of the system supplier shall participate in the checkout of metering and control systems. If interrelated devices furnished by other suppliers, such as valve actuators, motor controls, chemical feeders, or primary measuring devices, do not perform properly when placed in service, the

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technical representative shall use suitable test equipment to introduce simulated signals to verify or measure signals from such devices as required to locate the source of trouble or malfunction. A written report stating the results of such tests shall be furnished, if requested by the Engineer, to assign responsibility for corrective measures.

1. Installation Test Equipment. Unless specified otherwise, all test equipment for the calibration and checking of system components shall be provided by the Contractor for the duration of the testing work. Unless specified otherwise, test equipment will remain the property of the Contractor or the system Supplier.

**F. Adjustment and Cleaning**

1. Perform all required adjustments, tests, operational checks, cleaning and other start-up activities required.
2. Take precautions, as necessary, to properly protect all equipment from damage. Installed equipment to be protected from further construction operations.

**3.2 CUSTOMER TRAINING**

- A. The coordinating supplier shall provide a qualified representative at the job site to train the Owner's personnel in operating and maintenance of the equipment. The training session shall include a technical explanation of the equipment and an actual hands-on demonstration. The training session shall consist of one 2-hour session, and the schedule shall be arranged and coordinated with the Engineer.

**3.3 INSTRUMENT LIST**

Instrument List

<u>Tag #</u>	<u>Description</u>	<u>Service</u>	<u>Scale</u>	<u>Provided Under Specification</u>
FIT/FE-60	Pipeline flow	Magnetic Flow Meter	0-40 CFS	16900
FIT/FE-70	Bypass flow	Magnetic Flow Meter	0-40 CFS	16900
AIT/AE-80	Analytical signals	Analytical Analyzer		16900

END OF SECTION



**SECTION 16950 PROGRAMMABLE LOGIC CONTROLLERS**

**PART 1 GENERAL**

**1.1 SUMMARY**

- A. This section includes the items listed below and all other components necessary for a complete system as noted herein and indicated on the drawings
  - 1. Programmable Logic Controllers (PLCs)
  - 2. Communication equipment
  - 3. Programming
  - 4. Spare parts
  
- B. Related Sections
  - 1. Section 01600 – Materials and Equipment
  - 2. Section 16050 – Basic Electrical Materials & Methods
  - 3. Section 16900 – Instrumentation & Controls

**1.2 REFERENCES**

- A. ISA 5.1 – Instrumentation Symbols and Identification
- B. NEMA ICS 1 – General Requirements for Industrial Control and Systems
- C. NEMA ICS 2 – Standards for Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated 600 Volts
- D. DEMA ICS 3 – Industrial Control and Systems: Factory Built Assemblies
- E. NEMA ICS 6 – Industrial Controls and Systems: Enclosures

**1.3 DESIGN REQUIREMENTS**

- A. Discrete input/output signals shall be allowed to be 24VDC or 120VAC
- B. Analog input/output signals shall all be 4-20mA
- C. Analog signal isolators shall be independently powered units capable of driving two 4-20mA signals
- D. All required buffers, isolators, signal converter, and amplifiers for coordination with other equipment furnished under other sections, and between items of equipment needed for a complete system shall be furnished under this section of the specifications whether indicated on the Drawings or not or detailed in these specifications or not

**1.4 SYSTEM DESCRIPTION**

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- A. Equipment furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.
  - 1. I/O List. An I/O list is attached at the end of this section

**1.5 SUBMITTALS**

- A. Submittals shall be required as noted in Section 16900.

**1.6 QUALITY ASSURANCE**

- A. Supplier's qualifications
  - 1. The entire system shall be designed, coordinated, and supplied by the system integrator supplier.
- B. Coordination
  - 1. The PLCs and PLC system shall be designed and coordinated for proper operation with related equipment and materials furnished by other suppliers under other sections of these specifications. All devices shall be applied in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the instrument or device manufacturer and the manufacturer of related equipment.
  - 2. Installation drawings shall be prepared for interconnecting wiring and piping between the related equipment and the equipment furnished under this section. All interconnecting wiring shall be appropriate for the service and shall result in a properly functioning system.
  - 3. The Contractor shall provide coordination with other contractors and supervision of installation as required during construction.

**1.7 WARRANTY**

- A. The Supplier shall warrant the hardware, software, and configuration related to the operational performance of the facility for a period of one year from the date of system acceptance.

**PART 2 PRODUCTS**

**2.1 GENERAL REQUIREMENTS**

- A. All equipment furnished under this section shall be selected by the system supplier for its superior quality and intended performance. Unless indicated otherwise, all equipment and material shall be new, undamaged and meet the requirements of UL. Where UL requirements are not applicable, equipment and material shall be identified as such by the supplier and approved by the Engineer before purchase and installation. Equipment and materials used shall be subject to review and shall comply with the following requirements.

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1. Interchangeability. All PLC systems shall be products of the same manufacturer and of the same series or product line. Processors, local and remote input/output hardware, communications modules, and specialty modules shall be interchangeable among all I/O panels and systems.
  2. Installed I/O requirements. Each PLC shall have I/O modules installed to accommodate requirements shown on drawings and the I/O List at the end of this section and with a minimum of 20% spares installed.
  3. Acceptable Manufacturers.
    - a. PLC - Allen Bradley MicroLogix Series
    - b. No or equal
  4. Modules shall be added as needed to provide for all the I/O required on the project plus the spares.
  5. PLC shall be provided with Ethernet communications installed and functioning.
- B. Programmable Logic Controller (PLC)
1. The PLC system components shall be as noted herein:
    - a. Input/Output Modules
      - i) Digital Input Modules – Allen-Bradley
        - a) Number of Inputs: 8
        - b) Voltage Category: 120VAC
        - c) Module shall be Allen Bradley 1762-IA8.
      - ii) Digital Output Modules – Allen-Bradley
        - a) Number of Outputs: 8
        - b) Voltage Category: 120VAC
        - c) Module shall be Allen Bradley 1762-OW8.
      - iii) Analog Input Modules – Allen-Bradley
        - a) Number of Inputs: 4
        - b) Signal Range: 4-20mA
        - c) Module shall be Allen Bradley 1762-IF4.
      - iv) Analog Output Modules – Allen-Bradley
        - a) Number of Inputs: 4
        - b) Signal Range: 4-20mA
        - c) Module shall be Allen Bradley 1762-OF4.
    - b. Processors
      - i) Allen-Bradley – 1763-L16AWA or 1763-L16BWA
- C. PLC Programming Software
1. The PLC programming software shall be Allen Bradley RSMicro
- D. Operator Interface Terminal (OIT)
1. An OIT shall be installed in the door of the RTU panel.
  2. The OIT shall be a RedLion G07S0000 type operator panel with the following functionality (all accessories shall be provided as needed to accomplish these functions):
    - a. 7" display
    - b. 800 x 600 display resolution
    - c. NEMA 4X front panel

- d. At least one Ethernet port
- e. Capable of storing at least 2 GB for data logging
- f. Provide a minimum of 3 flash storage cards
- g. Provide with remote web access with password protection
- h. All setpoints will be password protected

### **PART 3 EXECUTION**

#### **3.1 INSTALLATION REQUIREMENTS**

##### **A. General Requirements**

- 1. It shall be the Supplier's responsibility to ensure that the entire PLC system and OIT system is installed in a satisfactory condition per these specifications and the manufacturer's requirements.

##### **B. Inspection**

- 1. Inspect materials and equipment for signs of damage, deterioration or other deleterious effects of storage, transportation, handling, or defects in manufacture or assembly.
  - a. Replace with identical new materials or equipment or repair to like new condition any materials or equipment showing such effects to the satisfaction of the Engineer and Owner.

##### **C. Equipment Installation**

- 1. Handle, install, connect, clean, condition, align and adjust products and equipment in strict accordance with manufacturer's instructions and in conformity with specification requirements.
  - a. Maintain one complete set of manufacturer's installation instructions at the jobsite during installation and until installation is accepted by the Engineer and Owner.
  - b. Perform all work in accordance with manufacturer's instructions.
    - i) Do not omit any preparatory step or installation procedure unless specifically modified or exempted by contract documents.
    - ii) Should job conditions or specification requirements conflict with manufacturer's instructions, consult with Engineer prior to proceeding.

##### **D. Adjustment and Cleaning**

- 1. Perform all required adjustments, tests, operational checks, cleaning and other start-up activities required.
- 2. Take precautions, as necessary, to properly protect all equipment from damage. Installed equipment to be protected from further construction operations.

##### **E. PLC Programming.**

- 1. The Contractor shall be responsible for all PLC programming.

##### **F. OIT Programming**

- 1. The Contractor shall be responsible for all OIT programming.

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Customer Training

2. The system supplier shall provide a qualified representative at the job site to train the Owner’s personnel in operating and maintenance of the equipment. The training session shall include a technical explanation of the equipment and an actual hands-on demonstration. The training session shall consist of one 2-hour session, and the schedule shall be arranged and coordinated with the Engineer.

I/O List

<u>Tag #</u>	<u>Description</u>	<u>DI</u>	<u>DO</u>	<u>AI</u>	<u>AO</u>	<u>Scale</u>	<u>Notes</u>
	<b><i>Diversion PLC</i></b>						
	Raw Water - Turbidity			1			
	Diversion Valve – Position Control				1		
	Diversion Valve – Position Feedback			1			
	<b><i>Control Building PLC</i></b>						
	Bypass Valve Actuator – Position Control				1		
	Bypass Valve Actuator – Position Feedback			1			
FIT-60	Pipeline Flow			1			
FIT-70	Bypass Flow			1			

END OF SECTION

**SECTION 16951 LOGIC DESCRIPTION**

**PART 1 GENERAL**

**1.1 SUMMARY**

- A. This section includes the items listed below and all other components necessary for a complete system as noted herein and indicated on the drawings
  - 1. General Programming Requirements
  - 2. PLC Programming
  - 3. OIT Programming
- B. Related Sections
  - 1. Section 16900
  - 2. Section 16950
- C. PLC programming services shall be provided by the system integrator.
- D. OIT programming shall be completed by system integrator (SI) as outlined below
- E. Scope of work shall also include, but is not limited to:
  - 1. Develop and test new PLC program based on control descriptions provided in this specification section.
  - 2. Develop and test OIT screens
  - 3. Loop test all PLC input and output points for proper operation.
  - 4. Verify new instrument setup and calibration coordinates with the PLC and OIT system
  - 5. Verify Ethernet communication between PLC and AIT-80 Panel
  - 6. Verify all communication functionality between PLC and Operator's residence Panel
  - 7. Provide training to City's personnel on new system.

**1.2 REFERENCES**

- A. ISA 5.1 – Instrumentation Symbols and Identification
- B. NEMA ICS 1 – General Requirements for Industrial Control and Systems
- C. NEMA ICS 2 – Standards for Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated 600 Volts

**1.3 SYSTEM DESCRIPTION**

- A. All the programming performed under this section shall be done in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the software manufacturer, unless exceptions are noted by engineer.

#### 1.4 SUBMITTALS

- A. Submittals shall be required as noted in section 16900.

#### 1.5 QUALITY ASSURANCE

- A. Supplier's qualifications
  - 1. The entire system shall be programmed under this agreement
  - 2. These control descriptions are provided for informational purposes and for coordination between the system supplier and the programmer.

### PART 2 EXECUTION

#### 2.1 GENERAL PROGRAMMING REQUIREMENTS

- A. Tag database structure and configuration.
  - 1. The process control system tag naming convention shall include the definition of all devices, derived and soft tags, and the required alarm processing and data logging definitions for each tag.
  - 2. All logic and control shall be done in the PLC
- B. PLC Programming standards.
  - 1. General Considerations
    - a. Program Documentation
      - i) Documentation for all PLC programs shall include comments, tag/register descriptions, or any other programming tags. All PLC programs shall be documented with comments provided for each subroutine, function and/or section. Use of abbreviations in comments and subroutine/section titles should be avoided. At the completion of the project, copies of programming, I/O list, memory map and communications map shall be provided in both printed and electronic format.
    - b. Motors
      - i) All motors shall have runtime totalizers and start counters. Both values shall be totalized regardless of whether the motors are in auto and manual control modes.
      - ii) Every motor that has PLC control shall have a manual or automatic operation for the motor. If manual is selected then the operator shall be able to start or stop the motor. If the motor is controlled from a VFD then the operator shall be able to enter a speed set point for the VFD. In automatic operation the control logic shall start and stop the motor as well as control the speed.
      - iii) The following signals shall be determined for all motors.
        - a) HOA switch in Auto
        - b) Run Indication
        - c) Fault Indication.
        - d) Motor fail to start. PLC calling the motor to run but no run signal report for 20 sec. if the motor is in auto.

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**KANNAH CREEK INTAKE REHABILITATION – BID ALTERNATE 1**

- e) Motor fail to stop. PLC not calling the motor to run but a run signal report for 20 sec. if the motor is in auto.
  - c. Analog signals
    - i) All analog inputs shall be scaled in Engineering units to be used in the logic.
    - ii) A low level and high level alarm shall be generated for each analog signal. Each alarm shall have separate alarm and reset set points that shall be operator programmable from the OIT screen.
  - d. All control to any devices will be stopped if there is a phase failure condition. After a time delay when the phase failure is normal, then normal operation shall proceed.
- C. Operator Interface Terminal (OIT) standards.
- 1. General Considerations
    - a. In general, when the term OIT is used it indicates the local operator terminal display.
    - b. All alarms will be displayed and logged on the OIT.
    - c. All analog signals will be trended and logged and displayed on the OIT in engineering units.
    - d. Motors
      - i) All motors shall be displayed on the OIT and have dynamic graphical indication whether they are on or off. The motors shall be green for running and red for off.
      - ii) All motors shall have runtime totalizers and start counters displayed near the motor's graphical display.
      - iii) Every motor that has PLC control shall have the associated set points and control criteria entered at the local operator terminal displays. This shall also allow the operator to select manual or automatic operation for the motor. If the motor is controlled from a VFD then the operator shall be able to enter a speed set point for the VFD when the motor is in the manual control mode.
    - e. The control signals for all motors shall be displayed on the OIT. They shall include but not limited to:
      - i) HOA Switch status: "In Auto", "In Hand" or "Off"
      - ii) Run Indication
      - iii) Fault Indication
      - iv) Motor fail to start. PLC calling the motor to run but no run signal report for 20 sec while the HOA is in Auto.
      - v) Motor fail to stop. PLC not calling the motor to run but a run signal report for 20 sec while the HOA is in Auto.
    - f. Alarming
      - i) All alarms shall be displayed and logged on the OIT screens.
      - ii) Selected alarms shall have a visual and audible alarm.



**2.2 SPECIFIC DEVICE CONTROL CRITERIA**

**A. Diversion Gates Control**

1. Water will enter the diversion structure and flow will be controlled by the 24-inch diversion valve. This valve shall be PLC controlled.
2. The valve shall be controlled by a manual operator setpoint entered in percentage on the OIT and the valve will provide position feed back to the PLC.

**B. Bypass flow control**

1. The bypass valve shall be controlled by the PLC
2. The bypass valve shall be controlled by an operator entered flow setpoint so the difference between the FIT-60 flow and the FIT-70 flow matches the operator entered flow setpoint.

**C. Flow Calculations**

1. All flows and associated calculated values shall be displayed and logged.
2. The flow to Juniata Reservoir shall be the Pipeline flow (FIT-60) less the bypass flow (FIT-70).
3. All flows shall be totalized for total daily flow, previous day flow, current month total flow and previous month total flow.
4. All flows shall be in both cubic feet per second (CFS) and million of gallons a day (MGD).

**D. Analytical measurements**

1. The value of the turbidity shall be monitored and logged.
2. The signal shall have operator entered high alarm set points.
3. The signal shall also have low level alarm set points.
4. On a high alarm of the signal the OIT shall email an alarm out to the operator.
5. On a high alarm of the signal the diversion flow valve shall shut automatically, and water will return to the creek over the weir. The operator shall have the ability to enable or disable this automatic function.
6. On low alarm of the signal the OIT shall email an alarm out to the operator.
7. On a low alarm of the signal the diversion flow valve shall open automatically, and water will return to the intake pipe.
8. There shall be an enable/disable function on the OIT for these alarms.

**E. Data Logging**

1. All data shall be logged to the OIT data storage device
2. All data logging will be in a .CSV file format
3. Flow values shall be recorded every 15 minutes
4. All other values shall be recorded every 30 minutes
5. All recorded data shall be stored for a minimum of 5 years

**F. Remote Access**

1. Programming and equipment shall be provided as needed to allow the operator to access the OIT over a virtual private network (VPN).

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2. The operator shall then be able to view all the screens on the OIT and download the data stored there.
3. Any routers needed for this shall be provided by the system integrator and setup and tested.
4. This system shall be accessed through the internet connection available at the operator's residence.

END SECTION

# **Appendix B**

Purdy Mesa Flowline at Sullivan Draw Project  
(Bid Alternate 2)

**PROJECT SUBMITTAL FORM**  
**Purdy Mesa Flowline at Sullivan Draw Project**  
**(Bid Alternate 2)**

PROJECT: Purdy Mesa Flowline at Sullivan Draw Project – Bid Alternate 2

CONTRACTOR:

PROJECT ENGINEER: John Eklund

Description	Date Received	Resubmittal Requested	Resubmittal Received	Date Accepted
-------------	---------------	-----------------------	----------------------	---------------

**WATERLINE AND STRUCTURE CONSTRUCTION SUBMITTALS**

Pipe – AWWA C-900 PVC, Eagle Loc DR-25				
Fittings – Elbows, Tees, Tapping Saddles, Coupling,				
Valves, Gate valves, Pressure Sustaining Valve, Flow control/Pressure Sustaining Valve				
Tracing wire & splices				
Pipe Bedding Gradation (Type A)				
Electromagnetic Flow Sensors				
Combination Air Valve and Vault Assembly (Includes Butterfly Valve)				
Mechanical Joint Restraints and Bell Restraints				
Adjustable Pipe Saddle Support				
Concrete Vault(s)				
Embankment Fill Gradation, Proctor Curve				
Base Course Gradation, Proctor Curve				
Concrete Mix Design: Structural, Thrust Restraint, Foundations				

**CITY OF GRAND JUNCTION  
PURDY MESA FLOWLINE – BID ALTERNATE 2**

Description	Date Received	Resubmittal Requested	Resubmittal Received	Date Accepted
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**ELECTRICAL & CONTROL CONSTRUCTION SUBMITTALS**

Conduit -				
Actuators				
Electrical Components				
Control Components				
Analytical Components				
Ancillary Components				
Pull Boxes				
Conduits				

**EROSION CONTROL / STORMWATER MANAGEMENT**

Concrete Washout				
Riprap Gradation				
Seed Mix – Native				

**PERMITS, PLANS, OTHER**

Construction Schedule				
CDPHE Dewatering Permit (if necessary)				

**PROJECT SPECIAL PROVISIONS**  
Purdy Mesa Flowline at Sullivan Draw Project  
(Bid Alternate 2)

**SP-1 18-INCH PIPE OVERFLOW**

Measurement – 18-Inch Pipe Overflow shall consist of the following:

Incorporation of the existing 18-inch steel transmission pipe as an overflow for the volume control tank. This work shall include all fittings, energy dissipation structure, rip rap, and appurtenant work associated with and connection to the existing pipe as called out on the plan set. This does not include work as identified under Bid Alternate 3 Volume Control Tank.

Add the following to this subsection:

**Pay Item**

Convert 18” Pipe to Drain Line

**Pay Unit**

Lump Sum

**SP-2 CMU EQUIPMENT ENCLOSURE, POLE, PHOTOVOLTAIC EQUIPMENT**

Measurement - CMU Building shall consist of the following:

- Interior dimensions: 6' x 6'
- Concrete foundation with meeting Mesa County Building Department Standards, and as detailed on plan sheets S2-801 through S2-807 of the project plan set Bid Alternate 2, (all ground preparation, placement and compaction of basecourse materials, forming, steel reinforcing, backfill and grading to provide positive flow away from the foundation is included).
- Necessary conduit/conduit penetrations to facilitate installation of equipment identified described with this provision and on the project drawings.
- Other appurtenances as needed to provide a complete functional structure.

The building constructed on site as described and shown on the project drawings shall be measured as a lump sum.

Measurement - Pole shall consist of the following:

- Standard dimension creosote treated utility pole, total above ground height equal to twenty (20) feet. Installed adjacent to CMU building no more than five (5) feet from CMU structure, location proximal to structure shall be field determined.

Measurement - Photovoltaic Equipment shall consist of the following:

- Dasol 90W 12V Solar Panel
- Sunsaver-6 12V w LVD SS-6L-12V
- Sun Xtender PVX-1530T 153 AH 12 V Battery
- Tamarak Solar UNI-SP01A
- 100 ft MC-4 PV Cable Extensions
- 10-2 Tray Cable
- Inline ATC Fuse Holder 10AWG
- ATC Fuse 30A
- Mounting Hardware for Panel Pole Mount

Installation of the Photovoltaic equipment shall include all support equipment, connections, penetrations, and appurtenances as needed to provide a complete functioning power supply in accordance with current industry code. All equipment shall be housed within the CMU structure, with exception of pole mounted panel. Coordination with other equipment installers supplying communication and control components shall be included with this work.

Add the following to this subsection:

**Pay Item**

CMU Building, Pole, and Photovoltaic Equipment  
(Complete in Place)

**Pay Unit**

Lump Sum

**SP-3 SCADA INTEGRATION AND EQUIPMENT**

Measurement - SCADA integration and equipment shall include the following:

This bid item shall include provision and installation of all equipment as identified on Sheet C2-505 of project plans, for the following locations;

1. Lower Pressure Vault
2. Upper Pressure Vault
3. Tank Site
4. Kannah Creek Water Tank
5. Kannah Creek WTP

Equipment shall be housed within the CMU equipment enclosure for locations 1, 2, and 3 above and in supporting facilities when applicable. Equipment needed for locations 4 and 5 above shall be housed in existing enclosures at those sites.

SCADA Integration shall include provision of all equipment specified on plan sheet C2-505, Bid Alternative 2 – Purdy Mesa Flowline. Installation and Integration of the SCADA equipment shall include all support equipment, connections, penetrations, and appurtenances as needed to provide a complete functioning SCADA system in accordance with current industry code. Coordination with other equipment installers supplying photovoltaic

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PURDY MESA FLOWLINE – BID ALTERNATE 2**

components, and with the City Water Department, shall be included with this work.

Installation and integration of equipment at WTP Site as identified on Sheet C2-505 of the plan set will not be included in this scope of work.

Add the following to this subsection:

<b><u>Pay Item</u></b>	<b><u>Pay Unit</u></b>
SCADA Integration (Complete in Place)	Lump Sum

**SP- 4 FLOW CONTROL VALVE and STRAINERS ASSEMBLY**

Measurement – Flow Control Valve and Strainers Assembly shall include the following:

This bid item shall include provision and installation of all equipment at limits as identified on Sheet C2-503 of project plans, Flow Control Valve & Strainers Assembly;

The assembly is made up of all components as called out on sheet C2-503. All communication and control components of this assembly will be paid for separately under the SCADA integration and equipment pay item.

Add the following to this subsection:

<b><u>Pay Item</u></b>	<b><u>Pay Unit</u></b>
Flow Control Valve and Strainers Assembly (Complete in Place)	Lump Sum

**SP- 5 PRESSURE SUSTAINING VALVE ASSEMBLY**

Measurement – Pressure Sustaining Valve Assembly shall include the following:

This bid item shall include provision and installation of all equipment at limits as identified on Sheet C2-504 of project plans, Pressure Sustaining Valve Assembly;

The assembly is made up of all components as called out on sheet C2-504. All communication and control components of this assembly will be paid for separately under the SCADA integration and equipment pay item.

Add the following to this subsection:

<b><u>Pay Item</u></b>	<b><u>Pay Unit</u></b>
Pressure Sustaining Valve Assembly (Complete in Place)	Lump Sum



# **Appendix C**

Purdy Mesa Flowline at Sullivan Draw Project  
Volume Control Tank  
(Bid Alternate 3)

**PROJECT SUBMITTAL FORM**

**Purdy Mesa Flowline at Sullivan Draw Project  
Volume Control Tank  
(Bid Alternate 3)**

PROJECT: Purdy Mesa Flowline at Sullivan Draw Project – Volume Control Tank  
Bid Alternate 3

CONTRACTOR:

PROJECT ENGINEER: John Eklund

Description	Date Received	Resubmittal Requested	Resubmittal Received	Date Accepted
-------------	---------------	-----------------------	----------------------	---------------

**TANK AND WATERLINE CONSTRUCTION SUBMITTALS**

Pipe – AWWA C-900 PVC, DR-25, Ductile Iron Pipe – Class 53				
Fittings – Elbows, Tees, Tapping Saddles, Couplings				
Valves, Gate valves, slide gates check valves				
Tracing wire & splices				
Pipe Bedding Gradation (Type A)				
Mechanical Joint Restraints				
Concrete Mix Design: Structural, Thrust Restraint, Foundations				
Embankment Fill Gradation, Proctor Curve				
Base Course Gradation, Proctor Curve				

**EROSION CONTROL / STORMWATER MANAGEMENT**

Concrete Washout				
Seed Mix – Native and lawn				

**PERMITS, PLANS, OTHER**

Construction Schedule				
CDPHE Dewatering Permit (if necessary)				

**PROJECT SPECIAL PROVISIONS**

Purdy Mesa Flowline at Sullivan Draw Project  
Volume Control Tank  
(Bid Alternate 3)

**SP-1 TECHNICAL SPECIFICATIONS FOR CONCRETE VOLUME CONTROL TANK**

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PURDY MESA FLOWLINE – PRESSURE CONTROL WATER TANK

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**SECTION 01 11 00  
SUMMARY OF WORK**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. General Description of Work.
- B. Contractor Use of Site and Premises.
- C. Work Sequence.

**1.2 GENERAL DESCRIPTION OF WORK**

- A. The Purdy Mesa Flowline - Pressure Control Water Tank consists of:
  - The construction of a reinforced concrete 450,000 gallon water storage tank and all related appurtenances and testing.
  - All piping, valves, and fittings required to construct the water tank.
  - All earthwork required to construct the water tank.
- B. The Contractor is required to install and maintain proper signage as required to direct public traffic.

**1.3 CONTRACTOR USE OF SITE AND PREMISES**

- A. Limit use of site and premises to allow:
  - 1. Access by property owners.
  - 2. Work by others authorized by Owner and work by Owner.
- B. Construction operations limited to owner property, right-of-way limits, easement boundaries, and as shown on the Plans.
- C. Time Restrictions for Performing Work. Work shall start no earlier than 7:00 a.m. and shall end no later than 7:00 p.m. Monday through Saturday unless authorized by the Engineer.
- D. Utility Outages and Shutdown: No culinary water service or fire protection service will be discontinued for a period of more than 8 hours in one 24-hour period.

**1.4 WORK SEQUENCE**

- A. Construct Work in a manner to meet the requirements of Section 1.3.D above during construction period, coordinate construction schedule and operations with Owner and Engineer.



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PURDY MESA FLOW CONTROL TANK – BID ALTERNATE 3**

- B. Construct Work to allow for review of all trenching and excavation prior to backfilling or other work that would prevent a complete visual inspection of the trench or excavation.

**PART 2 PRODUCTS**

Not Used

**PART 3 EXECUTION**

Not Used

**END OF SECTION**

**SECTION 01 22 00  
UNIT PRICE MEASUREMENT AND PAYMENT**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Authority
- B. Payment
- C. Defect Assessment
- D. Non-Payment for Rejected Products
- E. General Description of Measurement and Payment
- F. Alternates
- G. Schedule of Bid Items

**1.2 AUTHORITY**

- A. Take all measurements and compute quantities to estimate percent complete of each item listed in the schedule of values. The Engineer will verify measurements and quantities and percent complete.

**1.3 PAYMENT**

- A. Payment Includes: Full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

**1.4 DEFECT ASSESSMENT**

- A. Replace the Work, or portions of the Work, not conforming to specified requirements.
- B. If, in the opinion of the Engineer, it is not practical to remove and replace the Work, the Owner will direct one of the following remedies:
  - 1. The defective Work may remain, but the unit sum will be adjusted to a new sum at the discretion of the Engineer.
  - 2. The defective Work will be partially repaired to the instructions of the Owner, and the unit sum will be adjusted to a new sum at the discretion of the Engineer.
- C. The individual specification sections may modify these options or may identify a specific formula or percentage sum/price reduction.

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PURDY MESA FLOW CONTROL TANK – BID ALTERNATE 3**

- D. The authority of the Engineer to assess the defect and identify payment adjustment is final.

**1.5 NON-PAYMENT FOR REJECTED PRODUCTS**

- A. Payment will not be made for any of the following:
  1. Products wasted or disposed of in a manner that is not acceptable.
  2. Products determined as unacceptable before or after placement.
  3. Products not completely unloaded from the transporting vehicle.
  4. Products placed beyond the lines and levels of the required Work.
  5. Products remaining on hand after completion of the Work.
  6. Loading, hauling and disposing of rejected Products.
  7. Removing rejected materials and/or work and replacing with materials and/or work in compliance with these specifications.

**1.6 GENERAL DESCRIPTION OF MEASUREMENT AND PAYMENT**

- A. Measurement and Payment for the bid items listed in Base Bid shall be on the basis of the description in the Technical Specifications and Drawings. Unless the work to be done is so specifically called out to be measured and paid for in Base Form, payment for such work shall be included in other applicable items, and there shall be no separate measurement and payment for the work.
- B. Items listed in Document C-410 – Bid Form as lump sum (L.S.) shall include all work for the complete installation as generally described in the Drawings and the Technical Specifications.
- C. Payment shall be made at the contract bid price listed in the Bid Form.
- D. Partial payment for unit price bid items and lump sum bid items only partially completed at the end of monthly pay periods shall be made based upon the Engineers interpretation of the percentage of work completed. Partial payment for materials delivered and stored will be considered, if said materials have been submitted to the Engineer for review per General Requirements, and supporting invoices and documentation have been provided.
- E. Quantities indicated in the Bid Form are for bidding and contract purposes only, unless specified otherwise in the Technical Specifications.
- F. If the actual work requires more or fewer quantities than those quantities indicated in the Bid Form, the Contractor shall provide the required quantities.
- G. Payment Includes: Full compensation for all required labor, products, tools, equipment, materials, transportation, services and incidentals, erection, application or installation of an item of the Work, including mobilization, demobilization, supervision, overhead and profit.

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PURDY MESA FLOW CONTROL TANK – BID ALTERNATE 3**

- H. Final payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities accepted by the Engineer multiplied by the unit price for work which is incorporated in or made necessary by the Work unless specified otherwise.

**1.7 ALTERNATES**

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in Owner-Contractor Agreement
- B. Coordinate related work and modify surrounding work.

**SCHEDULE OF BID ITEMS**

**1.8 MOBILIZATION, DE-MOBILIZATION, AND TEMPORARY CONTROLS (BID ITEM 1)**

- A. Measurement shall be for the job, complete.

Payment shall be as outlined below:

PAY FACTORS FOR MOBILIZATION AND TEMPORARY FACILITIES	
Percent of Original Contract Amount Earned Not Including Materials Purchased	Percent of Amount Bid for Mobilization to be Paid
5	40
15	20
40	30
50	10

- B. Payment covers cost of mobilization, installation of all temporary facilities and signage, bringing all necessary construction equipment to the site, and removal of such temporary facilities and construction equipment at the end of the project. Upon completion of the Work, any unpaid amount of the original contract amount for the separate item of mobilization and temporary facilities will be paid. Also includes any and all temporary facilities including, but not limited to, water, power, fencing (permanent or temporary), fence removal as required, solid waste disposal, sanitation facilities, traffic control, additional survey, and any other temporary facilities or utilities, etc., preparation and implementation of a storm water pollution prevention plan (SWPPP) and the preparation of the system Operation and Maintenance Manual, and any and all permits required, and all other items not covered in other bid items.
- C. Payment shall be made at the lump sum price stated in the Bid Form.

**CITY OF GRAND JUNCTION  
PURDY MESA FLOW CONTROL TANK – BID ALTERNATE 3**

**1.9 CONCRETE WATER TANK AND ACCESSORIES (BID ITEM 2)**

- A. Measurement for the Concrete Water Tank and Accessories shall include all equipment, labor, materials, and testing required to construct the concrete water tank. This includes all excavation and grading, dewatering, concrete and reinforcing, piping, conduit, fittings, and valves, utility connections, miscellaneous metal fabrications, hatches, seeding, electrical, SCADA, cleaning, disinfection, testing, and any and all other items required to furnish and install the concrete water tank, connect it to necessary systems, and place it into service, as shown on the drawings and described in the specifications and contract documents.
- B. Payment shall be made at the contract lump sum price stated in the Bid Form.

**1.10 SWPPP (INCIDENTAL TO BID ITEMS AS INCLUDED IN BID ITEM 1)**

- A. No measurement for the SWPPP. Included in this item is all labor, equipment, materials, required for the development and installation and maintenance of the Storm Water Pollution Prevention Plan. This includes, but not limited to, plans, specifications, materials, BMPs (Best Management Practices), procedures, and inspections required by the State of Colorado and local agencies, and as identified within the above SWPPP and specifications. Measurement shall also include coverage under a Construction General Permit and application of an N.O.I. and ending with a N.O.T. Contractor shall provide a copy of the SWPPP, N.O.I. and N.O.T. to the Engineer.
- B. No additional payment shall be made for the “SWPPP”.

**1.11 QUALITY CONTROL TESTING AND INSPECTING (INCIDENTAL TO BID ITEMS)**

- A. No measurement for the Quality Control Testing shall occur.
- B. Included in this item are all equipment, materials and labor necessary to perform all quality control testing, developing a quality control plan that explains CONTRACTOR’s quality control organization, inspection plan testing plan, sampling plan, correction action plan, laboratory facility, quality control organization chart, control charts, and personnel qualifications.
- C. If ENGINEER requests supplemental control testing and such testing shows product meets specification, additional testing will be paid for using Contract Modification pricing.
- D. Prior to final payment, submit a final summary report complying with the specifications.
- E. No additional payment shall be made for “Quality Control Testing”.

**1.12 REPAIR OF UNDERGROUND UTILITIES DISTURBED BY CONSTRUCTION (INCIDENTAL TO BID ITEMS)**

- A. No measurement for the repair or replacement of underground utilities disturbed by Construction shall occur.

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- B. Included in this item are all equipment, materials and labor necessary to perform any and all repairs, relocations or replacement of all underground utilities, whether public or private disturbed or damaged by the act of construction related to this contract.
- C. No additional payment shall be made for “Repair of underground utilities disturbed by Construction”.

**1.13 BYPASS PUMPING (INCIDENTAL TO BID ITEMS)**

- A. No measurement for any bypass pumping relating to work within existing ditches shall occur.
- B. Included in this item are all equipment, materials and labor necessary to perform bypass pumping related to this contract.
- C. No additional payment shall be made for “Bypass Pumping”.

**1.14 DEWATERING (INCIDENTAL TO BID ITEMS)**

- A. No measurement for the Dewatering shall occur. Included in this item is all equipment, materials and labor necessary to maintain the ground water level (when ground water is present within the excavation area) to one foot below the surface of the trench bottom or base of the bedding course during pipeline or structures installation and until such have been backfilled and compacted. Dewatering shall also include grading and other protective measures as necessary to prevent surface runoff or ground water from flowing into trenches or other excavations. Dewatering shall also include cleanup of debris or silt from property, catch basins, ditches, swells or pipelines which occurred as a result of the dewatering operations. Contractor shall be responsible in obtaining permissions to discharge any waters onto private property or into privately owned facilities.
- B. No additional payment shall be made for “Dewatering”.

**PART 2 PRODUCTS**

Not Used

**PART 3 EXECUTION**

Not Used

**END OF SECTION**

**SECTION 03 01 00  
MAINTENANCE OF CONCRETE**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES:**

1. Concrete reinforcement repair.
2. Concrete surface repair.
3. Concrete crack repair.

**1.2 MEASUREMENT AND PAYMENT**

- A. No separate measurement and payment will be made for surface repairs, crack repairs, or other defect repair required under this section. No separate or additional measurement and payment shall be made for wall and floor surface coating required under this section.

**1.3 REFERENCES**

- A. ASTM International:
1. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
  2. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
  3. ASTM C33 - Standard Specification for Concrete Aggregates.
  4. ASTM C109/C109M - Standard Test Method for Compressive strength of Hydraulic Cement Mortars (Using 2-in. or (50 mm) Cube Specimens).
  5. ASTM C150 - Standard Specification for Portland Cement.
  6. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
  7. ASTM C293 - Standard Test Method for Flexural Strength of Concrete (Using Simple Beam With Center-Point Loading).
  8. ASTM C404 - Standard Specification for Aggregates for Masonry Grout.
  9. ASTM C882 - Standard Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete By Slant Shear.
  10. ASTM C1042 - Standard Test Method for Bond Strength of Latex Systems Used With Concrete By Slant Shear.
  11. ASTM D638 - Standard Test Method for Tensile Properties of Plastics.
  12. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics.
  13. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

**1.4 SUBMITTALS**

- A. Product Data: Submit product standards, physical and chemical characteristics, technical specifications, limitations, maintenance instructions, and general recommendations regarding each material.

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- B. Manufacturer’s Instructions: Submit mixing instructions.

**1.5 CLOSEOUT SUBMITTALS**

- A. Project Record Documents: Accurately record actual locations of structural repairs, type of repair, and products used.

**1.6 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.
- B. Applicator: Company specializing in concrete repair with minimum three years experience and approved by manufacturer.

**1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Comply with instructions for storage, shelf life limitations, and handling.

**PART 2 PRODUCTS**

**2.1 EPOXY ADHESIVE INJECTION MATERIALS**

- A. Manufacturers:
  - 1. The Euclid Chemical Company.
  - 2. L & M Construction Chemicals Inc.
  - 3. Sika Corporation
  - 4. Or approved equal
- B. Epoxy Adhesive: Two-part epoxy adhesive containing 100 percent solids, meeting the following minimum characteristics:

	Characteristic	Test Method	Results
1.	Bond Strength	ASTM C882	2,700 psi
2.	Tensile Strength	ASTM D638	6,600 psi
3.	Elongation	ASTM D638	2 percent at 7 days 70 degrees F
4.	Flexural Strength	ASTM D790	8,000 psi
5.	Compressive Strength	ASTM D695	6,500 psi

**2.2 EPOXY MORTAR MATERIALS**

- A. Manufacturers:
  - 1. The Euclid Chemical Company.
  - 2. L & M Construction Chemicals Inc.
  - 3. Sika Corporation



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- 4. Or approved equal.
  
- B. Epoxy Mortar: Three-part epoxy binding resin and aggregate mortar mixture.
  
- C. Epoxy Binding Resin: Two-part epoxy resin containing 100 percent solids, meeting the following minimum characteristics:

	Characteristic	Test Method	Results
1.	Bond Strength	ASTM C882	2,700 psi
2.	Tensile Strength	ASTM D638	6,600 psi
3.	Elongation	ASTM D638	2 percent at 7 days 70 degrees F
4.	Flexural Strength	ASTM D790	8,000 psi
5.	Compressive Strength	ASTM D695	6,500 psi
  
- D. Aggregate: Type recommended by mortar manufacturer.

**2.3 CEMENTITIOUS MORTAR MATERIALS**

- A. Manufacturers:
  - 1. The Euclid Chemical Company.
  - 2. L & M Construction Chemicals Inc.
  - 3. Sika Corporation
  - 4. Or approved equal.
  
- B. Cementitious Mortar: Packaged latex modified, silica fume enhanced, or portland cement patching mortar with the following properties:
  - 1. Compressive Strength: ASTM C109/C109M; minimum 2,000 psi after one day and 5,000 psi after 28 days.
  - 2. Bond Strength: ASTM C882 or ASTM C1042; minimum 2,500 psi after 28 days.
  - 3. Flexural Strength; ASTM C293; minimum 1,500 psi after 28 days.
  
- C. Bonding Agent: Polyvinyl acetate emulsion, dispersed in water while mixing, non-coagulant in mix, water resistant when cured.
  
- D. Cleaning Agent: Commercial muriatic acid.

**2.4 MIXING EPOXY MORTAR**

- A. Mix epoxy mortars to consistency for purpose intended.
  
- B. Mix components in clean equipment or containers. Conform to pot life and workability limits.

**2.5 MIXING CEMENTITIOUS MORTAR**

- A. Mix cementitious mortar to consistency required for purpose intended.
- B. Include bonding agent as additive to mix.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. Verify surfaces are ready to receive work.
- B. Beginning of installation means acceptance of substrate.

**3.2 PREPARATION**

- A. Clean concrete surfaces of dirt, laitance, corrosion, or other contamination; wire brush using acid; rinse surface and allow to dry.
- B. Flush out cracks and voids with chemical solvent or muriatic acid to remove laitance and dirt. Chemically neutralize by rinsing with water.
- C. Sandblast clean exposed reinforcement steel surfaces.
- D. Repair exposed structural, shrinkage, and settlement cracks of concrete by epoxy injection, epoxy application, bonding agent and cementitious paste method as appropriate or as directed by the Project Engineer.
- E. Repair spalling. Fill voids flush with surface. Apply surface finish.

**3.3 INJECTION - EPOXY RESIN**

- A. Provide temporary entry ports spaced to accomplish movement of fluids between ports; no deeper than depth of crack to be filled or port size diameter no greater than thickness of crack. Provide temporary seal at concrete surface to prevent leakage of adhesive.
- B. Inject epoxy resin adhesive into prepared ports under pressure using equipment appropriate for particular application.
- C. Begin injection at lower entry port and continue until adhesive appears in adjacent entry port. Continue from port to port until entire crack is filled.
- D. Remove temporary seal and excess adhesive.
- E. Clean surfaces adjacent to repair and blend finish.

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**3.4 APPLICATION - EPOXY MORTAR**

- A. Remove broken and soft concrete 1/4 inch deep. Remove corrosion from steel. Clean surfaces mechanically; wash with acid; rinse with water.
- B. Trowel apply mortar mix to average thickness as recommended by the product manufacturer. Tamp into place filling voids at spalled or voided areas.
- C. For patching honeycomb, trowel mortar onto surface, work mortar into honeycomb to bring surface flush with surrounding area. Finish trowel surface to match surrounding area.
- D. Cover exposed steel reinforcement with epoxy mortar, feather edges to flush surface.

**3.5 APPLICATION - CEMENTITIOUS MORTAR**

- A. Apply by spray, brush or roller coating of bonding agent to damp concrete surfaces. Provide full surface coverage.
- B. Apply cementitious mortar by steel trowel to average thickness as recommended by the product manufacturer. Tamp into place filling voids at spalled or voided areas. Work mix into honeycomb.
- C. Damp cure cementitious mortar for four days.

**3.6 FIELD QUALITY CONTROL**

- A. General Requirements: Testing, inspection and analysis requirements.

**END OF SECTION**

**SECTION 03 01 90  
QUALITY ASSURANCE PROCEDURES FOR CONCRETE WATER STORAGE  
STRUCTURE LEAK TESTING & PREVENTION**

**PART 1 GENERAL.**

**1.1 DISCLAIMER**

- A. Care shall be exercised by the contractor throughout construction of the water storage structure, all feasible and necessary steps shall be taken to minimize normal and anticipated shrinkage effects on the concrete comprising the structure during the required casting and curing period. It is a well known fact that concrete shrinkage effects may induce restrained shrinkage cracks to form in the concrete walls and/or slabs resulting in unacceptable amounts of leakage through the finished structure.
- B. The contractor shall consider all factors which may affect the curing, premature drying and shrinkage of the finished concrete structure including but not limited to water-cement ratios, total water content, total cement content, additives, delivery distance and time, temperature and weather during the placement and curing period, the means and methods of placing and consolidating the concrete, and the type and duration of the curing process used.

**1.2 MINIMUM CURING PERIOD**

- A. The minimum curing period for all concrete comprising the foundations, floor slabs, walls, columns and roof slabs shall be as follows:
  - 1. The time required for all concrete to reach the minimum specified compressive strengths as verified by concrete cylinder compression tests.
  - 2. 28-days minimum.

**1.3 DEFINITIONS**

- A. The following criteria shall be followed in defining cracks by minimum measured crack width; using feeler gauges or other approved means:
  - 1. Hair-line cracks: Cracks with maximum widths less than 0.015-inches (1/64")
  - 2. Medium cracks: Cracks equal to or greater to 0.015-inches (1/64") and less than or equal to .095-inches (3/32") in width at any point
  - 3. Large cracks : Cracks equal to or greater to 0.095-inches (3/32") in width at any point.

**1.4 WALL AND FLOOR SURFACE COATING**

- A. Where cracking and/or other surface defects are extensive the Project Engineer may direct that entire perimeter of the wall shall be coated.

## **PART 2 PRODUCTS**

### **2.1 CEMENTIOUS WATER-PROOF COATING**

- A. Thoroseal with Acryl 60
- B. or equal

## **PART 3 EXECUTION**

### **3.1 PRIMARY STRUCTURE INSPECTION FOR CRACKS AND OTHER DEFECTS**

- A. After the concrete has been cured for the minimum required period it shall be inspected by the Project Engineer or his approved representative for cracks, voids, rock pockets and other defects that may affect the serviceability or water retention characteristics of the finished structure.

### **3.2 CRACK REPAIR**

- A. All cracks, voids, rock pockets and other types of surface defects identified in the structure shall be repaired per the appropriate sections of these specifications or as approved by the Project Engineer. All Cracks, voids, rock pockets and other deep or surface defects shall be repaired per Section 03 01 00 – Maintenance of Concrete. All defects that can not be adequately repaired by the standard methods of repair shall be repaired as directed by the Project Engineer. The following outlines the repair alternative selections.
  - 1. Hair-line cracks shall be repaired or sealed as directed by the Project Engineer.
  - 2. Medium cracks shall be repaired or sealed with mandatory repair by injection.
  - 3. Large cracks shall be repaired with mandatory repair by injection or as directed by the Project Engineer required.
  - 4. Extensive cracks - When extensive wall surface cracking is identified such that, in the opinion of the Project Engineer, repair by the standard methods of crack and surface repair may not fully assure that the structure will be substantially leak-free, then parts or portions of the interior surface of the wall and floor shall be coated with a cementious water-proofing coating material furnished and installed per manufacturer's recommendations. The area to be coated shall be as directed by the project engineer.

Typically, this would involve applying the cementious water-proof coating to the lower one-third of the structures walls (or higher if directed by the Project Engineer) extending down and across the floor slab junction to a distance of 2-feet out from the base of the wall towards the structure center. The coated wall area shall extend around the perimeter of the interior of the tank wall at least 2-ft past areas with notable cracks or as directed by the Project Engineer.

### **3.3 PRIMARY STRUCTURE LEAK TESTING**

- A. After all repairs to the structures walls and other surfaces have been completed, including all required curing periods for the repair materials used, the structure shall be

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leak tested. The leak testing procedures are fully described in Section 03 30 00 – Cast-in-Place Concrete.

**3.4 SECONDARY STRUCTURE INSPECTION FOR LEAKAGE**

- A. If the structure fails the requirements of the Leak Test, or significant areas of leakage are noted during the Leak Testing procedure, then the tank shall be drained and additional repairs shall be made as directed by the engineer. These additional repairs shall include but not be limited to those methods specifically cited in this specification.

**3.5 REPAIR OF CRACKS AND OTHER CONCRETE DEFECTS**

- A. Areas deemed necessary shall be coated or re-coated with the water-proof cementitious coating specified in Paragraph 3.2.A.

**3.6 SECONDARY STRUCTURE LEAK TESTING**

- A. After all repairs to the structures walls and other surfaces have been completed, including all required curing periods for the repair materials used, the structure shall be leak tested again. The leak testing procedures are fully described in Section 03 30 00 – Cast-in-Place Concrete.
- B. If the structure fails the requirements of the Leakage Test, or significant areas of leakage are noted during the Leak Testing procedure, then the tank shall be drained and additional repairs shall be made as directed by the engineer per paragraphs 3.4 and 3.5 of this Section.

**3.7 MEASUREMENT AND PAYMENT**

- A. No separate measurement and payment will be made for crack and other defect repair required under this section. No separate or additional measurement and payment shall be made for wall and floor surface coating required under this section.

**END OF SECTION**

**SECTION 03 10 00  
CONCRETE FORMING AND ACCESSORIES**

**PART 1 GENERAL**

**1.1 WORK INCLUDED**

- A. This item of work includes the formwork and shoring for cast-in-place concrete and the installation into formwork of items such as anchor bolts, pipe and pipe fittings, and other items to be embedded in concrete (but not including reinforcing steel - see Section 03 20 00 - Concrete Reinforcing).

**1.2 QUALITY ASSURANCE**

- A. Codes and Standards
  - 1. The Contractor shall design, construct, erect, maintain, and remove forms and related structures for cast-in-place concrete work in compliance with the American Concrete Institute Standard ACI 347, "Recommended Practice for Concrete Formwork."
- B. Allowable Tolerances
  - 1. The Contractor shall construct formwork to provide complete cast-in-place concrete work as follows:
    - a. Variation from plumb lines and surfaces: 1/4 inch per 10 feet, but not more than 1 inch. For exposed corners, control joints grooves and other conspicuous lines: 1/4 inch in 20 feet maximum; 1/2 inch maximum in 40 feet or more. Depressions In Wall Surface: Maximum 1/4 inch when 10-foot straightedge is placed on high points in any direction or at any location. Wall Thicknesses: Maximum 1/4 inch minus or 1/2 inch plus from dimension shown.
    - b. Variation from level or grade in slabs, and in arises: 1/4 inch in 10 feet, 3/8 inch in 40 feet or more. For exposed horizontal grooves and other conspicuous lines: 1/4 inch in 20 feet maximum and 1/2 inch in 40 feet or more. Slab Finish Tolerances and Slope Tolerances: Floor surface shall not have crowns so high as to prevent 10-foot straightedge from resting on 1/4-inch end blocks, nor low spots that allow a block of twice the tolerance in thickness to pass under the supported 10-foot straightedge. Finish Slab Elevation: Within 1/2 inch of elevation specified except slabs which are designed and detailed to drain to floor drain or gutter shall adequately drain regardless of tolerances. Repair floor slopes in an approved manner if necessary to provide complete drainage. Thickness: Maximum 1/4 inch minus or 1/2 inch plus from thickness shown.
    - c. For beams and columns physical dimensions: Maximum 1/4 inch minus or 1/2 inch plus from dimension shown. Elevations: Within 1/2 inch plus or

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minus except where tops of beams become part of finished slab. In this case refer to slab tolerances. Columns shall be plumb within ¼ inch in any 10 feet with maximum ½ inch out-of-plumb at top with respect to bottom.

- d. Forms for sidewalks and driveways shall be standard steel forms or wood forms constructed and fastened to prevent movement. Set forms to true lines and grades, and securely stake in position.
2. Before concrete placement, the Contractor must check the lines and levels of erected formwork. The Contractor shall make corrections and adjustments to ensure proper size and locations of concrete members and stability of forming systems.
3. During concrete placement, the Contractor must check formwork and related supports to ensure that forms are not displaced and that completed work will be within the specified tolerances.

**1.3 SUBMITTALS**

- A. Samples: Prior to start of work, submit one sample each as follows:
  1. Form ties.

**1.4 SEQUENCING AND SCHEDULING**

- A. Schedule work for embedded, buried, or other items of work that affects form layout before completing concrete formwork.

**PART 2 PRODUCTS**

**2.1 FORMS FOR EXPOSED FINISH CONCRETE**

- A. Unless otherwise shown or specified, the Contractor shall construct formwork for exposed concrete surfaces with plywood, plywood faced metal frames, steel or other panel type materials to provide continuous, straight and smooth as-cast surfaces. The Contractor shall furnish the forms in the largest practicable sizes to minimize the number of joints and to conform to the joint system shown on the construction documents. The Contractor shall provide form material with sufficient thickness to withstand the pressure of the newly placed concrete without bow or deflection.

**2.2 FORM TIES**

- A. The Contractor shall provide factory fabricated, adjustable length, removable or snap-off metal form ties with conical or spherical type inserts, designed to prevent form deflection and to prevent spalling concrete surfaces upon removal. Do not use wire ties.
- B. The Contractor shall provide ties so that portion remaining within the concrete after removal of exterior parts is at least 1-1/2 inch from the outer concrete surface except as otherwise specified. Form ties shall be provided which will not leave a hole larger than



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1-inch diameter in the concrete surface. The holes shall be filled as per Section 03 30 00 - Cast-in-Place Concrete.

- C. Form ties and wire ties fabricated on the project site are not acceptable. Do not use wire ties of any kind. Ties shall withstand form pressures and limit form deflection to specified tolerances. Flat bar ties for panel forms shall have plastic or rubber inserts with minimum 1-inch depth and sufficient dimensions to permit proper patching of tie hole.
- D. Water Stop Ties:
  - 1. Provide for water-holding structures or dry structures with access such as basements, pipe galleries, etc., that are below finish grade.
  - 2. Ties shall have either an integral steel water stop 0.103-inch thick and 0.625 inch in diameter tightly and continuously welded to tie, or neoprene water stop 3/16-inch thick and 15/16 inch in diameter whose center hole is ½ diameter of snap tie, or a molded plastic water stop of comparable size.
  - 3. Flat snap ties are not permitted.
  - 4. Water Stop shall be considerably larger in area than tie cross-sectional area, oriented perpendicular to tie and symmetrical about center of tie.
  - 5. Construct ties to provide positive means of preventing rotation or disturbance of center portion of tie during removal of ends and prevent water leaking along tie.

**2.3 FORM COATING**

- A. The Contractor shall provide commercial formulation form-coating compounds that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatment of concrete surfaces requiring bond or adhesion, or impede the wetting of surfaces to be cured with water or curing compounds. All coating and curing compounds shall be ANSI/NSF Standard 61 approved.
- B. Form coating (nonstaining form oil) shall be equal to:
  - 1. Nox-Crete Company, Omaha, Nebraska.
  - 2. "Form-Guard," W.R. Grace and Company, Cambridge, Massachusetts.
  - 3. "Rheofinish," Master Builders, Inc.
  - 4. "Formcel," Lambert Corporation, Houston, Texas.

**2.4 DESIGN OF FORMWORK**

- A. The design of forms, shores, and bracing is the responsibility of the Contractor.
- B. The Contractor shall design, erect, support, brace, and maintain formwork so that it will safely support vertical and lateral loads that might be applied, until such loads can be supported by the concrete structure. Formwork shall be constructed so that concrete members and structures are of correct size, shape, alignment, elevation, and position.
- C. The Contractor shall provide shores and struts with positive means of adjustment capable of taking up formwork settlement during concrete placing operations, using

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wedges or jacks or a combination thereof. Trussed supports shall be provided when adequate foundations for shores and struts cannot be secured.

- D. The Contractor shall support form facing materials by structural members spaced sufficiently close to prevent deflection. Forms placed in successive units for continuous surfaces shall be fitted to accurate alignment, free from irregularities, and within allowable tolerances.
- E. Design joints in forms to remain watertight and withstand placing pressures without bulging outward or creating surface patterns. Do not use formwork that leaks mortar.
- F. Where poor formwork is used and finish obtained is less than specified, upgrade finish to an acceptable finish at no additional cost.
- G. Panel Deflections: Limit as required to achieve tolerances specified herein.
- H. For circular structures, forms shall conform to circular shape of structure. Straight panels may be substituted for circular forms if they do not exceed 2 feet in width and in addition to the requirement each panel does not provide an angular deflection more than 3½ degrees per joint, and do not conflict otherwise with these Specifications and/or Drawings.
- I. Design shall account for tolerances, form ties, finishes, architectural features, rebar supports, construction joint locations, and other nonstructural formwork requirements specified.
- J. Design formwork strong enough to hold high liquid heads without form distortion and to meet tolerances as specified herein. Coordinate form design with admixture company information and concrete slump.
- K. Structurally design forms, falsework, shoring, and other structural formwork and meet applicable safety regulations, current OSHA regulations, and other codes.
- L. A licensed engineer shall prepare formwork, falsework, and shoring designs to meet these Specifications and to meet all federal and state requirements.
- M. Meet applicable portions of ACI 347, ACI 318 current edition, and these Specifications.

**2.5 REINFORCING SPACERS AND REBAR SUPPORTS**

- A. Columns:
  - 1. Provide a positive spacer between column reinforcing and column forms to ensure adequate cover.
  - 2. Remove spacer as concrete is placed, consolidated, and proper support and spacing is achieved.
- B. Walls:

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1. Provide positive spacers or chairs specifically designed for wall forms to hold forms and reinforcing at correct dimensions and clearances.
  2. Remove spacer or chair if not designed to remain in place as concrete is placed, consolidated, and proper support and spacing is achieved.
- C. Slabs:
1. Provide positive spacers, chairs or concrete dobies to support reinforcing steel to the height noted on the plans. Place support sufficient to maintain rebar spacing to the bottom of the slab.
  2. Use concrete dobies to support reinforcement when forming is not used at the bottom of the slab.
  3. Rocks or masonry bricks are not allowed as rebar support.

### **PART 3 EXECUTION**

#### **3.1 FORM CONSTRUCTION**

- A. General: The Contractor shall construct forms complying with ACI Standards 318 and 347, to the exact sizes, shapes, lines, and dimensions shown, and as required to obtain accurate alignment, location, grades, level and plumb work in finish structures. All necessary detail work, construction aids, and embedded items shall be provided as required.
- B. The Contractor shall fabricate forms for easy removal without hammering or prying against concrete surfaces. Crush plates or wrecking plates shall be provided where stripping may damage cast concrete surfaces. Kerf wood inserts shall be provided for forming keyways, reglets, recesses, chamfers and the like, to prevent swelling and assure ease of removal.
- C. Forms for Exposed Concrete:
1. The Contractor shall drill forms to suit the ties used and to prevent leakage of concrete mortar around the tie holes. The Contractor shall not splinter forms by driving ties through improperly prepared holes.
  2. The Contractor shall not use metal cover slates for patching holes or defects in forms.
  3. The Contractor shall provide sharp, clean corners at intersecting planes, without visible edges or offsets. Back joints with extra studs or girts to maintain true, square intersections shall be provided.
  4. The Contractor shall use extra studs, walers, and bracing to prevent bowing of forms between studs and to avoid bowed appearance in concrete. Narrow strips of form material which will allow the forms to bow shall not be used.
  5. The Contractor shall assemble forms so that they may be readily removed without damage to exposed concrete surfaces.
  6. The Contractor shall place carefully and accurately all bracing to prevent sagging or misalignment.

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7. All forms shall be new or in first class condition free from holes, indentations, or irregular surfaces.
  8. The exposed concrete joints shall be formed with special care to assure proper alignment and uniform cross section.
  9. The Contractor shall form molding shapes, recesses and projections with smooth finish materials, and install these in the forms with sealed joints to prevent displacement.
- D. Cleaning and Tightening:
1. The Contractor shall thoroughly clean forms and adjacent surfaces to receive concrete. All chips, wood sawdust, dirt, or other debris shall be removed just before concrete is to be placed. All forms shall be re-tightened immediately after concrete placement as required to eliminate leaks.

**3.2 FORM COATINGS**

- A. The Contractor shall coat the contact surfaces of forms with form-coating compound before steel reinforcement is placed. No form coating shall be allowed on steel reinforcement or on previously cast concrete sections which abut the new concrete pour.
- B. The Contractor shall thin form-coating compounds only with the thinning agent of type and in amount and under the conditions recommended by the coating compound manufacturer. Excess form-coating material shall not be allowed to accumulate in the forms or to come into contact with concrete surfaces against which fresh concrete will be placed. All form coatings shall be applied in compliance with the manufacturer's instructions.
- C. Steel forms shall be coated with a non-staining, rust-preventative form oil or otherwise to protect against rusting. Rust-stained steel formwork will not be accepted. Coat contact surfaces of forms with a light uniform film (a coverage rate of 1,200 square feet per gallon or higher) of the surface consolidation agent. Apply to steel forms as soon as they are cleaned to prevent discoloration of concrete form rust. Do not get surface consolidation agent on concrete surfaces or reinforcing steel against which fresh concrete will be placed.

**3.3 INSTALLATION OF EMBEDDED ITEMS**

- A. General: Set and build into the 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 the items to be attached thereto. Securely anchor embedded items to prevent displacement during placement of concrete.
- B. Edge Forms and Screed Strips for Slabs:
  1. The edge forms or bulkheads and intermediate screed strips for slabs shall be set to obtain the required elevations and contours in the finished slab surface.

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The Contractor shall provide and secure units to support the types of screeds required.

- C. Prevent metals of dissimilar types from coming in contact with reinforcement.

**3.4 BEVELED EDGES (CHAMFER)**

- A. Form 3/4-inch bevels at concrete edges, unless otherwise shown.
- B. Where beveled edges on existing adjacent structures are other than 3/4 inch, obtain Engineer's approval of size prior to placement of bevel form strip.
- C. Prevent metals of dissimilar types from coming into contact with reinforcement.

**3.5 REMOVAL OF FORMS**

- A. General: Formwork not supporting concrete, such as sides of walls, and similar parts of the work, may be removed after cumulatively curing at not less than 50 degrees Fahrenheit for 24 hours after placing concrete, provided; (1) concrete strength is sufficient to withstand damage by form removal operation and the forces acting on it, and (2) that curing and protection operations are maintained.
- B. Formwork supporting the weight of concrete, such as slabs and other structural elements, may not be removed in less than 14 days, and not until the concrete has attained the minimum 28-day compressive strength as indicated by field cured test cylinders taken from that placement.
- C. Contractor shall assume responsibility for damage resulting from improper and premature removal of forms.
- D. Satisfy applicable OSHA requirements with regard to safety of personnel and property.
- E. Do not remove supports and reshore prior to obtaining adequate field cured cylinder results.

**3.6 CONCRETE FINISHES**

- A. As specified in Section 03 30 00 - Cast-in-Place Concrete.

**3.7 BACKFILL AGAINST WALLS**

- A. Do not backfill against walls until concrete has obtained compressive strength equal to specified 28-day compressive strength.
- B. Do not backfill against walls until the leak test has been passed.
- C. Place backfill simultaneously on both sides of wall where required to prevent differential pressures.

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**3.8 FIELD TESTS**

- A. Wall Finish Tolerances: Test for compliance with tolerances as specified.
- B. Slab Finish Tolerances and Slope Tolerances:
  - 1. Floor flatness measurements will be made the day after floor is finished and before shoring is removed, to eliminate effect of shrinkage, curling, and deflection.
  - 2. Support 10-foot long straightedge at each end with steel gauge blocks of thicknesses equal to specified tolerance.
  - 3. Compliance with designated limits in four of five consecutive measurements is satisfactory unless obvious faults are observed.
  - 4. A check for adequate slope and drainage will also be made to confirm compliance with these Specifications.
- C. Finish Tolerance Failures: Repair or replace concrete as specified in Section 03 30 00 - Cast-in-Place Concrete.

**3.9 REUSE OF FORMS**

- A. All forms to be reused shall be clean and surfaces repaired to be reused in following work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable. The Contractor shall apply new form-coating compound material to concrete contact surfaces as specified for new formwork.
- B. When forms are extended for successive concrete placement, the Contractor shall thoroughly clean all surfaces, remove fins and laitance, and tighten forms to close all joints. All joints shall be secured and tightened to avoid offsets.

**END OF SECTION**

**SECTION 03 15 16  
CONCRETE EXPANSION AND CONSTRUCTION JOINTS**

**PART 1 GENERAL**

**1.1 WORK INCLUDED**

- A. Concrete expansion, construction and control joints.
- B. Concrete joint fillers.

**1.2 SUBMITTALS**

- A. Product Data: Furnish for the following:
  - 1. Joint fillers for horizontal and sloped joints.
  - 2. Preformed control joints.
  - 3. Water stop.
  - 4. Adhered strip seal.
  - 5. Sealants.
- B. Shop Drawings: Furnish information listed below:
  - 1. Plastic Type Water Stops: Details of construction joint types; show in sufficient detail water stop support used in both concrete pours to demonstrate water stop will remain secure until complete encasement.
  - 2. Construction Joints: Layout and location indicating type to be used.
- C. Quality Control submittals: Furnish the following documents:
  - 1. Water stop manufacturer's written instructions for product shipment, storage, handling, installation and repair.
  - 2. Joint Filler and Primer: Manufacturer's written instructions for product shipment, storage, handling, application, and repair.
  - 3. Adhered strip seal manufacturer's written instructions for product shipment, storage, handling, application, and repair.

**1.3 DELIVERY, STORAGE, AND HANDLING**

- A. Packing and Shipping: Prepare and protect materials for shipment in accordance with manufacturer's recommendations.
- B. Acceptance at Site: Verify that water stops delivered meet the cross-section dimensions shown and manufacturer's reviewed product data prior to unloading and storage at the site.
- C. Protect hydrophilic waterstop from premature exposure to moisture which may cause premature swelling of waterstop. Protect from oil, dirt, and sunlight.

## **PART 2 PRODUCTS**

### **2.1 PLASTIC WATER STOP**

- A. Extruded from an elastomeric plastic compound of which the basic resin shall be polyvinyl chloride (PVC). Reclaimed PVC in the compound is not acceptable.
- B. Specific Gravity: Approximately 1.37.
- C. Shore Durometer Type A Hardness: Approximately 80.
- D. Performance Requirements: Corps of Engineers' Specification CRD-D-572.
- E. Type: Center bulb with a number of parallel ribs or protrusions on each side of strip center.
  - 1. Corrugated or tapered type water stops are not acceptable.
- F. Size: 6-inch 3/8-inch web.
- G. Thickness: Constant from bulb edge to the outside stop edge.
- H. Minimum Weight per Foot of Water Stop:
  - 1. 1.60 pounds for 3/8-inch by 6-inch.
- I. Factory fabrications: Use only factory fabrications for intersections, transitions, and changes of direction.
- J. Provide for at all construction, expansion and control joints indicated on the Drawings.
- K. Manufacturers and Catalog Numbers:
  - 1. Greenstreak Plastic Products, St. Louis, MO; Catalog No. 03150/GRD: Style 732 (6-inch by 3/8-inch).
  - 2. Vinylex Corp., Knoxville, TN; Catalog No. 03250/ VIN: No. RB6-38H (6-inch by 3/8-inch).
  - 3. Four Seasons Industries Durajoint, Garrettsville, OH; Catalog No. CSP-162: Type 9 (6 inches by 3/8 inch)

### **2.2 WIRE LOOPED PLASTIC WATER STOP**

- A. May be provided as an alternative to specified plastic water stops without wire loops.
- B. Comply with hereinbefore specified material and geometry requirements of Article PLASTIC WATER STOP, except as follows:
  - 1. Add continuous galvanized wire looping at plastic water stop edge for convenience in positioning and securing stop in-place in the forms.



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- C. Manufacturer and Catalog Numbers:
  - 1. The Schlegel Corp., Rochester, New York; "Wire Stop Water Stop"; geometry numbers 05-151-YACR-4361, 05-151-ACR-6380, 05-151-ACR-9380 as shown on Schlegel Corp., Drawing No. 05-151-ACR dated 11-30-82.
  - 2. Or equal.

**2.3 HYDROPHILIC WATER STOP**

- A. For use at construction joints only, where new concrete is place against existing concrete and as shown on the Drawings
- B. Material shall be a nonbentonite hydrophilic compound.
- C. Manufacturers and Products:
  - 1. Greenstreak Plastic Products, St. Louis, MO; Hydrotite CJ-1020-2K with Leakmaster LV-1 adhesive and sealant.
  - 2. Adeka Ultra Seal, JLM Associates, Spearfish, SD; MC-2010M with 3M-2141 adhesive and P-121 sealant.

**2.4 BOND BREAKER TAPE FOR EXPANSION JOINT**

- A. Adhesive-backed glazed butyl or polyethylene tape which will adhere to the premolded joint material or concrete surface.
- B. Width: Same as the joint.
- C. Location: As shown.

**2.5 BOND BREAKER**

- A. Provide either bond breaker tape as hereinbefore specified or a bond prevention material, nonstaining type, as specified in Section 03 30 00 - Cast-in-Place Concrete, except where a tape is specifically called for.

**2.6 PREMOLDED JOINT FILLER (PJF)**

- A. Bituminous Type: ASTM D994 or D1751.
- B. Sponge Rubber: Neoprene, closed-cell, expanded; ASTM D1056, Type RE-45-E1, with a compression deflection, 25 percent deflection (limits), 119 to 168 kPa (17 to 24 psi) minimum.
- C. Closed-Cell Neoprene: ASTM D1752, Type I; as manufactured by W.R. Meadows, Inc., Elgin, IL; or equal.

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**2.7 PREFORMED CONTROL JOINT**

- A. One-piece, flexible, polyvinyl chloride joint former; Kold-Seal Zip-Per Strip KSF-150-50-50, manufactured by Vinylex Corp., Knoxville, TN; or equal.
- B. One-piece steel strip with preformed groove; Keyed Kold Retained Kap, manufactured by Burke Concrete Accessories, Inc., San Mateo, CA; or equal.
- C. Provide in full-length unspliced pieces.
- D. Provide only where specifically permitted by Drawings.

**2.8 POURABLE JOINT FILLERS**

- A. Pourable joint filler shall be approved for use in potable water supply systems. The specific gravity of the in-place filler after curing shall be greater than 1.5. The manufacturers of the following fillers shall provide written certification that the products are approved by the EPA and the State Department of Health for use in potable water supply systems, and will not be a hazard to health.
- B. Manufacturers and Products:
  - 1. Sikaflex 2C, Colonial White color only, as manufactured by Sika Chemical Company, Lyndhurst, NJ; or equal.
  - 2. On sloping joints, use Gun Grade material of the above products of Sikaflex 1A similar nonsag material; submit product information for review and acceptance.
  - 3. Or equal.

**2.9 STEEL EXPANSION JOINT DOWELS**

- A. Dowels: Round smooth steel bars; ASTM A36.
- B. Bar Coating: Two-coating system No. 29A, FUSION BONDED, STEEL DOWEL COATING, as specified under Section 09 90 00 – Painting and Coating.

**2.10 ADHERED STRIP SEAL**

- A. Epoxy Adhesive: Two components, 100% solids, moisture-insensitive, high-modulus, high-strength, structural epoxy paste adhesive, complying with ASTM C-881.

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<b>Epoxy Adhesive Properties</b>			
SHELF LIFE	2 years in original, unopened containers.		
STORAGE CONDITIONS	Store dry at 40-95F. Condition material to 65-85F before using.		
COLOR	Concrete gray.		
MIXING RATIO	Component 'A': Component 'B' = 2:1 by volume.		
CONSISTENCY	Non-sag paste.		
POT LIFE	Approximately 30 minutes @ 73F. (60 gram mass)		
TACK-FREE TIME	2-3 hours.		
<b>TENSILE PROPERTIES (ASTM D-638)</b>			
14 day Tensile Strength		3,600 psi	
Elongation at Break		0.4 %	
Modulus of Elasticity		7.5 x 10 <sup>5</sup> psi	
<b>FLEXURAL PROPERTIES (ASTM D-790)</b>			
14 day Flexural Strength (Modulus of Rupture)		4,400 psi	
Tangent Modulus of Elasticity in Bending		1.0 x 10 <sup>5</sup> psi	
<b>SHEAR STRENGTH (ASTM D-732)</b>			
14 day Shear Strength		3,400 psi	
<b>BOND STRENGTH (ASTM C-882): Hardened Concrete to Hardened Concrete</b>			
2 day (moist cure) Bond Strength		2,300 psi	
14 day (moist cure) Bond Strength		2,400 psi	
2 day (dry cure) Bond Strength		3,300 psi	
<b>DEFLECTION TEMPERATURE (ASTM D-648)</b>			
7 day Deflection Temperature (fiber stress loading = 264 psi)		128F	
<b>WATER ABSORPTION (ASTM D-570)</b>			
24 hour Total Water Absorption		0.79%	
<b>COMPRESSIVE PROPERTIES (ASTM D-695)</b>			
Compressive Strength, psi			
2 hour	40F	73F	90F
4 hour	--	--	900
8 hour	--	140	5,400
16 hour	--	6,800	8,800
1 day	400	9,600	10,100
3 day	3,900	9,800	11,700
7 day	6,700	11,300	11,900
14 day	9,100	12,000	13,000
28 day	10,400	12,000	13,000
28 day	11,200	12,000	13,000
<b>MODULUS OF ELASTICITY, PSI</b>			
7 day		3.9 x 10 <sup>5</sup>	

- B. Hypalon Strips: Provide hypalon strips of width indicated by drawings and minimum 20 foot lengths. Minimum hypalon thickness shall be 40 mils. Minimum physical properties as follows:

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<b>SIKA HYPALON STRIP</b>
<i>TENSILE PROPERTIES (ASTM D-412)</i> <i>Elongate at Break: 800 %</i> <i>Tensile Strength: 1300 psi</i>
<i>TEAR RESISTANCE (ASTM D-624)</i> <i>250 lbs/in.</i>
<i>LOW TEMPERATURE PERFORMANCE MAINTAINED TO -40N F. (-40N C.)</i>

C. Provide product equal to: "Sikadur Combi-flex", Sika, Aurora, CO.

**2.11 ACCESSORIES**

- A. Joint Sealant: Joint sealant shall be two-part polysulfide or urethane conforming to FS TT-S-00227. The type used shall be specifically intended for exterior, submerged control joint applications. A non-sag joint sealant shall be used for vertical joints and self-leveling for horizontal joints.
- B. Nonshrink Grout:
  - 1. As specified in Section 03 30 00 - Cast-in-Place Concrete.
  - 2. Compatible with joint sealant.
- C. Roofing Felt: 30-pound asphalt-saturated; ASTM D226, Type II; or a tar-saturated roofing felt of equal quality.
- D. Reinforcing Steel: As specified in Section 03 20 00 - Concrete Reinforcing.
- E. Nails: Provide for securing bituminous type premolded joint filler.

**PART 3 EXECUTION**

**3.1 GENERAL**

- A. Locate joints as shown, or noted on the Drawings.
- B. Verify conformance of water stops with dimensions shown and with reviewed product data prior to embedding water stops in concrete.
- C. Construct straight joints; make vertical or horizontal, except where walls intersect sloping floors.
- D. Commence concrete placement after the joint preparation is complete.
- E. Time Between Concrete Pours:
  - 1. At least 2 hours must elapse after depositing concrete in long or high columns and/or heavy walls before depositing concrete in beams, girders, or slabs supported thereon.

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2. For short columns and low height walls, 10 feet or less, wait at least 45 minutes prior to depositing concrete in beams, girders, brackets, column capitals, or slabs supported thereon.
3. Consider beams, girders, brackets, column capitals, and haunches as part of the floor or roof system and place monolithically with the floor or roof system.
4. Should concrete placement sequence result in cold joint located below finished water surface, install water stop in joint prior to additional concrete placement. Notify Engineer prior to installing waterstop. Engineer shall approve preparations prior to concrete placement.

**3.2 SURFACE PREPARATION**

- A. Construction Joints: Prior to placement of abutting concrete, clean contact surface:
  1. Remove laitance and spillage from reinforcing steel and dowels.
  2. Roughen surface to a minimum of ¼-inch amplitude:
    - a. Sandblast after the concrete has fully cured.
    - b. Water blast after the concrete has partially cured.
    - c. Green cut fresh concrete with high pressure water and hand tools.
  3. Perform cleaning so as not to damage water stop, if one is present.
- B. Expansion Joint with Pourable Filler:
  1. Use motorized wire brush or other motorized device to mechanically roughen and thoroughly clean concrete surfaces on each side of joint from plastic water stop to the top of the joint.
  2. Use clean and dry high pressure air to remove dust and foreign material, and dry joint.
  3. Prime surfaces before placing joint filler.
  4. Avoid damage to water stop.
- C. Control Joint:
  1. Coat concrete surfaces above and below plastic water stop with bond breaker. Do not get bond breaker on water stop.
  2. Avoid damage to water stop.
  3. Verify that proper type and size of reinforcing and dowels are provided.

**3.3 INSTALLATION OF WATER STOPS**

- A. General:
  1. Join water stops at intersections to provide continuous seal.
  2. Center water stop on joint.
  3. Secure waterstop in correct position to avoid displacement during concrete placement.
  4. Repair or replace damaged waterstop.
  5. Vibrate concrete to obtain impervious concrete in the vicinity of all joints.
  6. Joints in Footings and Slabs:

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- a. Ensure that space beneath plastic water stop is completely filled with concrete.
  - b. During concrete placement make a visual inspection of the entire water stop area as shown.
  - c. Limit concrete placement to elevation of water stop in first pass, vibrate the concrete under the water stop, lift the water stop to confirm full consolidation without voids, then place remaining concrete to full height of slab as shown.
  - d. Apply procedure to full length of plastic water stops.
- B. Plastic Water Stop: Install in accordance with details shown and manufacturer's written instructions.
- C. Hydrophilic Waterstop:
1. Inspect waterstop for premature swelling, discontinuity, and debris contamination prior to concrete placement. Replace unacceptable waterstop.
  2. Adhere waterstop to concrete or other surfaces utilizing proper primer adhesive. For vertical applications, use nails in addition to the primer adhesive to secure waterstop to concrete.
  3. Primer shall be allowed to dry for two hours prior to application of waterstop.
  4. Apply waterstop the same day as primer adhesive.
  5. Protect waterstop from moisture, dirt, oil, and sunlight during the progress of work.
  6. Install waterstop with 2 inches minimum clear cover to concrete face.
  7. Waterstop shall be butt spliced, pressing ends together ensuring no separation or air pockets.
- D. Splices and Joints: In accordance with the water stop manufacturer's written instructions using a thermostat-ically controlled heating iron. Butt splice unless specifically detailed otherwise.
1. Allow at least 10 minutes before the new splice is pulled or strained in any way.
  2. Finished splices shall provide a cross-section that is dense and free of porosity with tensile strength of not less than 80 percent of the unspliced material.

**3.4 EXPANSION JOINT INSTALLATION**

- A. General:
1. Place bond breaker above and below water stop when premolded joint filler and pourable joint filler is not used.
  2. Premolded Joint Filler:
    - a. Sufficient in width to completely fill the joint space where shown.
    - b. If a water stop is in the joint, cut premolded joint filler to butt tightly against the water stop and the side forms.
  3. Precut premolded joint filler to the required depth, as detailed, at locations where joint filler or sealant is to be applied.

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4. Form cavities for joint filler with either precut, premolded joint filler, or smooth removable accurately-shaped material.
  5. Vibrate concrete thoroughly along the joint form to produce a dense, smooth surface.
- B. Bituminous Type Premolded Joint Filler:
1. Drive nails approximately 1 foot 6 inches on center through the filler to provide anchorage embedment into concrete prior to concrete placement.
  2. Secure premolded joint filler in forms before concrete is placed.
  3. Install in walks, at changes in direction at intersections, and at each side of driveway entrances.
- C. Pourable Joint Filler:
1. General: Install in accordance with the manufacturer's written instructions, except as specified below:
    - a. Apply primer prior to pouring joint filler.
    - b. Fill entire joint above the water stop with joint filler as shown.
    - c. Use masking tape on top of slabs at sides of joints; clean all spillage.
  2. Place cold-applied, two-component fillers in accordance with manufacturer's written instructions.
- D. Steel Expansion Joint Dowels:
1. Install coated bars parallel to wall or slab surface and in true horizontal position perpendicular to the joint in both plan and section views so as to permit joint to expand or contract without bending the dowels.
  2. Secure dowels tightly in forms with rigid ties.
  3. Install reinforcing steel in the concrete as shown to protect the concrete on each side of the dowels and to resist any forces created by joint movement.

**3.5 CONTROL JOINT INSTALLATION**

- A. Locate reinforcing and/or dowels as shown.
- B. Install PVC water stop or hydrophilic waterstop as shown as shown by the Drawings.
- C. Concrete surface to be dense and smooth.
- D. Install bond breaker to concrete surfaces above and below water stop.

**3.6 PREFORMED CONTROL JOINTS**

- A. Use only where specifically shown.
- B. Locate flush, or slightly below the top of slab.

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- C. Install in accordance with manufacturer's written instructions in straight, full-length unspliced pieces.
- D. Steel Strip Type with Preformed Groove: Brace to with-stand pressure of concrete during and after placement.

**3.7 ADHERED STRIP SEAL**

- A. Clean surfaces, place adhesive, and install hypalon strip in accordance with manufacturer's instructions.

**END OF SECTION**



**SECTION 03 20 00  
CONCRETE REINFORCING**

**PART 1 GENERAL**

**1.1 WORK INCLUDED**

- A. Fabrication of steel reinforcement for cast-in-place concrete structures, including bars, ties, supports, and welded wire fabric.
- B. Placement of steel reinforcement for cast-in-place concrete structures.

**1.2 QUALITY ASSURANCE**

- A. Codes and Standards: The Contractor shall comply with all requirements of the following codes and standards (most recent edition), except as modified herein:
  - 1. American Welding Society, AWS D12.1 "Recommended Practices for Welding Reinforcing Steel, Metal Inserts and Connections in Reinforced Concrete Construction."
  - 2. Concrete Reinforcing Steel Institute, "Manual of Standard Practice."
  - 3. American Concrete Institute, ACI 318 "Building Code Requirements for Reinforced Concrete."
  - 4. American Concrete Institute, ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structure."
  - 5. Other References:
    - a. ASTM A82 - Specification for Steel Wire, Plain, for Concrete Reinforcement.
    - b. ASTM A185 - Specification for Welded Wire, Fabric, Plain for Concrete Reinforcement.
    - c. ASTM A615 - Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
    - d. AASHTO M31- Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
    - e. AASHTO M32- Cold Drawn Steel Wire for Concrete.
    - f. AASHTO M54- Fabricated Steel Bar or Rod Mats for Concrete Reinforcement.
    - g. AASHTO M55- Welded Steel Wire Fabric for Reinforced Concrete.

**1.3 SUBMITTALS**

- A. Manufacturer's Data:
- B. The Contractor shall submit the Manufacturer's specifications and installation instructions for all proprietary materials and reinforcement accessories.
- C. Shop Drawings:

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1. The Contractor shall submit shop drawings for the fabrication, bending, and placement of concrete reinforcement. All work shall comply with the ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures." Submittals shall show bar schedules, stirrup spacing, diagrams of bent bars, arrangements and assemblies.
2. The Contractor shall submit certification of grade, chemical analysis and tensile properties of the steel furnished.

**1.4 DELIVERY, HANDLING, AND STORAGE**

- A. All steel reinforcement delivered to the project site shall be bundled, tagged, and marked. Metal tags shall be used indicating the bar size, lengths, and other information corresponding to markings shown on placement diagrams in accordance with ACI 315.
- B. The Contractor shall store concrete reinforcement materials at the site in a manner that will prevent damage and accumulation of dirt or excessive rust. Store to prevent contact with the ground. Protect all reinforcement from any contact with oil, grease, or petroleum based products of any kind.

**PART 2 PRODUCTS**

**2.1 REINFORCING STEEL GRADE**

- A. Unless otherwise called for on the Drawings, all reinforcing steel for this project shall conform to ASTM A615 Grade 60, except for #3 stirrups or column ties which shall be Grade 40. Epoxy coating when called for shall be in accordance with ASTM D 3963; A775.
- B. Bar mats shall conform to the requirements of AASHTO M54 (ASTM A82).

**2.2 ACCESSORIES**

- A. Chairs and spacers shall be metal stock, designed for the purpose intended.
- B. All accessories shall comply with CRSI "Recommended Practice for Placing Bar Supports, Specifications and Nomenclature."
- C. The Contractor shall provide stainless steel accessories for sight-exposed concrete (exterior), and concrete surfaces exposed to moisture or containing water.
- D. Slabs on grade where the base material will not support chairs, shall use supports with sand plates, horizontal runners or dobies to properly locate steel reinforcing in the slab.
- E. Wire-bar type supports shall complying with CRSI recommendations. Wood, brick, or other materials will not be accepted.
- F. Tie wire shall be 16-gauge, black, soft-annealed wire. Tie wire shall not be closer than 1-inch from surface of wall or slab after tying in place.

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- G. In epoxy coated applications, tie wire shall be epoxy coated.

**2.3 WELDED WIRE FABRIC**

- A. Welded-wire fabric shall be electrically welded, 65,000 psi yield strength minimum, and shall conform to ASTM A185 or A 497 (AASHTO M55) and ACI 318, latest edition.

**2.4 SPIRAL REINFORCING FOR COLUMNS**

- A. Spiral reinforcement shall meet ASTM A615, Grade 60.

**2.5 SPLICES AND MECHANICAL CONNECTIONS**

- A. Metal Sleeve: If used for splice, provide with cast filler metal, capable of developing in tension or compression 125 percent of specified yield strength of the bar, as manufactured by:
1. Erico Products, Inc., Cleveland, OH, Cadweld C-Series.
  2. Or equal.
- B. Mechanical Threaded Connections: Metal coupling sleeve with internal threads which engage threaded ends of bars to be spliced, and develops in tension or compression 125 percent of the specified yield strength of the bar, as manufactured by:
1. Erico Products, Inc., Cleveland, OH, Lenton Reinforcing Steel Couplers.
  2. Richmond Screw Anchor Co., Inc., Fort Worth, TX, Richmond DB-SAE Dowel Bar Splicers.

**PART 3 EXECUTION**

**3.1 FABRICATION**

- A. General: The Contractor shall fabricate reinforcing bars to conform to required shapes and dimensions, with fabrication tolerances complying with CRSI "Manual of Standard Practice" and ACI 301. In case of fabricating errors, the heating, rebending or straightening of reinforcement will not be permitted.

**3.2 GENERAL**

- A. Meet requirements in the manual titled, "Placing Reinforcing Bars", published by Concrete Reinforcing Steel Institute (CRSI).
- B. Steel reinforcement shall be protected at all times from injury. When placed in the work, it shall be free from dirt, detrimental scale, paint, oil and other foreign substance. When steel reinforcement has detrimental rust, loose scale and dust which is easily removable, it shall be cleaned by a satisfactory method, if approved.
- C. All bars shall be bent cold, unless otherwise permitted. No bars partially embedded in concrete shall be field bent except as shown on the Drawings or otherwise permitted.

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- D. Details of concrete reinforcement and accessories not covered herein or on the Drawings shall be in accordance with ACI 315.
- E. Notify Engineer when reinforcing is ready for inspection and allow sufficient time for this inspection prior to close-up of the forming system or placing concrete.

**3.3 INSTALLATION**

- A. The Contractor shall clean reinforcement to remove all loose rust and mill scale, earth, ice, oil or grease, and other materials which reduce or destroy the bond between the concrete and reinforcing steel.
- B. The Contractor shall position, support, and secure all reinforcement to prevent displacement by formwork, construction loadings, or concrete placement operations. Steel reinforcing shall be located and supported by metal chairs, runners, bolsters, spacers and hangers, as required. The reinforcement shall be placed to obtain the coverage for concrete protection noted on the Drawings. Where the coverage is not shown, the reinforcement shall be placed to obtain at least the minimum coverage specified hereinafter. The Contractor shall arrange, space, and securely tie bars and bar supports together with 16-gauge wire to hold reinforcement accurately and solidly in position during concrete placement operations. Wire ties shall be set so that the twisted ends are directed away from the exposed concrete surfaces. All reinforcement will be tied and secured in the correct position in the forms before placing concrete. Do not stab reinforcing into fresh placed concrete.
- C. The Contractor shall provide a sufficient number of supports of adequate strength to carry the reinforcement. Reinforcing bars shall not be placed more than 2 inches beyond the last leg of any continuous bar support. Supports shall not be used as bases for runways for concrete conveying equipment and similar construction loads.
- D. Supports or spacers of pebbles, pieces of broken stone, concrete rubble, broken brick or building blocks, metal pipe or wooden blocks will not be permitted.
- E. Splices:
  - 1. Standard reinforcement splices shall be done by lapping the ends, placing the bars in contact, and tightly wiring the splice together. The requirements of ACI 318 for minimum lap of spliced bars shall be provided. Use lap splices unless otherwise shown on the Drawings or permitted in writing by the Engineer. Stagger splices minimum of 48 bar diameters in adjacent bars unless otherwise shown on the Drawings or permitted in writing by the Engineer.
  - 2. No field welding or tacking of reinforcement will be permitted.
  - 3. Vertical bars in columns shall be offset at least one bar diameter at lapped splices. To ensure proper placement, templates shall be furnished for all column dowels.
- F. Unless otherwise shown on the Drawings, the Contractor shall provide cover as follows:
  - 1. Not less than 3 inches where the concrete is placed against the ground and without use of forms.

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2. Not less than 1 1/2-inches for bars smaller than No. 6 and not less than 2-inches for No. 6 bars and larger where concrete is exposed to the weather, water, or in contact with earth, but placed in forms.
  3. Not less than 1 1/2-inches for interior slabs, walls, beams, and columns.
- G. The Contractor shall provide a minimum of two No. 4 bars in the top and bottom of a slab or wall face at 45 degrees on all four corners at all openings in structural slabs and walls, unless otherwise shown on the Drawings. Bars shall extend on each side sufficiently to develop bond in each bar.
- H. The Contractor shall notify the Engineer when reinforcing is in place so that an inspection of reinforcement placement can be made prior to the close-up of formwork or the placement of concrete.
- I. Conform to ACI 301 for all placing tolerances.
- J. Bars may be moved to avoid interference with other reinforcing steel, conduits, or embedded items. If moved more than one bar diameter or the stipulated tolerance, the Contractor shall consult with the Engineer to determine final placement.
- K. At construction joints and before constructing concrete form work for next stage of construction, the Contractor shall clean all dowels, reinforcing bars and concrete surfaces. All loose material and foreign objects shall be cleaned out of forming before placement of concrete.
- L. Placing Welded Wire Fabric:
1. Extend fabric to within 2-inches of edges of slab, and slab control joints and lap splices at least 1½ courses of fabric or minimum 8-inches.
  2. Tie laps and splices securely at ends and at least every 24-inches with 16-gauge black annealed steel wire.
  3. Place welded wire fabric on #4 continuous bars at 4'-0" at proper distance above bottom of slab. All slab reinforcing is to be discontinuous at slab control joints.
  4. Meet current ACI 318 and current Manual of Standard Practice, Welded Wire Fabric, by the Wire Reinforcement Institute regarding placement, bends, laps, and other requirements.
  5. All welded wire fabric shall be provided in flat sheets. Rolled fabric will not be permitted.
- M. Field Bending:
1. Straightening and Rebending: Do not straighten or rebend metal reinforcement. Field bending of reinforcing steel bars is not permitted.
  2. Unless permitted by Engineer, do not cut reinforcing bars in the field.

**3.4 MECHANICAL SPLICES AND CONNECTIONS**

- A. Install as required by manufacturer with threads tightened as required by referenced ICBO Report.
- B. Carefully inspect each splice and verify that each component meets manufacturer's and ICBO requirements.
- C. Maintain minimum edge distance and concrete cover

**END OF SECTION**

**SECTION 03 30 00  
CAST-IN-PLACE CONCRETE**

**PART 1 GENERAL**

**1.1 WORK INCLUDED**

- A. This section shall include constructing the cast-in-place concrete structures consisting of Portland cement, fine and coarse aggregate, water and selected admixtures, combined, mixed, transported, placed, finished, and cured as herein specified.
- B. This section also includes grout for miscellaneous uses, surface hardeners, bonding agents, fiber reinforcement, and other related concrete accessories, and construction requirements.
- C. Contractor is responsible to have all cracks in water-bearing structures repaired.

**1.2 QUALITY ASSURANCE**

- A. The Contractor shall have available on-site a copy of ACI SP-15 "Specifications for Structural Concrete for Buildings with Selected ACI and ASTM References."
- B. The Contractor shall comply with all requirements of the following codes and standards, except as modified herein:
  - 1. ACI 301 "Recommended Practice for Concrete Inspection."
  - 2. ACI 318 "Building Code Requirements for Reinforced Concrete."
  - 3. ACI 304 "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete."
  - 4. ACI 305 "Recommended Practice for Hot Weather Concreting."
  - 5. ACI 306 "Recommended Practice for Cold Weather Concreting."
  - 6. ACI 308 "Recommended Practice for Curing Concrete."
- C. Other references:
  - 1. ASTM C-31 - Making and Curing Concrete Test Specimens in the Field
  - 2. ASTM C-33 - Specification for Concrete Aggregates
  - 3. ASTM C-94 - Specification for Ready-Mixed Concrete
  - 4. ASTM C-143 - Standard Test Method for Slump of Portland Cement Concrete
  - 5. ASTM C-150 - Specification for Portland Cement
  - 6. ASTM C-260 - Specification for Air-Entraining Admixtures for Concrete
  - 7. ASTM C-309 - Specification for Liquid Membrane-Forming Compounds for Curing
  - 8. ACI 302 - Concrete Floor and Slab Construction
  - 9. ACI 614 - Specification for Concrete Placement

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**1.3 SUBMITTALS**

- A. The Contractor shall submit an electronic file in .pdf format or three copies of the manufacturer's data with the application and installation instructions for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, joint systems, and others as requested by the Engineer.
- B. A concrete placement schedule shall be prepared by the Contractor and submitted to the Engineer for review prior to the start of concrete placement operations. This schedule shall take into account placement time of concrete in the forms, delivery time of the trucks to site and weather conditions expected during the placement of concrete.
- C. The Contractor shall furnish copies of the delivery tickets for each load of concrete delivered to the site and other information as specified under ASTM C94, Certification.
- D. Concrete Mix Design Proposals
  - 1. Concrete Mix: Submit each mix design to the Engineer for review at least 14 days before first use is planned. Include substantiating test data and mix design details, including aggregate gradation and source, water/cement ratio, mix proportions, air content, slump, and strength. Substantiating data must include tests by an independent testing laboratory verifying the requirements specified under "Section 2.01 PROPORTIONING AND DESIGN OF MIXES" and "paragraphs related to testing of the concrete." Submit complete information for each mix design which has different strength, different aggregate size or gradation, different proportions or is to be transported differently. For previously used mix submit copies of at least 10 tests meeting these specifications. Do not use any concrete until the mix design and substantiating data for that concrete has been reviewed.
  - 2. Pumped Concrete: At least 14 days before starting work, submit details of proposed pumping operation, equipment to be used, and mix designs. Do not pump concrete if Engineer feels an unsatisfactory concrete may result from the overall planned process and equipment.
- E. To demonstrate their capabilities and experience, provide qualification data for Contractor's proposed independent testing agency that will provide the testing services. Do not use the same agency that provides the mix design proposal specified herein. To qualify for acceptance, the independent testing agency must demonstrate, based on the evaluation criteria in ASTM C1093 that it has the experience and capability to satisfactorily conduct the testing indicated.

**PART 2 PRODUCTS**

**2.1 PROPORTIONING AND DESIGN OF MIXES**

- A. The following mix properties are required for all concrete placement within forms:
  - 1. Proportion and design concrete mixes shall meet the following requirements:



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a. As specified on the project drawings and General Structural Notes or, if not listed, then as follows:

i. For pipe encasements, thrust blocks, and miscellaneous concrete not beneath structures:

Strength @ 7 days	1800 psi
Strength @ 28 days	3000 psi
Maximum water/cement + fly ash ratio	0.55 by weight
Slump @ point of placement	3-5 inches
Entrained Air	4-6%
Maximum Aggregate Size	1 inch, as defined below, unless otherwise shown on the Drawings.

ii. For walls, floor and roof slabs, foundations, columns, and other structural concrete:

Strength @ 7 days	3000 psi
Strength @ 28 days	5000 psi
Maximum water/cement + fly ash ratio	0.40 by weight
Slump @ point of placement	3-5 inches
Entrained Air	4-6%
Maximum Aggregate Size	1 inch, as defined below, unless otherwise shown on the Drawings.

2. Design shall be by an approved independent testing laboratory and a trial mix batch shall be made and tested by that laboratory. Average strength of cylinders in trial batch must exceed specified strength by 15%.
3. A previously used mix design may be used provided aggregate source is the same, the mixing equipment is the same, and provided at least 10 tests were made by an independent laboratory with results meeting these specifications.
4. If any of the first three 7-day cylinder tests fail to meet the specified 7-day strength, the mix shall be modified for higher strength. Submit modified mix for review before use.
5. Adjustment to Concrete Mixes: Mix design adjustments may be requested by the Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, at no additional cost to the Owner. Test data for revised mix designs and strength results must be submitted and accepted before using the mix adjustments.
6. Entrained Air: Air-entraining admixture shall be used unless otherwise shown or specified. Air-entraining admixture shall be added at the manufacturer's prescribed rate to result in concrete at the point of placement with an air content as specified herein (volume basis).
7. Concrete shall be mixed in conformance with ASTM C94.

B. Entrained air admixtures shall be used according to the manufacturer's prescribed rate. Test in accordance with ASTM C231.

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- C. The use of an accelerating agent is not permitted unless specifically authorized by the Engineer.
- D. Combined Aggregate Gradings:
1. Aggregate size shall be 1-inch maximum for slabs, grade beams, interior walls, and sections less than 12 inches thick.
  2. Aggregate size shall be 3/4-inch maximum for structures with textured surfaces.
  3. Aggregate size shall be 1½-inches maximum for all other areas or sections, unless otherwise indicated on the Drawings.
  4. Grading limits for course aggregate shall be as follows:

Sieve Size	Percentage Passing		
	1-1/2" Max.	1" Max.	3/4" Max.
2"	-100	--	--
1-1/2"	95-100	-100	--
1"	--	95-100	-100
3/4"	25-60	--	90-100
½"	--	25-60	--
3/8"	--	--	40-90
No. 4	0-10	0-10	5-20
No. 8	0-5	0-5	0-5

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5. Grading limits for fine aggregates shall be as follows:

Sieve Size	Percentage Passing
3/8"	-100
No. 4"	95-100
No. 8	80-100
No. 16	50-85
No. 30	25-60
No. 50	10-30
No. 100	2-10
No. 200	0-4

6. The combined mixture of fine and coarse aggregate shall be such that not more than 1.5 percent passes the No. 200 sieve.

**2.2 PORTLAND CEMENT**

- A. Meet ASTM C150, Type I or Type I-II (sulphate resistant) or Type I-IILA (low alkali), including low alkali provisions of Table 2 of that specification.
- B. Nonhydraulic Above-Grade Structures: Use either Type I or Type II cement.
- C. Hydraulic and Below-Grade Structures: Use Type I-II (sulphate resistant) or Type I-IILA (low alkali) cement.

**2.3 AGGREGATES**

- A. Fine: Clean, sharp, natural sand, ASTM C 33. Fineness modulus shall not be less than 2.5 nor more than 3.0. Materials passing 200 sieve shall be 4 percent maximum.
- B. Coarse: Crushed stone or gravel, ASTM C 33. Maximum size of coarse aggregate shall be 1½-inches as defined hereinbefore, unless otherwise indicated on the Drawings. Materials passing 200 sieve shall be 0.5 percent maximum.
- C. Aggregates shall be natural, free from deleterious coatings, meeting ASTM C 33, nonreactive. Thoroughly and uniformly wash before use. In accordance with ASTM C 33, Appendix XI, paragraph X1.1, evidence of reactive problems on existing structures will be used to prove sources of aggregates are reactive and are unsuitable for use in the work. Import nonreactive aggregates if local aggregates are reactive. Import aggregates if local aggregates and concrete produces shrinkage volume changes in excess of specified amount.
- D. Local aggregates, including the alkali reactive fine aggregate (Birdsall Blunt sand), are acceptable with the exception that they can only be used with Dakotah Cement Type I-IILA and Type F Flyash added, as specified.

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- E. Local aggregates not in compliance with the soundness and durability requirements of this standard shall not be used except with prior written approval of the Engineer and provided it can be shown by special testing or a record of past performance that these aggregates produce concrete of adequate strength and durability. Aggregate soundness testing for fine and coarse aggregates shall be in accordance with ASTM C 88 using a sodium sulfate solution.
- F. Aggregates shall meet the requirements of NSF 61 and shall be non-toxic, contain no heavy metals, or other undesirable constituents that may leach out and degrade the water quality.

**2.4 WATER**

- A. All water for concrete mixtures shall be clean, potable, and free from injurious substances and conforming to ASTM C 94. Water containing 2 percent or more common salt shall not be used and chloride levels shall be less than 500 parts per million.

**2.5 AIR ENTRAINING ADMIXTURES**

- A. Air entraining admixtures shall be used in all concrete exposed to the weather and as specified for quality of concrete used, ASTM C 260, except that admixture shall be non-toxic after 30 days and contain no chlorides or other chemicals causing corrosion.
  - 1. "Aerolith," Sonneborn Building Products, Inc.
  - 2. "AE-90," Master Builders Company.
  - 3. "Sika-AER," Sika Chemical Corp.
  - 4. "Darex AEA," W.R. Grace and Company.
  - 5. "Protex," Protex Industries, Inc.
- B. Must be compatible with water-reducing admixture. Concrete with air-entrainment admixture added shall maintain air percentage as batched, within 2 percent for minimum 1 ½ hours after addition to concrete mix and through concrete pumping.

**2.6 WATER-REDUCING ADMIXTURES**

- A. Water-reducing admixtures shall conform to ASTM C494, Type A or Type D.
- B. Complex, multi-component, nonchloride, noncorrosive admixture providing unique performance qualities unobtainable from conventional water-reducing admixtures.
- C. Manufacturer and Product:
  - 1. Master Builders, Inc., Cleveland, OH, Pozzolith or Pozzolith Polyheed.
  - 2. W.R. Grace & Co., Cambridge, MA, WRDA-79.
- D. Must be compatible with air entraining admixture.

**2.7 SUPERPLASTICIZERS**

- A. Meet ASTM C494 and use only Type F or G, of second or third generation type.
- B. Hold slump of 5 inches or greater for the time required for placement into structure, or 2 hours minimum.
- C. Type F Superplasticizer: Batch plant added to extend plasticity time, control temperature of fresh concrete, reduce water 20 to 30 percent, and give higher strengths at all ages.
- D. Type G Superplasticizer: Batch plant added to extend plasticity time, maintain setting characteristics similar to normal concrete throughout its recommended dosage range and at varying concrete temperatures, reduce water 30 to 40 percent, and give high-early and ultimate strengths.
- E. Superplasticizers for Hot Weather Placements:
  - 1. A synthesized sulfonated complex polymer type superplasticizer containing no chlorides or alkalines.
  - 2. Add to mix at manufacturer's recommended dosage to allow placement with concrete temperatures up to 90 degrees F.
- F. Manufacturer and Product:
  - 1. Master Builders, Inc., Cleveland, Ohio, Rheobuild or Pozzolith Polyheed at a dosage greater than 10 ounces per 100 pounds of cement.
  - 2. W.R. Grace & Co., Cambridge, Maine, Daracem 100.
  - 3. Euclid Chemical Co., Cleveland, Ohio, Eucon Super F or 537G.

**2.8 FLY ASH**

- A. Fly ash may only be permitted if specifically approved by Engineer. Submit complete manufacturer's literature. If approved, conform to ASTM C618, Type F modified to allow  $\text{SiO}_2 + \text{Al}_2\text{O}_3 + \text{FeO}_3$  minimum 66 percent and  $\text{SiO}_2$  minimum 40 percent and to require a maximum loss on ignition of 2 percent. Do not use to replace more than 25% of cement by weight.

**2.9 CALCIUM CHLORIDE**

- A. Calcium chloride and products containing more than 0.1% chloride ions are not permitted. Provide admixture manufacturer's written certification that chloride ion content complies with specified requirements.

**2.10 FREEZE PROTECTION ADMIXTURE**

- A. ASTM C494 Type E admixture, specially formulated to provide protection from freezing down to 20 degrees F. (-7 degrees C.) until initial set has been reached.

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- B. Manufacturer and Product:
  - 1. Master Builders Co., Pozzutec 20.
  - 2. Or equal.

**2.11 CONCRETE CURING MATERIALS**

- A. Do not use curing compound where additional finishes such as hardeners, paintings, and other special coatings are required. Use water curing as specified instead.
- B. Absorptive cover shall be provided by burlap cloth made from jute or kenaf, weighing approximately 9 ounces per square yard and complying with AASHTO M 182, Class 2.
- C. A moisture retaining cover shall comply with one of the following:
  - 1. Waterproof paper, ASTM C 171 or AASHTO M 171.
  - 2. Polyethylene film, ASTM C 171.
  - 3. Curing Compound: Resin based compound conforming to ASTM C 309, with additional requirement that the moisture loss shall not exceed 0.030 gm/square cm/72 hours. Curing compound shall meet the requirements of ANSI / NSF Standard 61.
- D. Manufacturer's certification shall state that curing compound can be applied in one coat and shall show the quantity or coverage required to meet or exceed that above moisture retention.
- E. Provide manufacturer's certification that curing compound is acceptable to the appropriate state agency or health department.

**2.12 NON-SHRINK GROUT**

- A. Nonshrink Grout Category I:
  - 1. Nonshrink, nonmetallic, nongas-liberating grout for use in filling tie holes in concrete, blockouts for gate guides, joints of precast components or members, and grouting baseplates of columns that do not exceed one story in height shall be one of the following:
    - a. Crystex, L&M Construction Chemicals, Inc., Omaha, NE
    - b. EUCO NS grout, Euclid Chemical Co., Cleveland, OH
    - c. Five Star Special 100, U.S. Grout Corp., Fairfield, CT
    - d. SET nonshrink grout, Master Builders Co., Cleveland, OH
    - e. Supreme grout, Gifford Hill & Co., Dallas, TX
    - f. UPCON "Super Flow", UPCO Co., Cleveland, OH
  - 2. All grout shall be a fluid consistency in use except that for formwork tie holes the grout shall be dry pack consistency and shall fill the conical section with dense grout hammered in with steel tool and steel hammer.
  - 3. Use Category II type grout for filling through-bolt openings as hereinafter specified.

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4. Use Category II grouts for patching defects in walls and slabs after form removal.
- B. Nonshrink Grout Category II:
1. Nonshrink grout with natural aggregate for use in high strength, precision support of machine bases of 25 hp or less; bases for precast wall sections, columns, and precast members more than one story in height; filling of through-bolt openings in concrete walls; and patching defects in walls and slabs after form removal shall conform to the Corps of Engineers' Specification for Non-Shrink Grout, CRD-C261-81 and to these specifications. Fluid grout as determined by the flow cone, CRD-C611-81, shall have a minimum strength of 4,800 psi at 7 days and 6,800 psi at 28 days as determined by CRD-C227. The following listed grouts are acceptable for use as Category II grout (field test requirement shall be met):
    - a. Conbextra High Flow, Fosroc, Twinsburg, OH
    - b. Five Star Special 100, U.S. Grout Corp., Fairfield, CT
    - c. EUCO NS Grout, Euclid Chemical Co., Cleveland, OH
    - d. Master Flow 713, Master Builders, Cleveland, OH
    - e. Supreme grout, Gifford Hill & Co., Dallas, TX
    - f. UPCON "Super Flow", UPCO Division, Cleveland, OH
  2. No material other than water shall be added to the premixed grout at the jobsite. Follow manufacturer's instructions relative to mixing, placing, and curing.
- C. Nonshrink Grout Category III:
1. Nonshrink grout for use in high strength, precision support of machine bases for machinery of 30 hp or greater and soleplates where very large loads and stresses from vibration and other dynamic loads are involved and when the equipment will be subject to thermal movements. The following grouts are acceptable for use as Category III grout (field test requirements shall be met):
    - a. Embeco 636, Master Builders, Cleveland, OH
    - b. Conbextra High Flow, Fosroc, Twinsburg, OH
    - c. EUCO Hi-Mod grout, Euclid Chemical Co., Cleveland, OH
    - d. CRYSTEX, L&M Construction Chemicals, Inc., Omaha, NE
  2. The location for use, other than that specified above, shall be as shown on the Drawings and/or as specified hereinafter.
  3. The grout shall be free of gas-producing or gas-releasing agents, free of oxidizing catalysts, free of inorganic accelerators, and free of chlorides. Provide performance characteristics when mixed to fluid consistency, 22 to 25 seconds (flow cone method, CRD-C 611-80) as follows:
    - a. When mixed and maintained at 45 degrees F (7 degrees C) or higher, no visible bleeding and/or settlement up to 2 hours on ½ gallon grout poured into gallon can, covered with glass plate to prevent evaporation.

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- b. Grout shall be cured in accordance with grout manufacturer's instructions.
  - c. Provide (2" x 2" cube) strengths as specified. Prepare specimens and test in accordance with ASTM C 109-80 except as follows: Mix grout in accordance with manufacturer's instructions. Fill molds in two layers, puddling each layer gently with gloved finger five times; strike off excess grout; wipe edges of mold clean with rag and cover with steel plate clamped to mold until time to test. Seal cover 24 hours after placement.
4. The grout shall obtain a minimum compressive cube strength of 5,000 psi at 7 days and 9,000 psi at 28 days (2-inch cubes).

**2.13 SLURRY CONCRETE FOR HORIZONTAL CONSTRUCTION JOINTS IN WALLS**

- A. Flowable, consisting of sand, 3/8-inch minus aggregate, water, and minimum 1,128 pounds of cement per cubic yard.

**2.14 SURFACE HARDENER**

- A. Surface hardeners shall consist of a colorless aqueous solution of sodium silicate and magnesium and zinc fluosilicates suitable for application to cured or partially cured concrete surfaces and capable of reacting with the soluble calcium compounds present in the concrete to form a thin surface of increased hardness with reduced potential for dusting.
- B. Approved proprietary hardeners include:
  - 1. Saniseal 100, Master Builders Company.
  - 2. Hornolith, A.C. Horn Incorporated.
  - 3. Lapidolith, Sonneborn Company.
  - 4. Pena-Lith, W.R. Meadows Incorporated.
- C. The solution shall be delivered ready for use at the job site.

**2.15 CONTROL JOINT FORMS**

- A. Control Joint Forms: A standard manufacturer's item causing a control joint in the slab while providing keying across the joint. It shall not leave any portion projecting at the finished surface and it shall interrupt at least 1/4 of the slab depth. The joint or the method of installation shall insure a straight joint deviating not more than 1/2-inch from a straight line.

**2.16 EPOXY BONDING AGENT**

- A. Two component material suitable for use on dry or damp surfaces. Provide material "Type", "Grade", and "Class", to suit project requirements. Meet the requirements of ASTM C 881.



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- B. Products: Subject to compliance with requirements, provide one of the following:
1. Edoco 2118 Epoxy Adhesive; Edoco Technical Prod.
  2. Sikadur Hi-Mod; Sika Chemical Corp.
  3. Euco Epoxy 463 or 615; Euclid Chemical Corp.
  4. Patch and Bond Epoxy; The Burke Co.

### **PART 3 EXECUTION**

#### **3.1 CONCRETE MIXING**

- A. The materials for concrete shall be mixed at an acceptable concrete batch plant. Meet ACI 304 current edition and other requirements as specified for mix design, testing, and quality control.
- B. Ready-mix concrete shall comply with the requirements of ASTM C94 and as herein specified:
1. The addition of water to the mix at project site must be approved by the Engineer and the maximum water-cement ratio shall not be exceeded. The delivery ticket shall be noted with amount of additional water added and submitted to the Engineer.
  2. Concrete shall be discharged at the job within 1-1/2 hours after water has been added to the cement and aggregates or cement batched with the aggregates, unless a longer time is specifically authorized by the Engineer.
  3. During hot weather or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C94 may be required:
    - a. When the air temperature is between 85 degrees Fahrenheit and 90 degrees Fahrenheit, the mixing and delivery time shall be reduced from a maximum of 1-1/2 hours to 75 minutes and when the air temperature is above 90 degrees Fahrenheit, the mixing and delivery time shall be reduced to no more than 60 minutes.
- C. Truck Mixers:
1. Equip with electrically actuated counters to readily verify the number of revolutions of the drum or blades.
  2. Counter:
    - a. Resettable, recording type, mounted in driver's cab.
    - b. Actuated at time of starting mixers at mixing speeds.
  3. Performance Requirements:
    - a. Truck mixer operation shall provide a concrete batch as discharged within acceptable limits of uniformity with respect to consistency, mix and grading.
    - b. If slump tests taken at approximately the 1/4 and 3/4 points of the load during discharge give slumps differing by more than 1 inch when

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- specified slump is 3 inches or less, or differing by more than 2 inches when specified slump is more than 3 inches, discontinue use of truck mixer unless causing condition is corrected and satisfactory performance is verified by additional slump tests.
- c. Check mechanical details of mixer, such as water measuring, and discharge apparatus, condition of blades, speed of rotation, general mechanical condition of unit, and clearance of drum before attempting to reuse unit.
  4. Do not use nonagitating or combination truck and trailer equipment for transporting ready-mixed concrete.
- D. Mixing Process:
1. Concrete Volume in Truck:
    - a. Limit to 63 percent of total volume capacity per ASTM C94 when truck mixed.
    - b. Limit to 80 percent of total volume capacity when central mixed.
  2. Mix each batch of concrete in truck mixer for minimum 70 revolutions of drum or blades at rate of rotation designated by equipment manufacturer as mixing speed.
  3. Perform additional mixing, if required, at speed designated by equipment manufacturer as agitating speed.
  4. Place materials, including mixing water, in mixer drum before actuating the revolution counter for determining the number of mixing revolutions.

### **3.2 PREPARATION**

- A. Pre-Placement Inspection:
1. Before placing concrete, the Contractor will inspect and complete the formwork installation, placement of reinforcing steel, and items to be embedded or cast-in. Reinforcing shall not be stabbed into freshly placed concrete.
  2. The wood forms shall be wetted immediately before placing the concrete when form coatings are not used. Dampen subgrade before placing concrete for slabs on grade unless a vapor barrier is used.
  3. The installation of joint materials shall be coordinated with the placement of forms and reinforcing steel.
  4. Secure reinforcement in position and allow Engineer to review acceptability before placing concrete.
- B. Sleeves, Anchors and Inserts: All sleeves, anchors, and inserts required shall be properly placed, as detailed in the Drawings, in the concrete formwork and securely anchored to prevent displacement during the placing of the concrete.
- C. Prior to placement verify that mix design on delivery tickets correspond to required specification for component.

- D. Where waterstops are placed, clear all concrete materials from previous pours away from exposed section of waterstop.

### **3.3 CONCRETE PLACEMENT**

- A. Concrete shall be placed in compliance with the practices and recommendations of ACI Standards 304, 318, and 614, and as herein specified:
1. Concrete shall be placed 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 within the section. If a section cannot be placed continuously, the Contractor shall provide construction joints as specified in Section 03 15 16 - Concrete Expansion and Construction Joints. The placement of concrete shall be done at such a rate that concrete is still workable. Concrete shall be placed as near as practicable to its final location to prevent segregation due to rehandling or flowing. Do not subject concrete to any procedure which will cause segregation.
  2. In no case shall concrete be allowed to freely drop more than five feet.
  3. Screed concrete which is to receive other construction to the proper level to avoid excessive skimming or grouting.
  4. Concrete which has become non-plastic and unworkable, or does not meet the required quality control limits, or which has been contaminated by foreign material shall not be used. Do not use retempered concrete. Remove rejected concrete from the project site and dispose of it at an approved location.
- B. Placing Concrete Into Forms:
1. Concrete shall be placed in forms in horizontal layers not deeper than 48 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while the preceding layer is still workable to avoid cold joints.
  2. Temporary spreaders in forms shall be removed when concrete placement has reached the elevation of such spreaders.
  3. Concrete placed in forms shall be consolidated by mechanical vibrating equipment supplemented by hand-spading, rodding, and tamping. Use equipment and procedures for consolidation of concrete in accordance with the recommended practices of ACI 309, to suit the type of concrete and project conditions. Vibration of forms and reinforcing will not be permitted.
  4. Vibrators shall not be used to transport concrete inside of the forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than the visible effectiveness of the machine. Place vibrators to rapidly penetrate the layer of concrete and at least 6 inches into the preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit the duration of the vibration to the time necessary to consolidate the concrete and complete embedment of reinforcement and other embedded items without causing segregation of the mix. Generally, this will be from 5 to 15 seconds in accordance with ACI 301.
  5. Do not use aluminum pipe or other aluminum conveying devices.

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6. Provide sufficient illumination for interior of forms so concrete at places of deposit is visible to permit confirmation of consolidation quality.
  
- C. Conveyor Belts and Chutes:
  1. Design and arrange ends of chutes, hopper gates, and other points of concrete discharge throughout conveying, hoisting, and placing system such that concrete passing from them will not become segregated.
  2. Do not use chutes longer than 50 feet.
  3. Minimum Slopes of Chutes: Angled to allow concrete of specified consistency to readily flow without segregation.
  4. Conveyor Belts:
    - a. Approved by Engineer.
    - b. Wipe clean with a device which does not allow mortar adhering to the belt to be wasted.
    - c. Cover conveyor belts and chutes.
  
- D. Retempering: For concrete or mortar in which cement has partially hydrated, retempering is not permitted.
  
- E. Pumping of Concrete:
  1. General:
    - a. Pumping is the preferred method of placing concrete.
    - b. If pumped concrete does not produce satisfactory end results, discontinue pumping operation until the problem is corrected.
    - c. At Contractor's option, other approved methods of placement may be used.
  2. Equipment:
    - a. Provide standby pump, conveyor system, crane and concrete bucket, or other system acceptable to Engineer, on site during pumping, for adequate redundancy to assure completion of concrete placement without cold joints in case of a primary placing equipment breakdown.
    - b. Minimum Pump Hose (Conduit) Diameter: 4 inches.
    - c. Replace pumping equipment and hoses (conduits) that are not functioning properly.
    - d. Do not use aluminum conduits for conveying concrete.
  3. Field Control (For Pumped Concrete): Take concrete samples for slump (ASTM C143) and test cylinders (ASTM C31 and C39) and shrinkage specimens (ASTM C157) at placement (discharge) end of line.
  
- F. Removal of Water: Remove all water from space to be occupied by concrete.
  
- G. Consolidation and Visual Observation:
  1. Consolidate concrete with internal vibrators with minimum frequency of 8,000 vpm and amplitude required to consolidate concrete in section being placed.

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2. Provide at least one standby vibrator in operable condition at placement site prior to placing concrete.
  3. Consolidation equipment and methods shall meet ACI 309.
  4. Provide sufficient windows in the forms or limit form height to allow visual observation of concrete.
  5. Vibrator operator shall be required to see concrete being consolidated to ensure good quality workmanship, or an individual shall actually observe the vibration of concrete at all times and advise vibrator operator of any changes needed to ensure complete consolidation.
  6. Consolidation and placement locations shall be planned and accomplished so that vibrators shall be inserted in the concrete as it is placed and in locations not to exceed a distance of 5 feet from point of placement.
- H. Placing Concrete Slabs:
1. Prior to concrete placing, any area of subgrade on which concrete is to be placed shall be properly wetted. Concrete slabs shall be placed in a continuous operation, within the limits of construction joints, until the placement of a panel or section is completed. When in-place concrete has sufficiently set up (at least 24 hours), an alternate section may be placed. All joints between sections shall be properly keyed. The edges of all sections shall be tooled with a minimum radius or chamfer edging tool.
  2. Concrete shall be consolidated during placement operations using vibrating equipment, so that the concrete is thoroughly worked around reinforcement and other embedded items and into the corners.
  3. Slab surfaces shall be brought up to the correct level with a straightedge and struck off. Bull floats or darbies may be used to smooth the surface, leaving it free from humps or hollows. Do not sprinkle water on the plastic surface. Do not disturb the slab surfaces prior to beginning finishing operations.
  4. Control Joints for Slabs on Grade:
    - a. Locate as shown on the Drawings.
    - b. Construct with a manufactured, embedded control joint form or stop pour at each control joint and place concrete in checkerboard pattern with no two adjacent panels placed on the same day. Install form with no offsets and in straight lines as specified elsewhere.
    - c. Sawn control joints will be permitted where shown. Saw joint 1½-inches deep, or 1/4 slab thickness, whichever is greater. Start sawing within 12-hours of placement but delay as necessary to prevent raveling.
  5. Reinforcing steel shall be continuously maintained in the proper position during concrete placement operations.
  6. All exterior concrete slabs shall be sloped in a manner to prevent the collection of water.
- I. Slurry Concrete at Base of Wall:
1. Place slurry concrete layer 2" deep at base of wall.

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2. Use slurry concrete measuring device to ensure placement of exact amount in each section of wall.
3. Deposit concrete as quickly as possible after slurry concrete is placed.
4. Vibrate to mix concrete with slurry concrete.

**J. Bonding:**

1. Surfaces of set concrete at all joints shall be roughened, except where bonding is obtained by use of an approved concrete bonding agent, and the surfaces shall be cleaned of laitance coating, loose particles, and foreign matter. Surfaces shall be roughened in a manner to expose bonded aggregate uniformly and laitance, loose particles of aggregates, or damaged concrete at the surface shall be removed.
2. Bonding of fresh concrete to new concrete that has set, but is less than 60 days old or is not fully cured shall be done as follows:
  - a. At joints between a footing and walls or columns, and between walls or columns and beams or slabs that they support, and elsewhere unless otherwise specified herein, dampen, but do not saturate, the roughened and cleaned surface of set concrete immediately before placing the fresh concrete.
  - b. At vertical joints in exposed work, and at joints designed to contain liquids, dampen, but do not saturate, the roughened and cleaned surface of set concrete.
  - c. Neat cement grout as specified hereinbefore shall be applied to a minimum thickness of 2 inches. Fresh concrete shall be placed before the cement grout has attained its initial set. Limit concrete lift placed immediately on top of grout to 12 inches.
  - d. An approved commercial bonding agent may be used in lieu of neat cement grout for non- water stop applications. The agent shall be applied to cleaned concrete surfaces in accordance with the printed instruction of the bonding agent manufacturer.
3. Epoxy bonding adhesive shall be applied in accordance with the manufacturer's recommendations for bonding to old concrete (more than 60 days old). Coat contact surfaces with bonding agent after mechanically roughening surface to a clean, rough surface.

**K. Cold Weather Placing:**

1. All concrete work shall be protected from physical damage or reduced strength which could be caused by freezing or low temperatures, in compliance with the requirements of ACI 306 and ACI 318 and as herein specified.
2. When the temperature of the surrounding air is expected to be below 40 degrees Fahrenheit during concrete placement or within 3 days (72 hours) thereafter, the temperature of the placed concrete shall be maintained at temperatures no lower than 60 degrees Fahrenheit for sections less than 12

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inches in any dimension or 55 degrees for any other section. Heated water and/or aggregate shall be used in accordance with ACI 306.

- a. The placed concrete temperature shall be maintained at or above the specified temperatures for curing for at least 7 days.
3. Frozen concrete materials containing ice or snow shall not be used. Concrete shall not be placed on frozen subgrade or on subgrade containing frozen materials. The Contractor shall determine that the forms, reinforcing steel, and adjacent concrete surfaces are entirely free of frost, snow, and ice before placing any concrete.
  4. The use of calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators shall not be allowed, unless authorized in writing by the Engineer.
  5. Maintain temperature of concrete above 50 degrees for a minimum of 7 days.
  6. Strength requirements may require additional protection and curing during cold weather due to delayed field strength gain.
  7. Determine strength attainment, and the requirement for continued protection, from field test cylinders, cured along side the cast concrete structure.
  8. Surface Temperature:
    - a. The actual temperature of concrete surface determines effectiveness of protection, regardless of air temperatures or whether the objective is durability or strength.
    - b. Provide a sufficient number of thermometers placed on concrete surfaces spaced throughout the work to allow inspection and monitoring of concrete surface temperatures representative of all the work.
  9. External Heating Units:
    - a. Vent heating units and do not locally heat or dry concrete.
    - b. Do not exhaust flue gases directly into an enclosed area.
    - c. Ensure fire safety and fire prevention measures are enforced during use of heating units.
  10. Maintain curing conditions which will foster normal strength development without excessive heat, and without critical saturation of concrete at the close of the protection period.
  11. Limit rapid temperature changes, particularly before strength has developed sufficiently to withstand temperature stresses.
  12. At end of the required period, discontinue protection in such a manner that the drop in temperature of any portion of concrete will be gradual and will not exceed, in 24 hours, 50 degrees F.
- L. Hot Weather Placing:

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1. When hot weather conditions exist that would seriously impair the quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.
2. The ingredients shall be cooled before mixing to maintain the concrete temperatures at the time of placement below 80 degrees Fahrenheit. Mixing water may be chilled or chopped ice may be used.
3. Reinforcing steel may be covered with watersoaked burlap if it becomes too hot, so that the steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.
4. The use of retarding admixtures will not be allowed, unless otherwise accepted in mix designs by the Engineer.
5. The forms shall be thoroughly wetted before placement of concrete. Make provisions for windbreaks, shading, fog sprays, sprinkling, or wet cover, when necessary.
6. Reflective Cracking:
  - a. Prevent reflective cracking due to differential temperatures between concrete and reinforcing steel.
  - b. If reinforcement is in direct sunlight or is more than 20 degrees F higher in temperature than concrete temperature before placement, wet reinforcement to cool it with water fog spray 10 minutes before placing concrete.
  - c. Verify temperature of reinforcing is not more than 20 degrees F higher than fresh concrete.

**3.4 JOINTS**

- A. Construction Joints:
  1. Construction joints shall be located and installed as shown on the Drawings in a manner that will not impair the strength and appearance of the structure. Construction joints, if not shown, shall be located only with approval of the Engineer and as follows:
    - a. The Contractor shall provide key-ways at least 1-1/2 inch deep in all construction joints in walls, slabs, and between walls and footings where water stop is not called out in the plans.
    - b. Construction joints shall be placed perpendicular to the main reinforcement and all reinforcement shall continue across construction joints.
    - c. Construction joints shall be prepared as specified in ACI Standard 318.
- B. Expansion joints shall be located as shown on the Drawings. Expansion joints shall be held down to receive the joint sealant. The horizontal and vertical waterstop shall be welded together to provide a continuous watertight seal.



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- C. For bonding to new concrete horizontal construction joints, roughen the surface of the hardened concrete. Thoroughly clean and saturate with water, cover the horizontal surfaces only with at least two to three inches of grout, as hereinbefore specified, and immediately place concrete. New concrete is defined as less than 60 days old. Limit the concrete lift placed immediately on top of the grout to 12-inches thick and thoroughly vibrate to mix and consolidate the grout and concrete together.
- D. Also see Section 03 15 16 - Concrete Expansion and Construction Joints.

**3.5 FINISH OF FORMED SURFACES**

- A. Rough Form Finish:
  - 1. This finish shall include formed concrete surfaces buried from view by backfill in the finish work or covered by other construction, unless otherwise shown or specified. Any surface which will be exposed to the air in the completed structure shall be a smooth form finish.
  - 2. The standard rough form finish shall leave the concrete surface with the texture imparted by the form facing material used, with tie holes and defective areas repaired and patched and all fins and other projections exceeding 1/4 inch in height rubbed down or chipped off.
  - 3. Fill snap-tie holes with nonshrink, non-metallic grout. Patch honeycomb areas and rock pockets. Small air holes do not require patching.
- B. Smooth Form Finish (trowel finish):
  - 1. This finish includes formed concrete surfaces which will be exposed to the air in the completed structure or to be covered with a coating material applied directly to the concrete, or a covering material bonded to the concrete, such as water proofing, damp-proofing, painting, or other similar system.
  - 2. A smooth form finish shall be provided by selecting form materials that will impart a smooth, hard, uniform texture and arranging them orderly and symmetrically with a minimum of seams. All defective areas shall be patched and repaired with all fins or other projections completely removed and smoothed.
  - 3. For smooth form finish walls:
    - a. Fill snap-tie holes with approved nonshrink, nonmetallic color matched grout.
    - b. Grind off projections, fins, and rough spots.
    - c. Repair other defects such as honeycomb areas, rock pockets, and rough spots resulting from form release agent failure or other reason with color matched nonshrink grout.
  - 4. For smooth form trowel finish slabs:
    - a. Finish by screeding and floating with straightedges to bring surface to required finish elevation shown.

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- b. While concrete is still green, but sufficiently hardened to bear a person's weight without deep imprint, wood float to true, even plane with no coarse aggregate visible.
  - c. Use sufficient pressure on wood floats to bring moisture to surface.
  - d. After surface moisture has disappeared, hand trowel concrete to produce smooth, impervious surface, free from trowel marks.
  - e. Burnish surface with an additional troweling. Final troweling shall produce a ringing sound from trowel.
  - f. Do not use dry cement or additional water during troweling. No excessive troweling will be permitted.
  - g. Power Finishing:
    - i. An approved power machine may be used in lieu of hand finishing for finishing concrete floors and slabs in accordance with directions of machine manufacturer.
    - ii. Do not use power machine when concrete has not attained the necessary set to allow finishing without introducing high and low spots in slab.
    - iii. Do first steel troweling for slab by hand.
- C. Grout Cleaned Finish (sacked rubbed finish):
- 1. A grout cleaned finish will be applied to all concrete surfaces as specified hereinafter which have received smooth form finish treatment.
  - 2. The grout cleaned finish will use one part portland cement to 1-1/2 parts fine sand by volume, and shall be mixed with water to a consistency of thick paint. Proprietary additives may be used at the Contractor's option. Standard portland cement and white portland cement amounts shall be blended as determined by trial patches, so that final color of dry grout will match adjacent surfaces.
  - 3. The concrete surfaces shall be thoroughly wetted before the application of grout to the surfaces and to fill small holes. Excess grout will be removed by scraping and rubbing with clean burlap.
- D. Broomed Finish:
- 1. Finish as specified for trowel floor finish, except omit final troweling and finish surface by drawing a fine-hair broom lightly across the surface.
  - 2. Brooming: In same direction and parallel to expansion joints, or, in the case of inclined slabs, perpendicular to slope, except for round roof slab, broom surface in radial direction.
- E. Sidewalk Finish:
- 1. Slope walks down ¼ inch per foot away from structures, unless otherwise shown.
  - 2. Strike off surface by means of strike board and float with wood or cork float to a true plane, then flat steel trowel before brooming.
  - 3. Broom surface at right angles to direction of traffic.
  - 4. Lay out sidewalk surfaces in blocks with an approved grooving tool as shown or as directed by Engineer.

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- F. Related Unformed Surfaces:
  - 1. At horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, the placed concrete shall be struck off smooth and finished with a texture matching the adjacent formed surfaces. Continue the final surface treatment of the formed surfaces uniformly across the adjacent unformed surfaces, unless otherwise shown on the Drawings.
  
- G. A 3/4-inch chamfer shall be provided at the top of all exposed walls, except where support angles are installed, and at exposed vertical corners.
  
- H. In addition to the description of various finishes above, concrete surfaces shall be finished in accordance with ACI Standards 301 and 302 as scheduled below:

Surface	Finish
Interior Slabs	Smooth Trowel Finish
Exterior Slabs	Broom Finish
Exterior Concrete Above Grade, Interior Walls, and Ceilings	Rubbed Finish
Exterior Concrete Below Grade	Correct Defective Areas including Stone Pockets and Fill Tie Holes
Sidewalks	Sidewalk Finish

**3.6 CONCRETE CURING AND PROTECTION**

- A. General:
  - 1. Freshly placed concrete shall be protected from premature drying and excessive cold or hot temperature, and maintained without drying at a relatively constant temperature for the 7 day period of time necessary for the proper hydration of the cement. Concrete damaged by improper curing or placement methods shall be replaced by the Contractor and at no additional expense to the Owner.
  - 2. Curing procedures shall begin immediately after placement of the concrete and continue for at least seven days or until concrete has attained 75 percent of its compressive strength in accordance with ACI 308.
  
- B. Curing Method:
  - 1. Liquid membrane curing shall be provided as follows:
    - a. The Contractor shall use a commercially produced liquid membrane forming curing compound for curing concrete which meets the requirements of ASTM C309 and ANSI / NSF Standard 61.
    - b. Apply the specified membrane-forming curing compound to damp concrete surfaces as soon as the water film has disappeared. Apply uniformly in a 2-coat continuous operation by power spray equipment in accordance with the manufacturer's directions. Re-coat all areas which are subjected to heavy rainfall within 3 hours after initial

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- application. Maintain the continuity of the coating and repair any damage to the coat during the entire 7 day curing period.
- c. Membrane compounds shall not be used on surfaces which are to be covered with a coating material applied directly to the concrete or with a covering material bonded to the concrete, such as other concrete, liquid floor hardener, waterproofing, damp-proofing, flooring, paintings, and other coatings and finish materials.
2. Use approved water curing method where membrane compounds are not allowed.
  3. For walls, use one of the following curing methods:
    - a. Method 1: Leave concrete forms in place and keep entire exposed surfaces wet at all times.
    - b. Method 2: Apply specified curing compound as specified, where allowed, immediately after removal of forms. Apply curing compound in two coats. Each coat shall be applied at the manufacturers recommended rate for one coat application.
    - c. Method 3: Continuously sprinkle 100 percent of all exposed surfaces.
  4. For slabs, curbs, and sidewalks use one of the following curing methods:
    - a. Method 1: Protect surface by ponding.
    - b. Method 2: Cover with burlap or cotton mats and keep continuously wet.
    - c. Method 3: Cover with 1-inch layer of wet sand, earth, or sawdust, and keep continuously wet.
    - d. Method 4: Continuously sprinkle exposed surface.
    - e. Other agreed upon method that will provide moisture to be present and uniform at all times on all surface of slabs.
- C. Unformed surfaces shall be cured after finishing operations have been completed and as soon as marring of the concrete will not occur. The curing procedures shall continue for 7 days or until the concrete has attained 70 percent of its compressive strength in accordance with ACI 308.
- D. Temperature of Concrete During Curing:
1. When the atmospheric temperature is 40 degrees Fahrenheit and below, the concrete temperature shall be maintained between 50 and 70 degrees Fahrenheit continuously throughout the 7 day curing period. When necessary, the Contractor shall make arrangements before the placement of concrete for heating, covering, insulation or housing as required to maintain the specified temperature and moisture conditions continuously throughout the concrete curing period. Cold weather protections shall comply with the requirements of ACI 306.
    - a. Where water curing as specified herein for slabs is not possible, use an approved curing compound as herein specified at twice the manufacturer's recommended coverage per gallon.

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- b. Where specified curing compound cannot be used, special methods using moisture shall be agreed upon prior to pouring the concrete slabs.
    - c. Protect slabs during cold weather with polyethylene sheeting or other material inside required heated enclosure if foot traffic is permitted on slabs.
  - 2. When the atmospheric temperature is 80 degrees Fahrenheit and above, or during other climatic conditions which will cause a rapid drying of the concrete, the Contractor shall make arrangements before the start of concrete placement for the installation of wind breaks or shading, and for fog spraying, wet sprinkling, or a moisture-retaining covering. The concrete shall be protected continuously for the 7 day concrete-curing period. Hot weather concrete protection shall comply with the requirements of ACI 305.
  - 3. The concrete temperature shall be maintained as uniformly as possible, and protected from rapid atmospheric temperature changes. Temperature changes in concrete which exceed 5 degrees Fahrenheit in any one hour and 50 degrees Fahrenheit in any 24-hour period shall be avoided and protected against.
- E. During the curing period the concrete shall be protected from damaging mechanical disturbances including load stresses, excessive vibration and from damage caused by rain or flowing water. All finished concrete surfaces shall be protected from damage by subsequent construction operations. Any damage incurred shall be repaired by the Contractor at no additional expense to the Owner.

**3.7 CONCRETE REPAIRS**

- A. All concrete repairs are to be done in conformance with Section 03 01 00 – Maintenance of Concrete.

**3.8 SURFACE HARDENERS**

- A. Interior slabs shall receive an application of surface hardener as recommended by the manufacturer of the surface hardener.
- B. Floors to receive hardener shall be thoroughly cured for at least 28 days, clean, unpainted, free from membrane curing compounds, and perfectly dry with all work above them completed. Apply liquid hardener evenly, using three coats, allowing 24 hours between coats. The first coat shall be 1/3 strength, second coat 1/2 strength, and third coat 2/3 strength, mix with water. Each coat shall be applied so as to remain wet on the concrete surface for 15 minutes. Apply approved proprietary hardeners in conformance with the manufacturer's instructions. After the final coat is completed and dry, remove surplus hardener from the surface by scrubbing and mopping with water.

**3.9 CLEANING AND DISINFECTION OF STRUCTURES**

- A. Cleaning. Clean thoroughly all interior concrete surfaces using water under pressure. The cleaning method adopted should accomplish the following: (1) remove all deposits

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of foreign nature; (2) remove all growths; (3) clean the slopes, walls, top, and bottom; (4) avoid damage to the structure; and (5) avoid pollution or oil deposits by workers and equipment. All water used in cleaning the concrete structures should be disposed of before allowing water to the structure.

**3.10 MISCELLANEOUS CONCRETE ITEMS**

- A. Equipment Bases and Foundations: Provide machine and equipment bases and foundations, as shown on Drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates or manufacturer furnishing machines and equipment.
- B. Grout base plates and foundations as indicated, using specified non-shrink grout. Use non-metallic grout for exposed conditions, unless otherwise indicated. Block out the original concrete or finish off a sufficient distance below the bottom of the machinery base to provide for the thickness of grout shown on the Drawings. After the machinery has been set in position and wedged to the proper elevation by steel wedges, the space between the bottom of the machinery base and the original pour of concrete shall be filled with a pourable nonshrinking type grout as hereinbefore specified.

**3.11 REJECTIONS**

- A. Concrete Strength: Concrete strength shall be considered satisfactory if the average test of the two 28-day specimens exceeds the specified strength and neither specimen test falls below 95% of the specified strength. If the average strength of the two test specimens is less than specified and either specimen test is less than 95% of the specified strength, the concrete represented by the tests is rejected and must be removed and replaced at the Contractor's expense.
- B. Alignment: Where concrete slabs or walls do not meet the alignment requirements, the Contractor must grind off irregularities until they comply. However, if such removal leaves less concrete section than indicated, the Engineer may reject concrete if he feels the remaining section would not be adequate.
- C. Flatwork: Finished flatwork exceeding the tolerances of these specifications shall be repaired or replaced so that strength or appearance is not adversely affected. Follow paragraph 3.07 for repair work or as directed by Engineer.
- D. Appearance: Concrete exposed to view with defects which adversely affect the appearance of the specified finish may be repaired, if possible in accordance with paragraph 3.07. If, in the opinion of the Engineer, the defects cannot be repaired to equal the specified finish, the concrete shall be rejected.
- E. Misplaced Members: Concrete members cast in the wrong location may be rejected if the strength, appearance, or function of the structure is adversely affected or misplaced items interfere with other construction.
- F. Rejected Concrete: Rejected concrete shall be removed and replaced. Limits of removal shall be as directed by the Engineer to accomplish a structure equal in strength,

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serviceability, and appearance, to that which would have been achieved by acceptable concrete.

- G. Expense of Repairs: The cost of all repairs, removal, replacement, etc., required by the provisions of this Article shall be borne by the Contractor.

**3.12 TESTS OF AGGREGATE**

- A. Provide tests of aggregate before concreting per ASTM C33. Tests may be waived by Engineer if aggregates to be used have shown actual use to produce concrete of required strength, durability, water-tightness, fire resistance, and wearing qualities. See Section 2.03 for additional information concerning local aggregates.

**3.13 STRENGTH TEST OF CYLINDERS DURING WORK**

- A. Provide for test purposes, sets of four cylinders each, taken for each 40 cubic yards or portions placed each day with a minimum of 3 tests per pour. Test one cylinder per set at 7 days, two at 28 days, and retain one for backup.
- B. Evaluation will be in accordance with ACI Standard Building Code Requirements for Reinforced Concrete (ACI 318-05), Section 4.7, "Evaluation and Acceptance of Concrete", and these Specifications. Where the term "building official" is used in Section 4.7 of ACI 318, term shall be redefined to "the Owner's representative".
- C. Specimens will be made, cured, and tested by the Contractor's independent testing firm in accordance with ASTM C31 and ASTM C39.
- D. Frequency of testing may be increased at discretion of Engineer.
- E. Cold Weather Placement Tests:
1. During cold weather concreting, Contractor's independent testing firm will cast cylinders for field curing as follows. Use method which will produce greater number of specimens:
    - a. Six extra test cylinders from the last 100 cubic yards of concrete.
    - b. Minimum three specimens for each 2 hours of placing time or for each 100 yards.
  2. These specimens shall be in addition to those cast by Contractor for lab testing.
  3. Keep field test cylinders in same protective environment as the parts of the structure they represent, to determine if specified strength has been obtained and no further protection is needed. Do not place in insulated device that provides additional protection to the cylinder.
  4. Test cylinders in accordance with applicable sections of ASTM C31 and C39.
  5. Evaluation and Acceptance: As specified herein.

**3.14 SLUMP TESTS**

- A. Take slump tests with each strength test and from each truck after pumping and as directed in accordance with ASTM C143.

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**3.15 AIR CONTENT**

- A. ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231, pressure method for normal weight concrete; take air tests with each strength test and each truck and as directed.

**3.16 CONCRETE TEMPERATURE**

- A. ASTM C1064; one test hourly when air temperature is 40 degrees F and below and when 80 degrees F and above, and one test for each set of compressive strength specimens.

**3.17 TEST OF HARDENED CONCRETE**

- A. Acceptance shall be based on concrete cylinder tests in accordance with Paragraph 3.11. Contractor may provide additional test by coring per ASTM C42 or load tests for that portion of job where questionable concrete has been placed. Such additional testing will be accepted in lieu of cylinder tests. Results of rebound hammer tests will not be accepted except in defining problem areas.

**3.18 COST OF TESTING**

- A. The Contractor shall bear all costs of testing required by this section including tests of hardened concrete where cylinder strengths indicate high or low strength concrete.

**3.19 TEST RESULTS**

- A. Submit two (2) copies of all tests to Engineer within 24 hours of testing.

**3.20 CURE BOX**

- A. Provide a cure box at the project site for initial cure of test cylinders. Construct and equip box to provide initial cure in accordance with ASTM C31. Do not place cold weather cylinders in the curebox after protection of concrete is in place.

**3.21 WATER LEAKAGE TESTS**

- A. Purpose: Determine integrity of finished concrete and to show exposed wall surfaces are visually acceptable.
- B. Testing to be done in accordance with ACI 350.1 "Tightness Testing of Environmental Concrete Structures", latest edition.
- C. All Water-Holding Structures:
  - 1. Perform leakage tests after concrete has cured and obtained its design strength, and before backfill, or other work which will cover concrete wall surfaces is begun.
  - 2. Make other equipment, i.e., stop gates, sluice gates, valves, etc., or temporary bulkheads water-tight prior to test.



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3. As an alternative to having watertight bulkheads, gates, or valves, accurately measure the leakage through gates, valves, and bulkheads with methods acceptable to Engineer. An assumed leakage through gates and valves based on manufacturer's recommendations is not acceptable.
  4. Fill with water to maximum liquid level prior to leak testing. Fill at a maximum rate of 2 ft. per hour. Maintain level for 48 hours for moisture absorption by concrete.
  5. Close all valves and gates to the structure and measure the change in water surface every 24 hours for a 72-hour period.
  6. During test period, examine exposed portions of structure for dampness or leaks and mark visible leaks or damp spots. Leaks and damp spots indicate a failed leak test.
- D. Test Evaluation Criteria:
1. An acceptable test shall have a drop in water surface in 24-hour period with basin full less than 0.050 percent of normal volume of liquid contained in water-holding structure, after accounting for evaporation and precipitation in open basins, and damp spots or seepage are not present on walls or other areas exposed to view.
  2. Determine evaporation by floating an evaporation pan in structure during test period.
  3. If the test evaluation criteria are not met, the owner may elect to accept the work at a discounted rate of payment as determined by the engineer. The discount rate may include, but is not limited to, the value of the water lost, pumping costs, shortened functional life of the work, etc.
- E. Excessive Leakage and Leakage Test Failure: If drop in water surface exceeds test evaluation criteria or if damp spots or seepage is visible in exposed surfaces, the leak test shall be considered as failing.
- F. Repairs:
1. If leakage is excessive, and if damp spots and observed seepage is present on exposed surfaces, drain water-holding structure, patch all leaks and damp spots previously marked, and make necessary repairs, and retest basin.
  2. Repair in accordance with Section 03 01 00 – Maintenance of Concrete and as approved by Engineer.
- G. Retest:
1. Refill water-holding structure and test for leakage until structure meets test criteria.
  2. Successful Test: If liquid level criteria is met and damp spots and seepage problems are corrected, the retest will be considered acceptable.

**END OF SECTION**

**SECTION 05 50 00  
METAL FABRICATIONS**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Shop fabricated metal items.
- B. Wall Ladder

**1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION**

- A. Section 03 30 00 - Cast-In-Place Concrete: Placement of metal fabrications in concrete.
- B. Section 03 10 00 – Concrete Forming and Accessories: Anchor for casting into concrete.

**1.3 REFERENCES**

- A. ASTM A36 - Structural Steel.
- B. ASTM A283 - Carbon Steel Plates, Shapes, and Bars.
- C. ASTM A307 - Carbon Steel Externally Threaded Standard Fasteners.
- D. ASTM A325 - High Strength Bolts for Structural Steel Joints.
- E. ASTM A500 - Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.
- F. ASTM A501 - Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- G. AWS A2.0 - Standard Welding Symbols.
- H. AWS D1.1 - Structural Welding Code.
- I. SSPC - Steel Structures Painting Council.

**1.4 QUALIFICATIONS**

- A. Welders Certificates: Prior to start of work, submit to Engineer certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

**1.5 FIELD MEASUREMENTS**

- A. Verify that field measurements are as indicated on Drawings.

## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

- A. Steel Sections: ASTM A36, Fy = 36 ksi.
- B. Plates: ASTM A283.
- C. Pipe: ASTM A501 or A53 Type E or S Grade B Fy= 35 ksi.
- D. Bolts, Nuts, and Washers: ASTM A325-N.
- E. Anchor Bolts: ASTM A307
- F. Welding Materials: AWS D1.1; type required for materials being welded.
- G. Shop and Touch-Up Primer: SSPC 15 Type I red oxide.
- H. Ladder: ASTM A36, Hot Dipped Galvanized

### **2.2 FABRICATION**

- A. Fit and shop assemble in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Continuously seal joined members by continuous welds.
- D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

### **2.3 FINISHES**

- A. Refer to Section 09 90 00, Painting and Coating

## **PART 3 EXECUTION**

### **3.1 PREPARATION**

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply items required to be cast into concrete with setting templates, to appropriate sections.

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**3.2 INSTALLATION**

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Field weld components indicated on drawings.
- D. Perform field welding in accordance with AWS D1.1.
- E. Obtain Engineer approval prior to site cutting or making adjustments not scheduled.
- F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.
- G. Install ladder and safety cage in accordance with manufacturer requirements.

**3.3 ERECTION TOLERANCES**

- A. Maximum Offset From True Alignment: 1/8 inch.

**END OF SECTION**

**SECTION 07 90 00  
JOINT PROTECTION**

**PART 1 GENERAL**

**1.1 SUMMARY**

- A. Section includes sealants and joint backing, precompressed foam sealers, and accessories.

**1.2 REFERENCES**

- A. ASTM International:
  1. ASTM C834 - Standard Specification for Latex Sealants.
  2. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications.
  3. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
  4. ASTM C1193 - Standard Guide for Use of Joint Sealants.
  5. ASTM D1056 - Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.
  6. ASTM D1667 - Standard Specification for Flexible Cellular Materials-Vinyl Chloride Polymers and Copolymers (Closed-Cell Foam).
  7. ASTM D2628 - Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements.

**1.3 SUBMITTALS**

- A. Products Data: Submit data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.
- B. Manufacturer's Installation Instructions: Submit special procedures, surface preparation, and perimeter conditions requiring special attention.
- C. Warranty: Include coverage for installed sealants and accessories failing to achieve airtight seal and watertight seal, exhibit loss of adhesion or cohesion, and sealants which do not cure.

**1.4 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Applicator: Company specializing in performing Work of this section with minimum three years documented experience.

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**1.5 ENVIRONMENTAL REQUIREMENTS**

- A. Maintain temperature and humidity recommended by sealant manufacturer during and after installation.

**1.6 COORDINATION**

- A. Coordinate Work with sections referencing this section.

**PART 2 PRODUCTS**

**2.1 JOINT SEALERS**

- A. Manufacturers:
  - 1. Dow Corning Corp. Model.
  - 2. GE Silicones Model.
  - 3. Mameco International Inc. Model.
  - 4. Pecora Corp. Model.
  - 5. Sika Corp. Model
  - 6. Or approved equal.
  
- B. Products Description:
  - 1. High Performance General Purpose Exterior (Nontraffic) Sealant: Polyurethane; ASTM C920, Grade NS, Class 25, Uses M, G, and A; single or multi- component.
    - a. Type: Sikaflex-1a manufactured by Sika.
    - b. Color: Standard colors matching finished surfaces.
    - c. Applications: Use for:
      - i. Control, expansion, and soft joints in masonry.
      - ii. Joints between concrete and other materials.
      - iii. Joints between metal frames and other materials.
      - iv. Other exterior non-traffic joints for which no other sealant is indicated.
  
  - 2. General Purpose Traffic Bearing Sealant: Polyurethane; ASTM C920, Grade P, Class 25, Use T; single or multi- component.
    - a. Type: SikaFlex 1C-SL manufactured by Sika.
    - b. Color: Standard colors matching finished surfaces.
    - c. Applications: Use for exterior and interior pedestrian and vehicular traffic bearing joints.
  
  - 3. Exterior Foam Expansion Joint Sealer: Precompressed foam sealer; Polyurethane with water-repellent; products recommended by manufacturer for traffic-bearing use.
    - a. Color: Black color.
    - b. Size: As required to provide weathertight seal when installed.
    - c. Applications: Use for exterior wall expansion joints.

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4. General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, single component, paintable.
  - a. Color: Standard colors matching finished surfaces.
  - b. Applications: Use for interior wall and ceiling control joints, joints between door and window frames and wall surfaces, and other interior joints for which no other type of sealant is indicated.:
5. Bathtub/Tile Sealant: White silicone; ASTM C920, Uses M and A; single component, mildew resistant.
  - a. Applications: Use for joints between plumbing fixtures and floor and wall surfaces, and joints between kitchen and bathroom toilet room counter tops and wall surfaces.
6. Sealant for Continuous Water Immersion: Polyurethane; NSF 61 Approved; ASTM C920, Grade NS, Class 25, Uses M and A; approved by manufacturer for continuous water immersion; single or multi- component.
  - a. Type: Sikaflex 1a manufactured by Sika.
  - b. Color: Standard colors matching finished surfaces.
  - c. Applications: Use for improved tank access.

## **2.2 ACCESSORIES**

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Joint Backing: Round foam rod compatible with sealant; ASTM D1056, sponge or expanded rubber; oversized 30 to 50 percent larger than joint width.
- D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- A. Verify substrate surfaces and joint openings are ready to receive work.
- B. Verify joint backing and release tapes are compatible with sealant.

### **3.2 PREPARATION**

- A. Remove loose materials and foreign matter impairing adhesion of sealant.
- B. Clean and prime joints.

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- C. Perform preparation in accordance with ASTM C1193.
- D. Protect elements surrounding Work of this section from damage or disfiguration.

**3.3 INSTALLATION**

- A. Perform installation in accordance with ASTM C1193.
- B. Perform acoustical sealant application work in accordance with ASTM C919.
- C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
- D. Install bond breaker where joint backing is not used.
- E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- G. Tool joints concave.
- H. Precompressed Foam Sealant: Do not stretch; avoid joints except at corners, ends, and intersections; install with face 1/8 to 1/4 inch below adjoining surface.

**3.4 CLEANING**

- A. Clean adjacent soiled surfaces.

**3.5 PROTECTION OF INSTALLED CONSTRUCTION**

- A. Protect sealants until cured.

**END OF SECTION**



**SECTION 09 90 00  
PAINTING AND COATING**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Surface preparation and field application of paints and coatings.

**1.2 REFERENCES**

- A. ASTM D16 - Definitions of Terms Relating to Paint, Varnish, Lacquer, and Related Products.
- B. NACE (National Association of Corrosion Engineers) - Industrial Maintenance Painting.
- C. SSPC (Steel Structures Painting Council) - Steel Structures Painting Manual.
- D. NPCA (National Paint and Coatings Association) – Guide to U.S. Government Paint Specifications.

**1.3 DEFINITIONS**

- A. Conform to ASTM D16 for interpretation of terms used in this Section.

**1.4 SUBMITTALS**

- A. The Contractor shall submit a written copy of the coating manufacturer's recommendations for the shipping, handling, storage, application, curing, recoating and disposal of all products used for this project. The Contractor shall supply color chips available for the vault piping. Owner will make color selection.
- B. Manufacturer's Instructions: Indicate special surface preparation procedures and substrate conditions requiring special attention.

**1.5 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

**1.6 REGULATORY REQUIREMENTS**

- A. Conform to applicable code for flame and smoke rating requirements for finishes.
- B. All pertinent safety regulations shall be adhered to strictly. All OSHA, federal, state regulations will be observed and conformed to. Material safety data sheets shall be submitted by the product manufacturer and such precautions enforced.

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- C. Contractor shall be fully responsible for the generation, management, and disposal of hazardous waste materials which are generated by the Work. Contractor shall comply with all local, state, and federal regulations regarding removal, containment, and disposal of the cleaning and painting debris.

**1.7 FIELD SAMPLES**

- A. Provide field sample of paint.
- B. Provide field sample panel, 2 feet long by 1 foot wide, illustrating special coating color, texture, and finish.
- C. Locate where directed.
- D. Accepted sample may remain as part of the Work.

**1.8 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, store, protect and handle products to site.
- B. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- C. Container label to include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- D. Store paint materials at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

**1.9 ENVIRONMENTAL REQUIREMENTS**

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Minimum Application Temperatures for Latex Paints: 45 degrees F (7 degrees C) for interiors; 50 degrees F (10 degrees C) for exterior; unless required otherwise by manufacturer's instructions.
- C. Minimum Application Temperature for Alkyd Finishes: 65 degrees F (18 degrees C) for interior exterior, unless required otherwise by manufacturer's instructions.
- D. Provide lighting level of 80 ft. candles measured mid-height at substrate surface.
- E. Dispose of all sand blasting and cleaning materials off-site, and in conformance with applicable local, state, and federal regulations.

**1.10 EXTRA MATERIALS**

- A. Provide 1 gallon of each color, type, and surface texture to Owner.

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- B. Label each container with color, type, texture, and locations, in addition to the manufacturers label.

**PART 2 PRODUCTS**

**2.1 MANUFACTURERS**

- A. Manufacturers - Paint
  1. Benjamin Moore.
  2. Sherwin Williams.
  3. Tnemec Company
  4. Pittsburg Paint.
  5. Mobile Chemical Company.
  6. Ponderosa Paint.
  7. Ameron International.

**2.2 MATERIALS**

- A. Coatings: Ready mixed, except field catalyzed coatings. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating; good flow and brushing properties; capable of drying or curing free of streaks or sags.
- B. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, and of commercial quality.

**2.3 FINISHES**

- A. Refer to schedule at end of section for surface finish schedule.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. Verify site conditions.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- D. Test shop applied primer for compatibility with subsequent cover materials.

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**3.2 PREPARATION**

- A. Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
- B. Correct defects and clean surfaces which affect work of this section. Remove existing coatings that exhibit loose surface defects.
- C. Seal with shellac and seal marks which may bleed through surface finishes.
- D. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- E. Uncoated Steel and Iron Surfaces: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by power tool wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.
- F. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- G. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.
- H. Metal Doors Scheduled for Painting: Seal top and bottom edges with primer.

**3.3 APPLICATION**

- A. Apply products in accordance with manufacturer's instructions.
- B. Do not apply finishes to surfaces that are not dry.
- C. Apply each coat to uniform finish.
- D. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.
- E. Vacuum clean surfaces free of loose particles. Use tack cloth just prior to applying next coat.
- F. Allow applied coat to dry before next coat is applied.

**3.4 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT**

- A. Paint shop primed equipment.
- B. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

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- C. Prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, and equipment except where items are prefinished.
- D. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

**3.5 FIELD QUALITY CONTROL**

- A. Test questionable coated areas in accordance with Engineers Instructions.

**3.6 CLEANING**

- A. Clean work.
- B. Collect waste material, which may constitute a fire hazard, place in closed metal containers and remove daily from site.

**3.7 PAINTING SCHEDULE**

- A. SHOP PRIMED ITEMS FOR SITE FINISHING
  - 1. Metal Fabrications Section 05 50 00: Trough edge angles and miscellaneous connections.
- B. TANK: "HOT DIPPED" GALVANIZED APPURTENANCES
  - 1. The tank appurtenances that are noted on plans to be "Hot Dipped" Galvanized after fabrication are to be touched up after installation using a NSF 61 approved Galvanic Paint.

**3.8 SCHEDULE - COLORS**

- A. As approved by Owner, and accepted by Engineer. Submit color patches as required.

**END OF SECTION**

**SECTION 31 10 00  
SITE CLEARING**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Protection of existing features.
- B. Removing and disposing of trees and shrubs.
- C. Stripping and stockpiling of top layer of plants and grasses.
- D. Clean-up.

**1.2 REFERENCES**

Not used.

**PART 2 PRODUCTS**

Not Used.

**PART 3 EXECUTION**

**3.1 PROTECTION OF EXISTING FEATURES**

- A. Protect benchmarks and survey monuments from damage and displacement.
- B. Protect existing structures from damage.
- C. Protect existing fence lines from damage unless otherwise noted for removal and/or replacement on the construction plans.

**3.2 REMOVAL AND DISPOSAL OF TREES AND SHRUBS**

- A. Remove only those trees and shrubs necessary to construct access roads, pipelines, and/or storage tank with appurtenances. Trees should be protected when outside the earthwork boundaries. Any trees and shrubs designated to be removed shall be removed to the roots. Burning of the trees and shrubs on site or burial in backfill or trenches is prohibited.

**3.3 STRIPPING AND STOCKPILING OF TOP LAYER OF PLANTS AND GRASSES**

- A. Only areas designated on the construction drawings shall be stripped of top soil. These areas include those where earthwork is to be performed.

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- B. Top soil shall be stripped to a minimum 12" depth and stockpiled at areas designated in the drawings for use during final grading.
- C. Top soil stockpile shall be separated from other soil materials to prevent contamination.
- D. Debris of any type, such as garbage and any other deleterious material, shall be disposed of off-site at a location provided by the contractor. Location shall be in compliance with all Federal, State, and Local Regulations.

**3.4 CLEANUP**

- A. Upon completion of the site work and project, clean the entire work area. Remove all excess excavated material, rocks, boulders, logs, trees, pipe, or debris of any type from the site and dispose at a site acceptable to Federal, State, and Local Regulations.

**END OF SECTION**

**SECTION 31 22 13  
ROUGH GRADING**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Examination
- B. Preparation
- C. Removal and Disposal
- D. Subsoil Excavation
- E. Filling
- F. Tolerances
- G. Field Quality Control
- H. Schedules

**1.2 REFERENCES**

- A. ASTM C136 - Method For Sieve Analysis of Fine and Coarse Aggregates.
- B. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 10 lb (2.49 Kg) Rammer and 18 inch (304.8 mm) Drop.
- C. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- D. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

**1.3 PROJECT RECORD DOCUMENTS**

- A. Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- A. Subsoil Fill: Type S1 as specified in Section 32 05 13 – Soils for Exterior Improvements.



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- B. Structural Fill: Type A1 and A2 as specified in Section 32 05 16 – Aggregates for Exterior Improvements.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. Verify site conditions.
- B. Verify that survey bench mark and intended elevations for the Work are as indicated.

**3.2 PREPARATION**

- A. Contractor is responsible to protect all construction stakes and bench marks. If original survey stakes or markers are destroyed, they will be replaced at the Contractors expense.
- B. Stake and flag locations of known utilities.
- C. Locate, identify, and protect utilities that remain, from damage.
- D. Notify utility company to remove and relocate utilities.
- E. Protect above and below grade utilities that remain.
- F. Protect plant life, lawns, and other features remaining as a portion of final landscaping.
- G. Protect bench marks, survey control point, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

**3.3 REMOVAL AND DISPOSAL**

- A. Remove all shrubs including the roots from areas of construction excavation as described in Section 31 10 00 – Site Clearing.

**3.4 SUBSOIL EXCAVATION**

- A. Excavate subsoil from areas to be further excavated, or re-graded.
- B. Do not excavate wet subsoil.
- C. Stockpile subsoil on site to be used in fill. Protect from erosion.

**3.5 FILLING**

- A. Fill areas to contours and elevations with unfrozen materials.
- B. Place fill material on continuous layers and compact per schedule at the end of this section.

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- C. Maintain optimum moisture content of fill materials to attain required compaction density.
- D. Slope grade away from tank minimum 1.5 ft vertically in 3 ft horizontally unless noted otherwise.
- E. Make grade changes gradual. Blend slope into level areas.

**3.6 TOLERANCES**

- A. Top Surface of Subgrade: Plus or minus 1/10 foot from required elevation.

**3.7 FIELD QUALITY CONTROL**

- A. Testing: In accordance with ASTM D1557 and ASTM D2922 or as noted on plans.
- B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.
- C. Frequency of Tests: As required to assure quality.

**3.8 SCHEDULES**

- A. Structural Fill:
  - 1. Fill Type A1 and A2: Maximum 8 inches compacted depth.
  - 2. Compact to a minimum of 95 percent of maximum dry density.
- B. Pipeline Backfill:
  - 1. Fill Type A3 and A4: Maximum 8 inches compacted depth.
  - 2. Compact to a minimum of 95 percent of maximum dry density.
- C. Untreated Base Course
  - 1. Fill Type A6: Maximum 6 inches compacted depth.
  - 2. Compact to a minimum of 95 percent of maximum dry density.
- D. Tank Site Fill:
  - 1. Fill Type S1, A1, and A3: Maximum 8 inches compacted depth per lift.
  - 2. Compact to a minimum of 92 percent of maximum dry density.

**END OF SECTION**

**SECTION 31 23 16  
EXCAVATION**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Excavation for building foundations.
- B. Excavation for utility and site structures.
- C. Excavation for paving, roads, parking areas, and slabs-on-grade.
- D. Excavation for landscaping.

**1.2 FIELD MEASUREMENTS**

- A. Verify that survey benchmark and intended elevations for the Work are as indicated.

**PART 2 PRODUCTS**

Not Used.

**PART 3 EXECUTION**

**3.1 PREPARATION**

- A. Identify required lines, levels, contours, and datum.
- B. Verify location of potentially conflicting utilities.
- C. Protect utilities indicated to remain from damage.
- D. Coordinate with utility owners to allow relocation of utilities if necessary.
- E. Protect plant life and other features remaining as portion of final landscaping.
- F. Protect benchmarks, survey control points, existing structures, fences, and paving from excavating equipment and vehicular traffic.

**3.2 EXCAVATION**

- A. Underpin or shore up adjacent structures which may be damaged by excavation work, including utilities.

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- B. Excavate subsoil to the lines and grades shown on the plans required to accommodate building and structure construction.
- C. Grade top perimeter of excavation to prevent surface water from draining into excavated area.
- D. Hand trim excavation. Remove loose matter.
- E. Remove lumped subsoil, frozen subsoil and boulders.
- F. Scarify to a depth of 8" and compact excavated area to ninety-five percent (95%) maximum density of ASTM D1557 prior to placing aggregate material.
- G. Notify Engineer of unexpected subsurface conditions.
- H. Correct unauthorized excavation at no extra cost to Owner.
- I. Correct areas over-excavated by filling with Structural Fill Type A2 aggregate material and compacting to ninety-five percent (95%) ASTM D1557 Density.
- J. Repair utilities and items damaged during excavation, which are intended to remain, at no additional cost to Owner.

**3.3 FIELD QUALITY CONTROL**

- A. Field inspection will be performed.
- B. Provide for visual inspection of bearing surfaces and compaction testing.

**3.4 PROTECTION**

- A. Protect excavated area by methods required to prevent cave-in or loose soil from falling into trench; maintain soil stability.
- B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.
- C. Protect structures, utilities and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth operations.

**END OF SECTION**

**SECTION 31 23 23**

**FILL**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Trench filling and backfilling.
- B. Backfilling areas excavated for structures.
- C. Consolidation and compaction.
- D. Fill under paving.
- E. Fill for over-excavation.

**1.2 REFERENCES**

- A. ANSI/ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.
- B. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 10 lb. Rammer and 18 inch Drop.
- C. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- D. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

**1.3 SUBMITTALS**

- A. Samples: Submit 45 lb. sample of each type of aggregate and soil materials to testing laboratory, in air-tight containers.
- B. Submit all sample and compaction test results to Engineer.

**PART 2 PRODUCTS**

**2.1 BACKFILL MATERIALS**

- A. Native materials free of shale, clay, friable material and debris with a maximum aggregate size that does not exceed 4 inches and approved by the engineer.
- B. Type A3 Aggregate specified in Section 32 05 16 – Aggregates for Exterior Improvements.
- C. Subsoil Type S1 specified in Section 32 05 13 – Soils for Exterior Improvements.

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**2.2 BEDDING MATERIALS**

- A. Type A4 Aggregate as specified in Section 32 05 16 – Aggregates for Exterior Improvements.

**2.3 FOUNDATION MATERIALS**

- A. Type A5 Aggregate as specified in Section 32 05 16 – Aggregates for Exterior Improvements.

**2.4 IMPORT TRENCH BACKFILL MATERIALS**

- A. Type A3 Aggregate as specified in Section 32 05 16 – Aggregates for Exterior Improvements.

**2.5 BASE MATERIALS**

- A. Type A6 Untreated Base Course as specified in Section 32 05 16 – Aggregates for Exterior Improvements.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. Verify fill materials to be used are acceptable.
- B. Where applicable, verify subdrainage, dampproofing, or waterproofing installation has been inspected.
- C. Verify structural ability of unsupported walls to support loads imposed by fill.
- D. Project Engineer must review all excavations prior to backfill.

**3.2 PREPARATION**

- A. Compact subgrade to density requirements for subsequent backfill materials. Scarify, wet and recompact, if necessary, to achieve densities.
- B. Cut out soft areas of subgrade not capable of insitu compaction. Backfill with Structural Fill Type A2 fill as necessary and compact to density equal to or greater than requirements for subsequent backfill material.
- C. Prior to placement of any fill material, scarify to 8” and compact subgrade to ninety-five percent (95%) of its maximum dry density in accordance with ASTM-D1557.

**3.3 BACKFILLING**

- A. Backfill areas to contours and elevations with unfrozen Type S1 subsoil or Type A3 fill.

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- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces. If wet, frozen, porous, spongy or other unsuitable materials are encountered, backfill trench with import trench backfill at no additional cost to Owner.
- C. Pit Run Type A3 Fill: Place and compact materials in continuous layers not exceeding six (6) inches compacted depth.
- D. Subsoil Type S1 Fill: Place and compact material in continuous layers not exceeding eight (8) inches compacted depth.
- E. Compact fill materials to ninety-five percent (95%) maximum density as determined by ASTM-D1557. Unless noted otherwise on the Drawings.
- F. Employ a placement method that does not disturb or damage existing structures or utilities.
- G. Maintain optimum moisture content of backfill materials to attain required compaction density.
- H. Do not backfill against unsupported foundation walls unless approved by the Engineer.
- I. Slope grade away from structures at a minimum 5 percent slope for a minimum distance of 10 ft., unless noted otherwise.
- J. Remove surplus and unusable backfill materials from site.
- K. Leave fill material stockpile areas completely free of excess fill materials.

**3.4 TOLERANCES**

- A. Structures and Paved Areas
  - 1. Top Surface of Backfilling: Plus or minus 0.10 foot from required elevations.
- B. General Open and Landscaped Areas
  - 1. Top Surface of Backfilling: Plus or minus 1 inch from required elevations.

**3.5 FIELD QUALITY CONTROL**

- A. Field testing will be performed.
- B. Tests and analysis of fill material will be performed in accordance with ANSI/ASTM C136 and ANSI/ASTM D1557 and with General Requirements.
- C. Compaction testing will be performed in accordance with ASTM D1557 and ASTM D2922 and with General Requirements.
- D. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

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- E. Frequency of Compaction Tests: As required to assure quality of work.
- F. Proof roll compacted fill surfaces under foundations, slabs-on-grade, pavers, and paving.

**3.6 PROTECTION OF FINISHED WORK**

- A. Protect finished Work.
- B. Recompact fills subjected to vehicular traffic before placement of subsequent layers.

**END OF SECTION**



**SECTION 32 05 13  
SOILS FOR EXTERIOR IMPROVEMENTS**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Trench Backfill Soil Materials.
- B. Topsoil

**1.2 REFERENCES**

- A. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 10 lb. Rammer and 18 inch Drop.
- B. ASTM D2487 - Classification of Soils for Engineering Purposes.
- C. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- D. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures in place by Nuclear Methods (Shallow Depth).

**1.3 SUBMITTALS**

- A. Samples: Submit, in airtight containers, 45 lb. (20 kg) sample of each type of soil trench backfill material to testing laboratory. Submit test results to Engineer.
- B. Materials Source: Submit name of imported materials suppliers. Provide materials from same source throughout the work. Change of source requires Engineer's approval.

**PART 2 PRODUCTS**

**2.1 SOIL MATERIALS**

- A. Subsoil Type S1: Excavated and re-used material, graded, free of lumps larger than 6 inches, rocks larger than 6 inches, frozen material, and debris.
- B. Use Subsoil Type S1 for trench backfill material.

**2.2 SOURCE QUALITY CONTROL**

- A. Inspection and testing will be performed.
- B. Tests and analysis of soil material will be performed in accordance with ANSI/ASTM D1557, ASTM D2922, and ASTM D3017. A minimum of five (5) tests must be done.

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- C. If tests indicate materials do not meet specified requirements, change material and retest at no cost to Owner.

**PART 3 EXECUTION**

**3.1 STOCKPILING**

- A. Stockpile soil material as shown and described on the drawings.
- B. Stockpile in sufficient quantities to meet project schedule and requirements.
- C. Separate differing materials with dividers or stockpile apart to prevent mixing.
- D. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

**3.2 STOCKPILE CLEANUP**

- A. Remove stockpile, leave area in a clean and neat condition. Grade stockpile site surface to prevent free standing surface water.

**END OF SECTION**

**SECTION 32 05 16  
AGGREGATES FOR EXTERIOR IMPROVEMENTS**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Aggregate materials for pipe bedding, structure foundation, roadway base course, import trench backfill and drain rock.

**1.2 REFERENCES**

- A. ANSI/ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.
- B. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 10 lb. Rammer and 18 inch Drop.
- C. ASTM D2049 - Test Method for Relative Density of Cohesionless Soils.
- D. ASTM D2487 - Classification of Soils for Engineering Purposes.
- E. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

**1.3 SUBMITTALS**

- A. Samples: Submit, in airtight containers, 45 lb. (20 kg) sample of each type of aggregate material to testing laboratory. Submit test results to Engineer.
- B. Materials Source: Submit name of aggregate materials suppliers. Provide materials from same source throughout the work. Change of source requires Engineer approval.

**PART 2 PRODUCTS**

**2.1 AGGREGATE MATERIALS**

- A. Aggregate Type A1: Angular, crushed stone free of shale, clay, friable material and debris meeting the following limits:

<u>Sieve Size</u>	<u>Percent Passing</u>
1.5 inches	100
1 inch	95 to 100
1/2 inch	25 to 60
No. 4	0 to 10
No. 8	0 to 5

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Use for free draining granular backfill beneath floor slabs and along sides of tank.

- B. Structural Fill Type A2: Durable material free of shale, clay, organic matter, friable material and debris meeting a CDOT Class 6 base course material or the following limits:

<u>Sieve Size</u>	<u>Percent Passing</u>
3 inches	100
No. 4	35 to 50
No. 200	15 max

Liquid Limit 24 max  
Plasticity Index 9 max

Use for structural fill material beneath tank foundations.

- C. Pit Run Type A3: Durable material free of shale, clay, organic matter, friable material and debris meeting the following limits:

<u>Sieve Size</u>	<u>Percent Passing</u>
4 inches	100
3 inches	98 to 100
2 inches	75 to 100
1 inch	40 to 80
No. 4	25 to 60
No. 200	5 to 12

Use for trench backfill material.

- D. Pipe Bedding Material Type A4: Angular, crushed stone free of shale, clay, friable materials and debris; graded in accordance with ASTM C136 within the following limits:

<u>Sieve Size</u>	<u>Percent Passing</u>
3/4 inch	100
1/2 inch	75 to 100
3/8 inch	65 to 85
No. 4	40 to 65
No. 10	25 to 50
No. 50	10 to 25
No. 200	0 to 5

Use for pipe bedding material.

- E. Aggregate Type A5: Angular, crushed stone free of shale, clay, friable material and debris; graded in accordance with ASTM C136 within the following limits:

<u>Sieve Size</u>	<u>Percent Passing</u>
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1 inch	100
3/4 inch	75 to 100
1/2 inch	25 to 60
3/8 inch	0 to 5

Use for pipe foundation material.

- F. Untreated Base Course Type A6: Untreated base course shall be free of shale, clay, friable material and debris; graded in accordance with ANSI/ASTM C136, ASTM D2487 Group Symbol GW; within the following limits: (Alternative gradations will be considered)

<u>Sieve Size</u>	<u>Percent Passing</u>
3/4 inch	100
1/2 inch	70 to 100
No. 4	41 to 68
No. 16	21 to 41
No. 40	10 to 27
No. 200	0 to 5

**2.2 SOURCE QUALITY CONTROL**

- A. Field inspection and testing will be performed.
- B. Tests and analysis of aggregate material will be performed in accordance with ASTM C136 and ASTM D2487. A minimum of five tests must be done.
- C. If tests indicate materials do not meet specified requirements, change material and retest at no cost to Owner.

**PART 3 EXECUTION**

**3.1 STOCKPILING**

- A. Stockpile materials on site.
- B. Stockpile in sufficient quantities to meet project schedule and requirements.
- C. Separate differing materials with dividers or stockpile apart to prevent mixing.
- D. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.
- E. Upon removal, do not mix material with native materials.

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**3.2 STOCKPILE CLEANUP**

- A. Remove stockpile, leave area in a clean and neat condition. Grade site surface to prevent free standing surface water.

**END OF SECTION**

**SECTION 33 05 10  
PIPE AND PIPE FITTINGS**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Ductile Iron Pipe and Fittings
- B. Couples and Coupling Adapter
- C. Sleeves
- D. Aggregate
- E. Concrete
- F. Joint Restraint Glands
- G. Tests
- H. Valve Boxes
- I. Pipe Supports

**1.2 REFERENCES**

- A. ANSI/AWWA C104: Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
- B. ANSI/AWWA C105: Polyethylene Encasement for Ductile-Iron Pipe Systems.
- C. ANSI/AWWA C110: Ductile Iron and Gray-Iron Fittings for Water and Other Liquids.
- D. ANSI/AWWA C111: Rubber Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.
- E. ANSI/AWWA C115: Flanged Ductile Iron Pipe with Threaded Flanges.
- F. ANSI/AWWA C151: Ductile Iron Pipe.
- G. ANSI/AWWA C153: Ductile Iron Compact Fittings.
- H. ANSI/AWWA C213: Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines.
- I. ANSI/AWWA C600: Installation of Ductile-Iron Water Mains and Their Appurtenances

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- J. ASTM-A120: Pipe, Steel, Black and Hot-dipped Zinc Coated (Galvanized), Welded and Seamless.
- K. ASME B16.3: Malleable Iron Threaded Fittings.
- L. ASTM-A53: Pipe, Steel, Black and Hot Dipped Zinc Coated, Welded and Seamless.
- M. AWWA M-11: Manual of Water Supply Practices, Steel Pipe Guide for Design and Installation.

**1.3 SUBMITTALS**

- A. Submit manufacturer's certification that pipe and fittings meet or exceed specified requirements.
- B. Submit manufacturer's installation instructions.
- C. Submit shop drawings showing accurate dimensions of pipe, valves, fittings, pumps, support system, and appurtenances. Submit calculations verifying that the system can withstand all pipe system forces.

**1.4 PROJECT RECORD DOCUMENTS**

- A. Accurately record actual location of constructed pipe lines in relation to existing permanent benchmarks.

**1.5 DELIVERY, STORAGE AND HANDLING**

- A. Unload, store and load pipe in a manner that prevents shock, damage or excessive exposure to sunlight and weather.
- B. Coated pipe shall be shipped on padded bunks with nylon belt tie down strips or padded banding.

**PART 2 MATERIALS**

**2.1 GENERAL**

- A. Piping material specifications are as described herein. Pressure class rating and pipe stiffness requirements are specified on the piping schedule, located at the back of this specification or identified on the plans.

**2.2 DUCTILE IRON PIPE AND FITTINGS**

- A. Bell and Spigot: Ductile iron pipe conforming to ANSI/AWWA C151/A21.51, push-on rubber gasket joint pipe. Ductile iron pipe shall be minimum pressure class 350, and supplied with a lining conforming to the ANSI/AWWA C104/A21.4 cement mortar lining.



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- B. Flanged DIP and Fittings: Ductile iron pipe spools shall be pressure class 350 ductile iron pipe. Spools shall be manufactured in accordance with ANSI/AWWA C115 with flanges manufactured in accordance with ANSI B16.1 Class 125.
- C. “DIP Wall Spools and Sleeves: DIP spools shall conform to ANSI/AWWA C110 and ANSI/AWWA C115 ductile iron with connecting end type as called for on the plans and compatible with connecting piping and valving. Spools and sleeves shall be class pressure 350 and withstand the anticipated bury depths. Wall spools shall incorporate a statically cast seep ring, which is positioned to accommodate cast-in-place concrete placement, as shown on the plans. Minimum laying length shall be 24 inches.”

**2.3 COUPLES AND COUPLING ADAPTER**

- A. Couples: Rockwell OMNI Coupling System 413 or approved equivalent.
- B. Coupling Adapter: Rockwell Model 912 flanged coupling adapter or approved equivalent. Flanged coupling adapters to be restrained with 6 stainless steel tie rods.

**2.4 SLEEVES**

- A. Sleeves are to be MJ long sleeves sized according to pipe as shown in the plans.

**2.5 AGGREGATE**

- A. All aggregate for pipe bedding and foundation stabilization shall conform to Sections 32 05 16 – Aggregates for Exterior Improvements and 31 23 17 - Trenching of these Specifications.

**2.6 CONCRETE**

- A. Concrete for thrust blocks shall conform to Section 03 30 00 – Cast-in-Place Concrete of these Specifications.

**2.7 JOINT RESTRAINT GLANDS**

- A. Wedge action MEG-A-LUG joint restraint glands as manufactured by EBAA Iron, Inc., or approved equivalent. Gland shall be rated at 350 psi with 2:1 safety factor. Gland shall be fusion epoxy coated, minimum dry film thickness 20 mils.

**2.8 TESTS**

- A. Provide compaction testing of trench backfill in accordance with Owner specifications.
- B. Provide pipe pressure testing in accordance with this Section.

**2.9 VALVE BOXES**

- A. Adjustable cast iron valve boxes and lid, as shown on the plans.

**2.10 PIPE SUPPORTS**

- A. Pipe supports shall be as shown on the Plans.

**PART 3 EXECUTION**

**3.1 EXAMINATIONS**

- A. Verify excavation under provisions of Owner specifications.
- B. Verify that excavation will allow a minimum pipe cover of 60" or as shown on the Plans and described elsewhere in the Specifications. If existing pipelines are less than minimum cover, connect to existing pipeline and angle pipe, as necessary, to achieve cover requirements.
- C. Verify that excavations are to required alignment, grades, dry, and not over-excavated.
- D. Examine pipe and fittings for defects or damage.
- E. Verify all pipe, fittings, aggregate, and all materials delivered to the site meet the requirements of these Technical Specifications.
- F. Examine existing piping locations and structures where connections are to be made.
- G. Verify equipment locations and make modifications in piping to properly connect to equipment as necessary, prior to fabrication.

**3.2 PIPE INSTALLATION**

- A. Remove all water from excavation.
- B. Install pipe in accordance with the manufacturer's recommendations.
- C. Utilize proper tools for cutting and beveling pipe ends and joining pipe using manufacturer's recommended tools designed for this task.
- D. Clean and prepare pipe joint using manufacturer's recommended gasket and lubricant.
- E. Utilize proper tools to complete joint, assuring that plain end is inserted "home" in the bell.
- F. Assure that no dirt or other foreign material is allowed in pipeline. Plug all pipe ends with water tight plugs when leaving the pipe unattended.
- G. Complete trenching and backfilling for pipelines in accordance with Owner specifications.
- H. Install pipe fittings so a constant alignment and level grade is achieved through all the pipe and fittings.

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- I. Install pipelines to the alignments and grades shown on the Drawings.
- J. Properly align pipe perforated slots in trench.
- K. Anchors and Supports: Install anchors and supports as necessary to properly support pipe against all static, dynamic, and vibratory loads. Contractor shall submit shop drawings and calculations for proposed pipe support system.
- L. Install pipe connectors in strict accordance with the recommendation of the connector manufacturer.

**3.3 THRUST BLOCKS**

- A. Place thrust blocks at each elbow, tee, cross, and gate valve installed underground.
- B. Provide bearing area against undisturbed earth.
- C. Place thrust blocks such that fitting can be removed at a later date without damage to the pipeline.
- D. Place 6 mil Visqueen plastic between thrust block and fitting.
- E. Place concrete so no concrete touches the nuts and bolts of the fitting or valve, and the nuts and bolts can be removed and replaced without removing any concrete.
- F. Thrust Block: Sizes are shown on the plans or in the APWA Specifications.

**3.4 FLUSHING**

- A. All new water systems or extensions to existing systems shall be thoroughly flushed before being placed in service. Flushing shall be accomplished through hydrants, or end of line blow-off assemblies at a minimum flushing velocity of 2.5-feet per second. See chart below.

<b>FLOW RATE AND OPENINGS TO FLUSH PIPELINES (40- psi Residual Pressure)</b>	
<b>Pipe Size (inches)</b>	<b>Flow Required to Produce 2.5 fps velocity (gpm)</b>
2	26
4	100
6	220
8	390
10	610
12	880
14	1,200
16	1,565
18	1,980
20	2,450

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24	3,525
30	5,507

B. Certify test results meet these specifications.

**3.5 PRESSURE TESTING**

- A. Pressure testing shall conform to AWWA C600 for Ductile Iron pipe, AWWA C605 for PVC pipe, or for other pipe as follows:
1. All newly laid pipes or any valved section thereof shall be subjected to a hydrostatic pressure. A leakage test shall be conducted concurrently with the pressure test.
  2. Test pressures shall not be less than 1.5 times the static pressure at the highest point along the test section.
  3. Test pressures shall not exceed pipe or thrust restraint design pressures.
  4. Test pressures shall be of at least 2-hour duration.
  5. Test pressures shall not vary by more than plus or minus five (+ 5) psi for the duration of the test.
  6. Test pressures shall not exceed twice the rated pressure of the valves or hydrants when the pressure boundary of the test section includes closed gate valves or hydrants.
  7. Test pressures shall not exceed the rated pressure of the valves when the test boundary of the test section includes closed, resilient-seated gate valves or butterfly valves.
  8. Each valved section of pipe shall be slowly filled with water and the specified test pressure, based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gage, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Public Works Representative/Engineer.
  9. Before applying the specified test pressure, air shall be expelled completely from the pipe, valves, and hydrants. If permanent air vents are not located at all high points, the Contractor shall install corporation cocks at such points so that the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied. At the conclusion of the pressure test, the corporation cocks shall be removed and plugged.
  10. All exposed pipe, fittings, valves, hydrants, and joints shall be examined carefully during the test. Any damaged or defective pipe, fittings, valves, or hydrants that are discovered following the pressure test shall be repaired or replaced with sound materials and the test shall be repeated until it is satisfactory to the Owner.

**3.6 LEAK TESTING**

- A. Leak testing shall conform to AWWA C600 for Ductile Iron pipe, AWWA C605 for PVC pipe, or for other pipe as follows:
1. A leakage test shall be conducted concurrently with the pressure test.

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2. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within 5 psi of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water.
3. No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{SD(P)^{0.5}}{148,000}$$

in which L is the allowable leakage, in gallons per hour; S is the length of pipeline tested in feet; D is the nominal diameter of the pipe, in inches; and P is the average test pressure during the leakage test, in pounds per square inch gage.

4. Allowable leakage at various pressures is shown in the following table:

Allowable Leakage per 1000 ft of Pipeline – gph											
Avg. Test Pressure <i>psi (Bar)</i>	Nominal Pipe Diameter (inches)										
	3	4	6	8	10	12	14	16	18	20	24
450 (31)	0.43	0.57	0.86	1.15	1.43	1.72	2.01	2.29	2.58	2.87	3.44
400 (28)	0.41	0.54	0.81	1.08	1.35	1.62	1.89	2.16	2.43	2.70	3.24
350 (24)	0.38	0.51	0.76	1.01	1.26	1.52	1.77	2.02	2.28	2.53	3.03
300 (21)	0.35	0.47	0.70	0.94	1.17	1.40	1.64	1.87	2.11	2.34	2.81
275 (19)	0.34	0.45	0.67	0.90	1.12	1.34	1.57	1.79	2.02	2.24	2.69
250 (17)	0.32	0.43	0.64	0.85	1.07	1.28	1.50	1.71	1.92	2.14	2.56
225 (16)	0.30	0.41	0.61	0.81	1.01	1.22	1.42	1.62	1.82	2.03	2.43
200 (14)	0.29	0.38	0.57	0.76	0.96	1.15	1.34	1.53	1.72	1.91	2.29
175 (12)	0.27	0.36	0.54	0.72	0.89	1.07	1.25	1.43	1.61	1.79	2.15
150 (10)	0.25	0.33	0.50	0.66	0.83	0.99	1.16	1.32	1.49	1.66	1.99
125 (9)	0.23	0.30	0.45	0.60	0.76	0.91	1.06	1.21	1.36	1.51	1.81
100 (7)	0.20	0.27	0.41	0.54	0.68	0.81	0.95	1.08	1.22	1.35	1.62

\*If the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.

\*\*To obtain leakage in liters/hour, multiply the values in the table by 3.785.

5. When testing against closed metal-seated valves, an additional leakage per closed valve of 0.0078 gal/hr/in. of nominal valve size shall be allowed.
6. When hydrants are in the test section, the test shall be made against the closed hydrant.
7. Acceptance shall be determined on the basis of allowable leakage. If any test of pipe laid discloses leakage greater than specified, the Contractor shall, at its own expense, locate and repair the defective material until the leakage is within the specified allowance.
8. All visible leaks are to be repaired regardless of the amount of leakage.

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**3.7 CONNECTIONS TO EXISTING MAINS**

- A. Expose existing main and verify line size and type of pipe.
- B. Provide the necessary fittings that comply with these Specifications and connect to the existing main. Properly align pipe to interface with existing pipeline so no unusual stresses are applied to the pipe.
- C. Maximum allowable pipe gap at compression couples is one-half (1/2) inch maximum.

**END OF SECTION**

# **Appendix D**

## **CONSTRUCTION DRAWINGS**

Kannah Creek Intake Rehabilitation Project  
(Bid Alternate 1)

Purdy Mesa Flowline at Sullivan Draw Project  
(Bid Alternate 2)

Purdy Mesa Flowline at Sullivan Draw Project  
Volume Control Tank  
(Bid Alternate 3)

# **Appendix E**

BLM Required Mitigation Measures

for

Purdy Mesa Flowline Project (Bid Alternate 2)

Purdy Mesa Flowline Project Volume Control Tank  
(Bid Alternate 3)



## **Purdy Mesa Flowline BLM Required Mitigation Measures 8/7/18**

**A-24,** Utilize dust suppression techniques on unpaved surfaces, including watering, chemical suppressants, and gravel.

**S-2,** When saturated soil conditions exist on access roads or location, or when road rutting becomes deeper than 3 inches, construction shall be halted until soil material dries out or is frozen sufficiently for construction to proceed without undue damage and erosion to soils, roads, and locations.

**S-4,** Topsoil shall only be used for reclamation and shall not be used as fill or to bed or pad the pipe during backfilling.

**H-2,** For surface-disturbing activities exceeding 1 acre, develop and implement Stormwater Pollution Prevention Plans to include site-specific design, systematic site monitoring, installation of run-on/off controls such as ditches or berms, and installation of adaptive BMPs to reduce potential erosion and sediment production and transport. Stormwater will be dispersed to stabilized areas to slow velocity, prevent erosion, and support infiltration into soils. Stormwater BMPs identified in the State-approved Storm Water Pollution Prevention Plan shall be in place prior to any earth-disturbing activity. Additional BMPs will be installed if determined necessary by the BLM. All measures shall be maintained in good, functional condition. All temporary BMPs shall be removed once site stabilization and reclamation efforts have been deemed successful by the BLM.

**FWS-9,** Where development is allowed within 100 meters of occupied habitat for threatened, endangered, proposed, and candidate species or BLM sensitive species, unauthorized disturbance of plant habitat will be avoided by on-site guidance from a biologist, and by fencing the perimeter of the disturbed area, or such other method as agreed to by US Fish and Wildlife Service. In such instances, a monitoring plan approved by US Fish and Wildlife Service will be implemented for the duration of the project to assess impacts to the plant population or seed bank. If detrimental effects are detected through monitoring, corrective action will be taken through adaptive management.

**CR-3,** The holder of a BLM authorization to carry out land use activities on federal lands, including all leases and permits, must notify the BLM, by telephone and written confirmation, immediately upon the discovery of human remains, funerary items, sacred objects, or objects of cultural patrimony (43 CFR 10.4[g]). Activities must stop in the immediate vicinity of the discovery. The discovery must be protected from the authorized activity for a period

**CR-4,** The National Historic Preservation Act, as amended, requires that if newly discovered historic or archaeological materials or other cultural resources are identified during project implementation, work in that area must stop and the BLM Authorized Officer must be notified immediately. Within five working days, the BLM Authorized Officer will inform the proponent as to:

- a) Whether the materials appear eligible for the National Register of Historic Places;
- b) The mitigation measures the proponent will likely have to undertake before the site could be used (assuming in situ preservation is not practicable) (36 CFR 800.13); and
- c) A timeframe for the BLM Authorized Officer to complete an expedited review under 36 CFR 800.11 to confirm, through the State Historic Preservation Office, that the BLM Authorized Officer's findings were correct and mitigation was appropriate.

**CR-5,** A standard Education/Discovery stipulation for cultural resource protection shall be attached to the land use authorization. The operator or its contractor is responsible for informing all persons who are associated with the project operations that federal laws protect cultural resources and they will be subject to prosecution for disturbing or destroying any historic or archaeological sites, or collecting any cultural objects, prehistoric or historic from federal lands.

**CR-6:** Strict adherence to the confidentiality of information concerning the nature and location of archeological resources will be required of any company issued a land use authorization and all of their subcontractors (Archaeological Resource Protection Act, 16 US Code 470hh).

**LR-2,** Rights-of-way and other lands and realty authorizations, including power lines, pipelines, transmission corridors, energy development sites and related development, and gravel pits, will contain noxious and invasive plant management terms or stipulations for all ground-disturbing actions. These will include conducting a pre-disturbance noxious weed inventory, designing to avoid or minimize vegetation removal and weed introduction or spread, managing weeds during the life of the right-of-way or authorization to prevent or minimize weed introduction or spread, abandoning the right-of-way or authorization to establish competitive vegetation on bare ground areas, and monitoring revegetation success and weed prevention and control for a reasonable number of years.

**LR 5,** Copies of the right-of-way grant with the stipulations shall be kept on site during construction and maintenance activities. All construction personnel shall review the grant and stipulations before working on the right-of-way or permitted area.

**LR-8.** The Holder shall promptly remove and dispose of all waste caused by its activities. The term “waste” as used herein means all discarded matter including, but not limited to, human waste, trash, garbage, refuse, petroleum products, ashes, and equipment. No burning of trash, trees, brush, or any other material shall be allowed.

**LR-9,** The Proponent (applying for new right-of-way) shall notify all existing right-of-way holders in the project area prior to beginning any surface disturbance or construction activities. The Holder shall obtain an agreement with any existing right-of-way holders or other parties with authorized facilities that cross or are adjacent to those of the holder to assure that no damage to an existing right-of-way or authorized facility will occur. The agreement(s) shall be obtained prior to any use of the right-of-way or existing facility.

**LR-14.** All construction activities shall be confined to the minimum area necessary. The exterior boundaries of the construction area shall be clearly flagged prior to any surface-disturbing activities.

The most recent version of the Colorado Fire Stipulations will be incorporated in the project proposal as well

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To avoid impacts to white-tailed prairie dogs during the pupping season apply Timing Limitation-19 **STIPULATION:** Prohibit surface occupancy and use and surface-disturbing activities within active white-tailed prairie dog towns from April 1 to July 15.

To prevent disruption of reproductive activity of burrowing owls during the production Period apply the wildlife raptor nest Timing Limitation **STIPULATION:** No surface use is allowed from March 1 to August 15.

**Other** (Paleo/watershed/LWC etc.) Specialist Comments/Requirements: The proposed project is underlain by Cretaceous Mancos Formation, which is categorized as PFYC 3, and as

such, does not normally require survey or monitoring. However a known fossil locality exists very close to the project, and potentially extends in a manner that would allow the locality to be impacted by the proposed project. The known locality consists of museum quality specimens of crinoid 'death' assemblages; crinoid are plan like species that lived in marine environment similar to sea- lilies.

Survey requirements: No Survey required, as the locality has been required, and there exists higher potential for additional significant discoveries similar to the locality.

Language for extraordinary circumstance #2?:

Necessary Mitigation?: Monitoring of all surface disturbing activity for this project is required in order to identify and prevent significant damage to fossils before specimens could be excavated.

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT

**RIGHT-OF-WAY NOTICE TO PROCEED**

Right-of-Way or Temporary Use Permit (TUP) Serial Number

COC 0 011879

Date  
**SEP 06 2018**

Issuing Office  
Grand Junction Field Office

Right-of-Way or TUP name

Purdy Mesa Waterline Replacement

**Certified/Registered Mail-Return Receipt Requested**

INSTRUCTIONS — Use Certified or Registered Mail or hand deliver. Send or give original to Holder. Distribute other copies as indicated after receipt date.

Holder:

In accordance with the terms and conditions of the above referenced right-of-way grant or TUP you are hereby authorized to proceed with the activities noted below in the locations specified. Map(s) are attached.  Yes  No

Activity	Location
<p>The Purdy Mesa Waterline was authorized under the authority of the Act of March 3, 1891, As such the replacement of the waterline does not require a decision from the BLM as long as the disturbance remains within the historic limits of the right-of-way, 50' on either side from centerline</p> <p>Activity: Replacement of 0.91 miles of water line across public lands within the limits of right-of-way COC 0 011879. Includes the installation of a pressure control tank, control valve, air valves as well as solar power to support monitoring and control features.</p> <p>The protection measures found in the attached Colorado Hookless Protection Plan July 2018 are to be followed.</p>	<p>Ute Meridian T. 2 S., R. 2 E., sec. 27, NENE; sec. 28, SENE, N2NW.</p>

Authorized officer is:

*for*  
Katie A. Stevens  
\_\_\_\_\_  
(Name)

Field Manager  
\_\_\_\_\_  
(Title)

Onsite inspection and compliance of the Right-of-Way or TUP stipulations will be conducted by the authorized officer's representative.

Scott Hall, Realty Specialist  
\_\_\_\_\_  
(Name of Authorized Officer's Representative)

Grand Junction Field Office  
2815 H Road, Grand Junction, CO 81501  
\_\_\_\_\_  
(Office, Street Address, City, State, Zip)

970 244 3009  
\_\_\_\_\_  
(Office Phone Number)

\_\_\_\_\_  
(Cell Phone Number)

*Wright*  
\_\_\_\_\_  
(Authorized Officer's or Representative's Signature)

*9-6-18*  
\_\_\_\_\_  
(Date)

Holders Acknowledgement when notice is delivered in person.

\_\_\_\_\_  
(Signature of Recipient)

\_\_\_\_\_  
(Firm Name)

\_\_\_\_\_  
(Name of Recipient)

\_\_\_\_\_  
(Date)

**CITY OF GRAND JUNCTION**  
**PURDY MESA FLOWLINE REPLACEMENT PROJECT**  
**COLORADO HOOKLESS CACTUS PROTECTION PLAN**

**Prepared For:**  
**City of Grand Junction**

**Prepared By:**  
**WestWater Engineering**  
**2516 Foresight Circle, #1,**  
**Grand Junction, CO 81505**

**July 2018**



## Introduction

At the request of the City of Grand Junction, CO (City), WestWater Engineering (WestWater) has prepared a Colorado hookless cactus protection plan for the proposed Purdy Mesa Flowline Replacement Project. The City would replace approximately 1.24 miles of the Purdy Mesa Flowline at Sullivan Draw in Mesa County, Colorado (Figure 1). The proposed project would be located primarily within the City's existing waterline easement, with the exception of one staging area located at the western terminus of the waterline. The flowline would transport untreated water from Hallenbeck and Juniata Reservoirs to a water treatment plant on Orchard Mesa. The flowline segment to be replaced is a critical piece of the City's water delivery infrastructure that is over 60 years old and beyond its design life.

The Purdy Mesa Flowline Right-of-Way (ROW) was granted under the Act of March 3, 1891, which allows for fifty-feet on both sides of the waterline for proper maintenance and operation of the line. The BLM will authorize the Notice to Proceed under the City's historic right to maintain and operate the Purdy Mesa Flowline. This project will not require a new federal action; thus consultation with U.S. Fish and Wildlife Service will not be initiated for this project. The purpose of this cactus protection plan is to address and mitigate the potential effects of the project on the Colorado hookless cactus (*Scelerocactus glaucus*), which is listed as threatened under the Federal Endangered Species Act of 1973, as amended (ESA).

## Project Description

The City plans to replace 1.24 miles of the existing Purdy Mesa Flowline. The project would be located in Sections 27 and 28, Township 2 South, and Range 2 East (Figure 1).

The Purdy Mesa Flowline transports untreated water from Juniata Reservoir to the City's water treatment plant on Orchard Mesa. Of the 1.24 miles to be replaced, 0.91 mile of the alignment would be located on BLM surface and 0.32 mile of the alignment would be located on privately-owned land. The City plans to complete project construction within their 100-foot wide existing right of way (ROW) easement. They would utilize one additional area for staging at the western terminus of the waterline (Figure 1). The temporary staging area would be 100 feet by 100 feet in size or 0.23 acre.

The estimated construction duration would be approximately 180 days, and construction would be scheduled during the months of October 2018 through March 2019. Access to the construction site would be limited to the existing, paved, Land's End Access Road (County road number), and dirt two-track roads. All work would occur within the existing reclaimed ROW. Construction would typically take place during normal business hours of approximately 8:00 a.m. to 5:00 p.m., Monday through Friday. Construction equipment would generally remain on-site throughout the approximately 180 day construction timeframe. One to two four-man crews would travel to and from the site daily via Reeder Mesa Road and Land's End Road. Approximately 10 – 15 truckloads of pipe would be delivered by truck to the construction site via Land's End Road. Pipe deliveries would occur periodically throughout the construction timeframe. A pressure control tank would be constructed onsite from concrete and reinforcing materials. Materials for the construction of the pressure control tank would be delivered to the site via Land's End Road at some point during the construction timeframe.

The replacement flowline would be buried an average of 36 inches deep running parallel to the existing Purdy Mesa Flowline, which would continue to be in service during construction activities. Once the replacement flowline construction is completed, the existing flowline segment would be disconnected and abandoned in place. The replacement flowline would be 20 inch diameter PVC for the entire length of the replacement segment. A portion of the existing flowline from the pressure control tank on the eastern end of the replacement segment to the bottom of Sullivan Draw would be utilized for tank overflow. Along the length of the flowline, there would be approximately 8 - 10 control valves and 8 - 10 air valves installed.

The replacement flowline would cross Reeder Mesa Road in three places (Figure 1). At each road crossing, the road would be closed during flowline installation. Construction at each road crossing would be timed to ensure that the associated road closure will not interfere with scheduled school bus traffic. During road closures, Reeder Mesa Road traffic would be detoured to Land's End Road.

At the intermittent stream crossing in the bottom of Sullivan Draw, special topsoil management techniques would be employed to preserve and replace wetland soils and vegetation intact in order to maintain wetland hydrology. Stormwater Best Management Practices (BMPs) would be put in place to prevent the discharge of sediment from the active construction site in accordance with the City's Stormwater Management Plan (SWMP) and Colorado Department of Public Health and Environment (CDPHE) stormwater discharge permit. Due to the time of year that construction is planned, dust abatement is not anticipated to be necessary. However, if weather conditions dictate that dust abatement is necessary, as much as 15,000 to 20,000 gallons of untreated water per day from the existing flowline could be used.

During construction, approximately 200 feet of trench would be open at a time, and the total length of open trench would not exceed 1,000 feet at any time. Any open trench within 50 feet of a public road would be fenced with orange construction fencing. The crossing of the intermittent drainage in the bottom of Sullivan Draw would be constructed during frozen conditions, obviating the need to flume the drainage during pipeline construction. The fringe wetland areas surrounding the crossings of the intermittent drainages at the bottom of Sullivan Draw would be left in place until trenching activities reach them. At that time, wetland soils with vegetation intact would be removed and kept moist until the trench is backfilled, at which point the soils would be replaced. The City has obtained the necessary U.S. Army Corps of Engineers permits associated with the crossing.

After the replacement flowline has been pressure tested and put into service, the ROW and staging area would be reclaimed. The area immediately adjacent to the pressure control tank would not be reclaimed but could be stabilized with gravel if necessary. For long-term erosion control on the ROW, water bars would be installed transverse to the trench at 50 foot intervals on steeper slopes and 100 foot intervals on less steep slopes. Once seasonal weather conditions allow, all upland disturbed areas would be seeded with an approved BLM seed mix. Stormwater management BMPs would be left in place and stormwater inspections would be conducted according to the City's SWMP and requirements of the stormwater discharge permit until reclamation successfully stabilizes the site.



### Colorado Hookless Cactus

Based on biological surveys completed during the spring of 2017, an estimated 813 Colorado hookless cactus occur within 100 meters of the proposed flowline (WestWater 2017). Cactus locations and distance to the flowline are shown on Figures 2a to 2c. Of these, 194 cacti are within 30 meters of the waterline with the nearest cactus being approximately 1.51 meters from the proposed edge of disturbance. Several cacti were initially observed within the 100-foot construction easement; however, once cacti had been identified, the City made efforts to neck down the construction ROW in order to avoid direct removal of cactus along the alignment (Figures 2a to 2c). The nearest cactus to the proposed staging area would be approximately 123 meters east.

### Colorado Hookless Cactus Protection Measures

The City will avoid directly disturbing all cacti observed near the easement. All project related activity will remain within the existing 100-foot easement and temporary staging area. In areas where cacti occur adjacent to the existing easement, construction activities will be necked down in order to avoid direct impacts to cactus observed along the 100-foot easement. During construction activities, cacti will be avoided by a minimum of 5 feet. Standard mitigation measures that will be implemented for this project are detailed as follows:

- Avoid direct removal of cactus.
- Confine all project related personnel and equipment within the BLM approved ROW.
- Areas within 50 meters of cactus will be fenced with orange construction fencing to indicate to construction personnel of sensitive areas as shown on Figures 2a to 2c.
- A BLM approved biological monitor will be on-site during construction within 50 meters of cactus as delineated by the orange construction fencing.
- Only dust abatement that is free of chemicals will be used during project construction.
- Construction will occur outside of the cactus bloom period (typically mid-April through mid-June).
- A noxious weed management plan that meets state and county rules and regulations, and is in compliance with the Grand Junction Field Office Integrated Weeds Management Plan, will be implemented.
- The City will treat noxious weeds along the ROW. No herbicide will be applied within 100 meters of any known Colorado hookless cactus, unless specifically approved by the BLM. In these areas, weeds will be manually removed.
- Herbicide use will be restricted to the buffer distances outlined in Table 1 (BLM 2010). Precautions will be taken to minimize drift by not applying herbicides when winds exceed 10 mph (6 mph for aerial applications), or when a heavy rainfall event is imminent.

**Table 1. Herbicide Buffer Distances from Terrestrial Threatened, Endangered, Proposed, and Candidate Plant Species**

Active Ingredient	Buffer Width	Method(s) to Which Applied
2,4-D	0.5 mile	All
Bromacil	1,200 feet	All



**Table 1. Herbicide Buffer Distances from Terrestrial Threatened, Endangered, Proposed, and Candidate Plant Species**

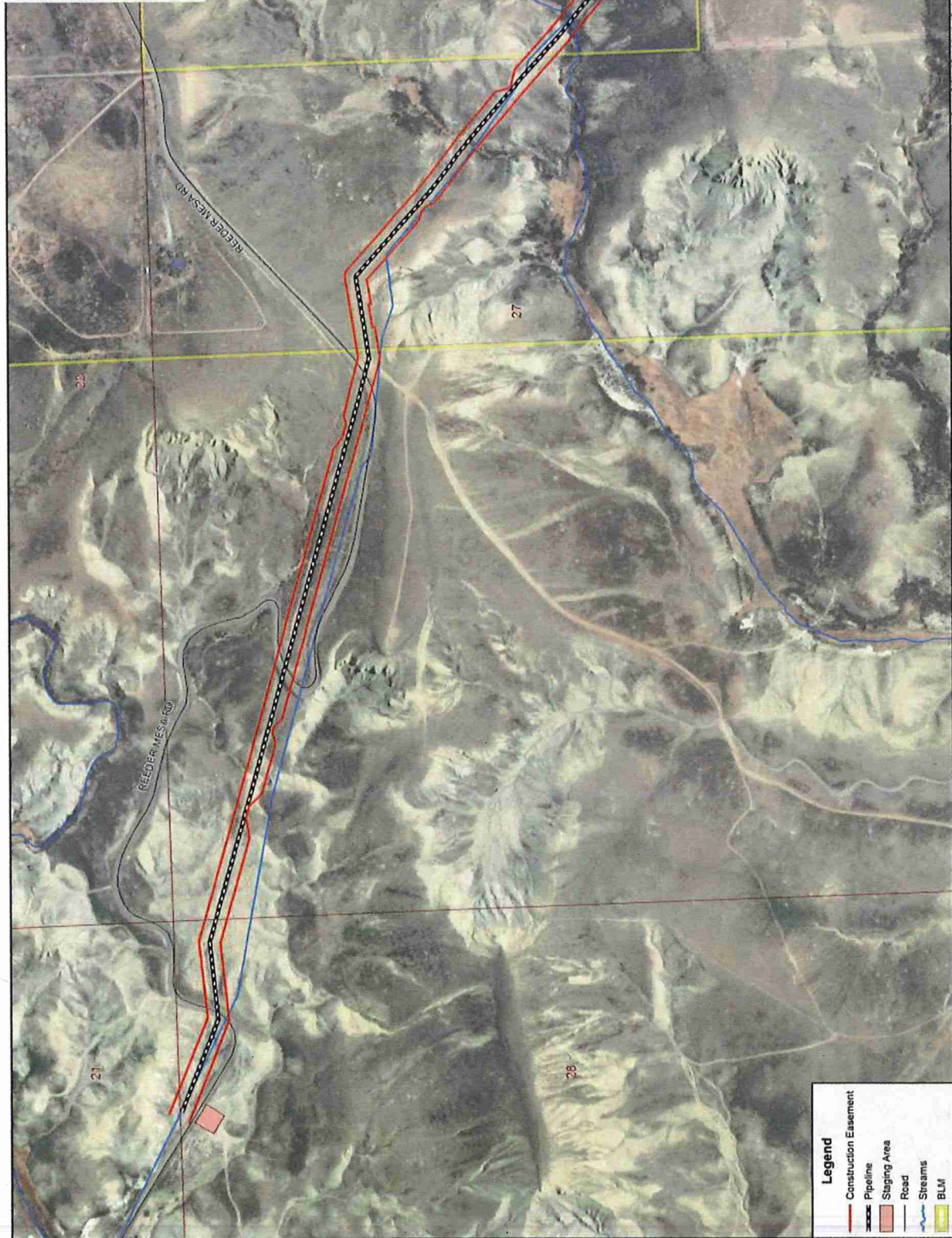
Chlorsulfuron	1,200 feet	Ground
	1,500 feet	Aerial
Clopyralid	900 feet	Ground, typical rate
	0.5 mile	Ground, maximum rate; aerial
Dicamba	1,050 feet	Ground
Diflufenzopyr	100 feet	Low boom, typical rate
	500 feet	Low boom, maximum rate; high boom
	900 feet	Aerial
Diquat	900 feet	Ground, typical rate
	1,000 feet	Ground, maximum rate
	1,200 feet	Aerial
Diuron	1,100 feet	All
Fluridone	0.5 mile	All
Glyphosate	50 feet	Ground, typical rate
	300 feet	Ground, maximum rate; aerial
Hexazinone	300 feet	Ground, typical rate
	900 feet	Ground, maximum rate
Imazapic	25 feet	Ground, typical or maximum rates
	300 feet	Aerial, typical rate
	900 feet	Aerial, maximum rate
Imazapyr	900 feet	Ground or aerial, typical rate
	0.5 mile	Ground or aerial, maximum rate
Metsulfuron Methyl	900 feet	Ground or aerial, typical rate
	0.5 mile	Ground or aerial, maximum rate
Overdrive®	100 feet	Low boom, typical rate
	900 feet	Low boom, maximum rate; high boom
Picloram	0.5 mile	All
Sulfometuron Methyl	1,500 feet	All
Tebuthiuron	25 feet	Low boom, typical rate
	50 feet	Low boom, maximum rate; high boom, typical rate
	900 feet	High boom, maximum rate
Triclopyr	300 feet	Ground, typical rate
	500 feet	Aerial, typical rate
	0.5 mile	Ground or aerial, maximum rate

- A BLM approved, certified weed free seed mix will be utilized during reseeding of the waterline alignment.

## References

BLM. 2010. Programmatic Integrated Weed Management Plan for the Bureau of Land Management, Grand Junction Field Office, McInnis Canyons NCA, and Dominguez-Escalante NCA, June, 11, 2010. Biological Assessment. Bureau of Land Management, Grand Junction, CO.

WestWater. 2017. Purdy Mesa Waterline Biological Survey Report. WestWater Engineering, Grand Junction, CO.



**Figure 1**  
**City of Grand Junction**  
**Purdy Mesa Flowline**  
**Cactus Protection Plan**  
**Project Features**  
**WestWater Engineering**  
 Consulting Engineers & Scientists

0 100 200 300  
 Feet

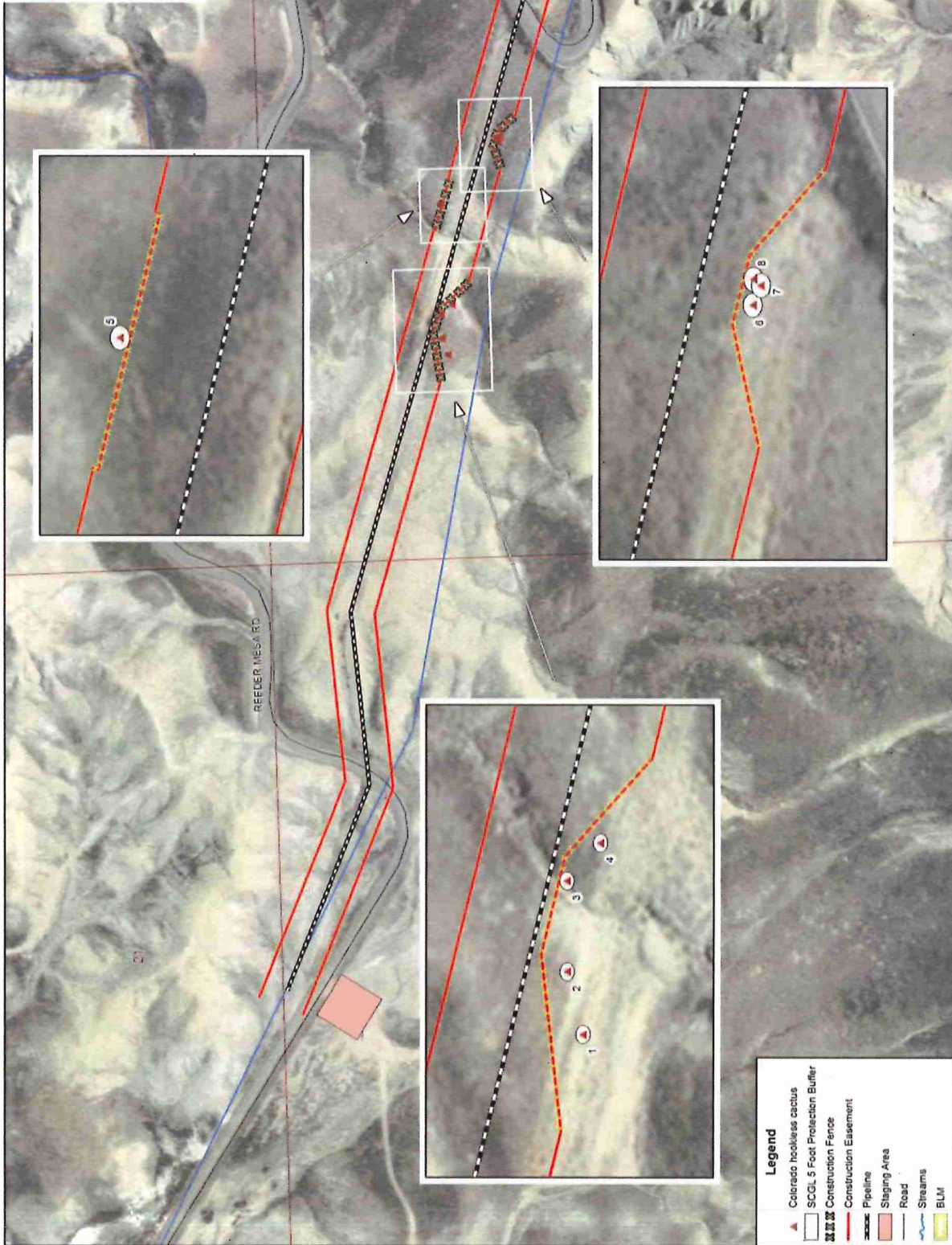
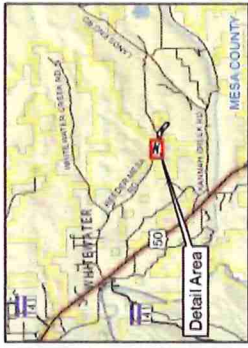
July 2018

**Legend**

- Construction Easement
- Pipeline
- Staging Area
- Road
- Streams
- BLM

Map Source: Aerial Imagery from Google Earth, 2018; Project Location: T2S R2E; Project Name: Purdy Mesa Flowline Cactus Protection Plan





**Figure 2a**  
**City of Grand Junction**  
**Purdy Mesa Flowline**  
**Cactus Protection Plan**  
**Cactus Protection Buffers**  
**WestWater Engineering**  
 Consulting Engineers & Scientists

Scale: 0 50 100 Feet

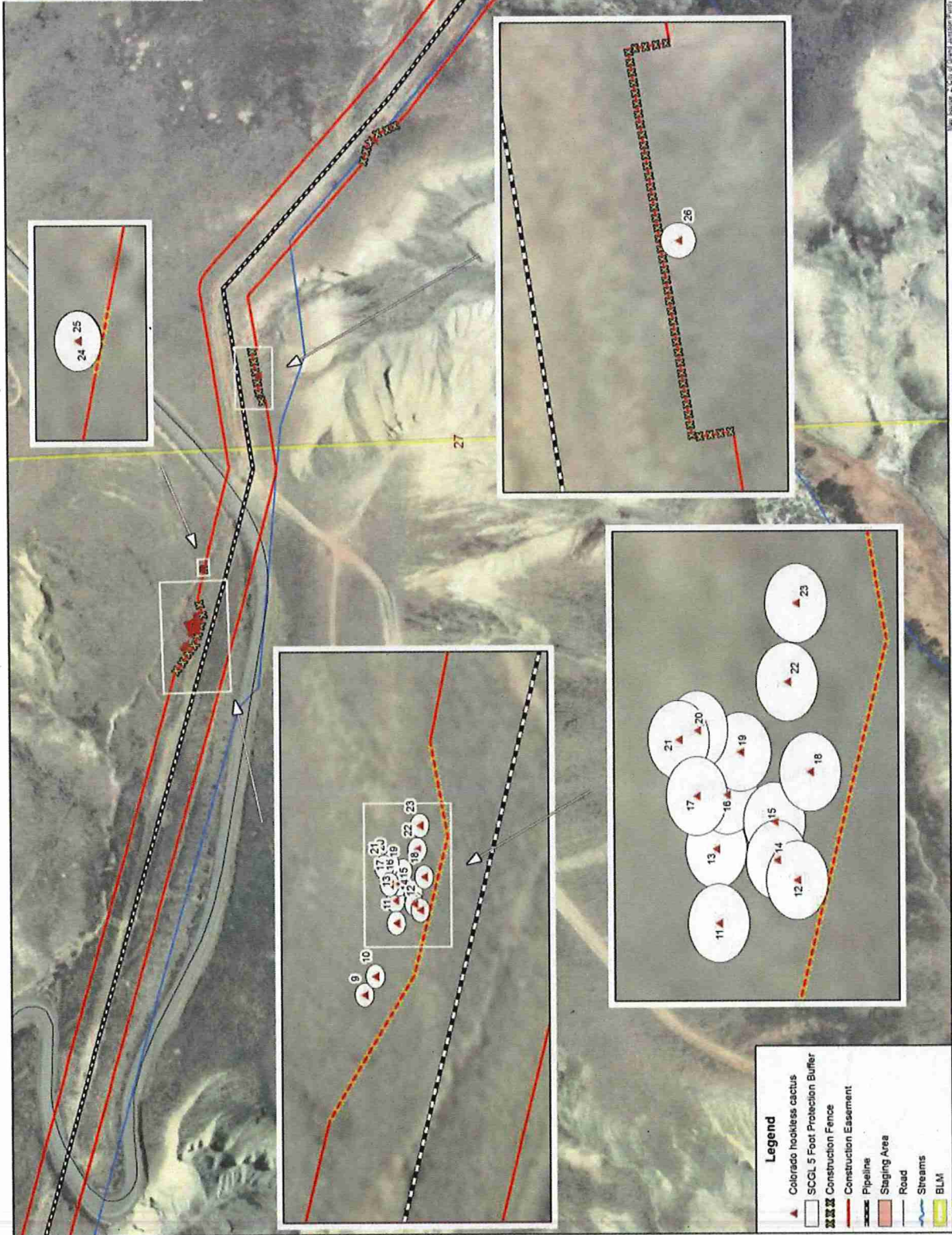
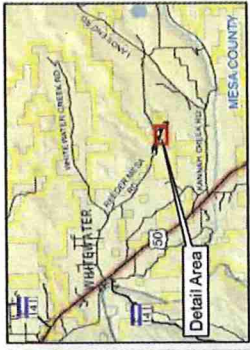
Map Date: July 2018

**Legend**

	Colorado hoodless cactus
	SCGL 5 Foot Protection Buffer
	Construction Fence
	Construction Easement
	Staging Area
	Road
	Streams
	BLM

Map Scale: 1 inch = 100 feet. All rights reserved. This map is the property of WestWater Engineering & Scientists. No part of this map may be reproduced without written permission from WestWater Engineering & Scientists.



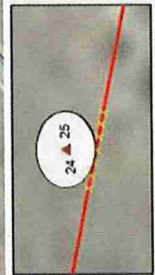
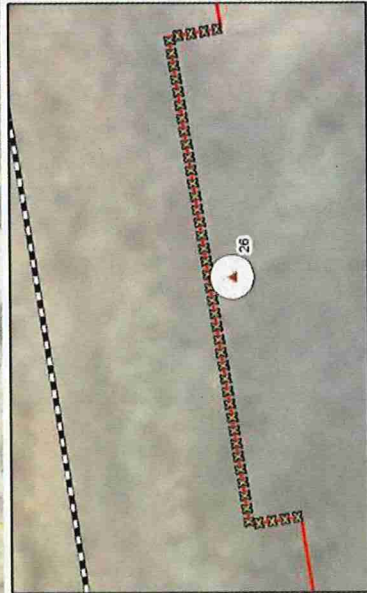
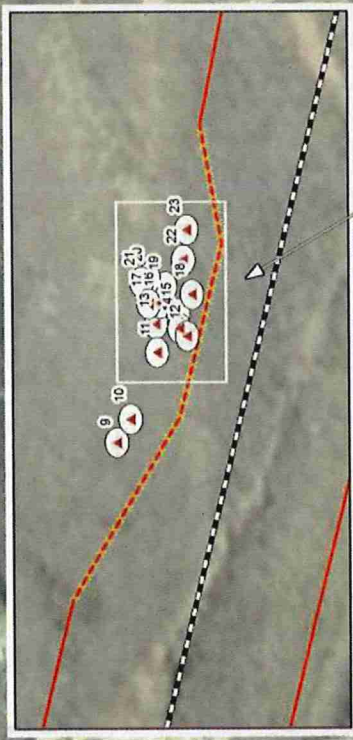
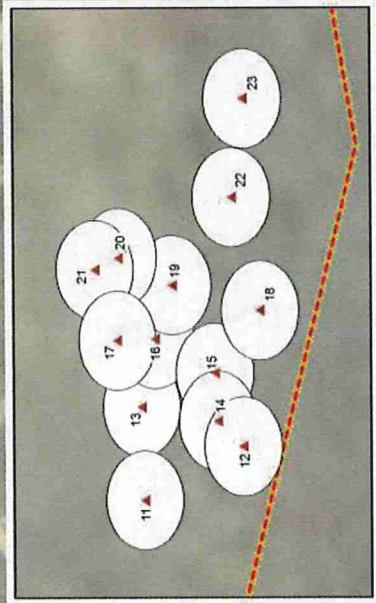


**Figure 2b**  
**City of Grand Junction**  
**Purdy Mesa Flowline**  
**Cactus Protection Buffers**  
**WestWater Engineering**  
 Consulting Engineers & Scientists

0 50 100 150  
 Meters

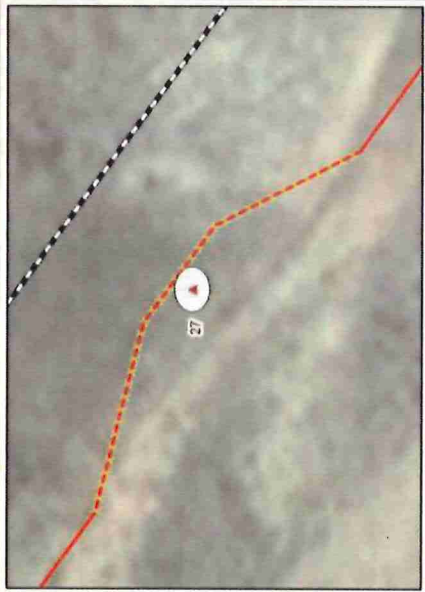
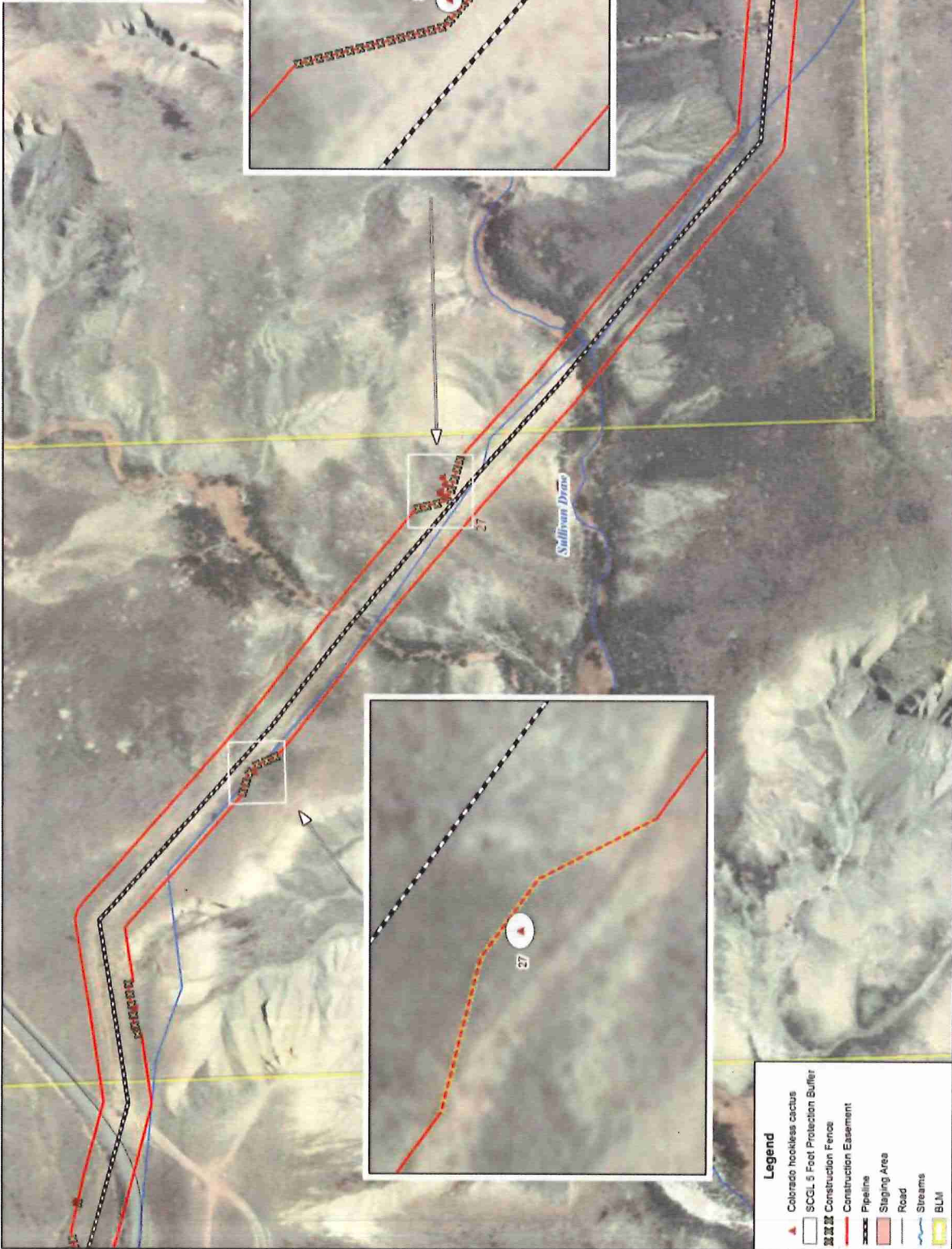
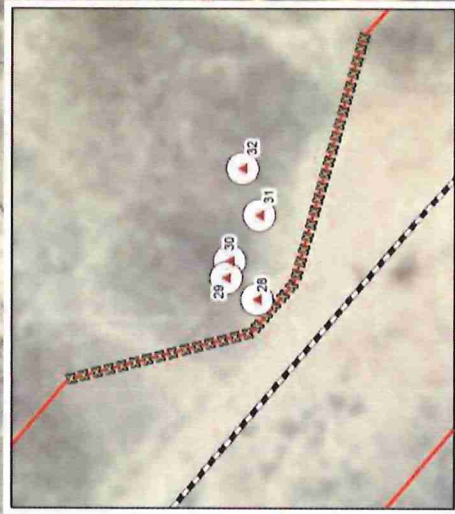
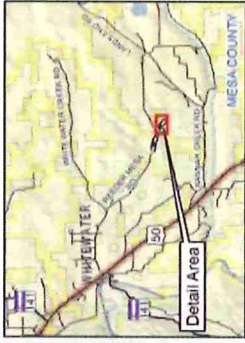
July 2018

- Legend**
- ▲ Colorado hookless cactus
  - SCCL 5 Foot Protection Buffer
  - ▬▬▬ Construction Fence
  - ▬▬▬ Construction Easement
  - ▬ Pipeline
  - ▭ Staging Area
  - ▬ Road
  - ▬▬▬ Streams
  - ▬ BLM



WestWater Engineering & Scientists, Inc. is an Equal Opportunity Employer. Minorities and women are encouraged to apply.





**Figure 2c**  
 City of Grand Junction  
 Purdy Mesa Flowline  
 Cactus Protection Plan  
 Cactus Protection Buffers  
 WestWater Engineering  
 Consulting Engineers & Scientists

July 2018

0 50 100 150  
 Feet

- Legend**
- ▲ Colorado hornless cactus
  - SCCL 5 Foot Protection Buffer
  - ▬ Construction Fence
  - ▬ Construction Easement
  - ▬ Pipeline
  - ▬ Staging Area
  - ▬ Road
  - ▬ Streams
  - ▬ BLM

# **Appendix F**

USACE Nation Wide Permit Required Measures

for

Kannah Creek Intake Project (Bid Alternate 1)

Purdy Mesa Flowline Project (Bid Alternate 2)



DEPARTMENT OF THE ARMY  
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT  
1325 J STREET  
SACRAMENTO CA 95814-2922

September 27, 2018

Regulatory Division (SPK-2018-00438)

City of Grand Junction  
Attn: Mr. John Eklund  
333 West Avenue, Building D  
Grand Junction, Colorado 81501

Dear Mr. Eklund:

We are responding to your August 13, 2018, pre-construction notification for a Department of the Army (DA) permit for the Purdy Mesa Flowline project. The approximately 1.25-mile linear-project site crosses Sullivan Draw and extends through the SE  $\frac{1}{2}$  NE  $\frac{1}{4}$  and N  $\frac{1}{2}$  NW  $\frac{1}{4}$  of Section 27, and the NE  $\frac{1}{4}$  NE  $\frac{1}{4}$  of Section 28, Township 2 South, Range 2 East, Ute Meridian, centered approximately at Latitude 38.956081°, Longitude -108.352386°, near Reeder Mesa in unincorporated Mesa County, Colorado.

Based on the information you provided to this office, the Purdy Mesa Flowline project involves the temporary discharge of fill material into 0.007 acre of waters of the U.S. for the installation of 1.25 miles of 20-inch diameter flowline at an average depth of 36 inches, subject to Section 404 of the Clean Water Act. The specific activities that require DA authorization include the trench-cutting and backfill of wetlands at three separate locations. These activities will result in temporary impacts to approximately 0.006 acre of emergent wetland and 0.001 acre of non-wetland water. The proposed activities would be conducted in accordance with the Pre-Construction Notification submittal, signed May 17, 2018.

We have determined that activities in waters of the U.S. associated with the project are authorized by Nationwide Permit (NWP) 12 – Utility Line Activities. You must comply with all terms and conditions of the NWP and applicable regional conditions. Information about the NWP terms and conditions and Sacramento District regional conditions for Colorado are available on our website at [www.spk.usace.army.mil/Missions/Regulatory/Permitting/NationwidePermits.aspx](http://www.spk.usace.army.mil/Missions/Regulatory/Permitting/NationwidePermits.aspx). Within 30 days after completion of the authorized work, you must sign the enclosed Compliance Certification and return it to this office.

This verification is valid until March 18, 2022, when the existing NWPs are scheduled to be modified, reissued, or revoked. Furthermore, if you commence or are under contract to commence this activity before the date the NWP is modified, reissued, or revoked, you will have 12 months from the date of the modification, reissuance or revocation to complete the activity under the present terms and conditions. Failure to comply with the



general and regional conditions of this NWP may result in the suspension or revocation of your authorization.

Please refer to identification number SPK-2018-00438 in any correspondence concerning this project. If you have any questions, please contact me at the Grand Junction Regulatory Field Office, 400 Rood Avenue, Room 224, Grand Junction, Colorado 81501, by email at [w.travis.morse@usace.army.mil](mailto:w.travis.morse@usace.army.mil), or telephone at (970) 243-1199 ext. 1014. We would appreciate your feedback on this permit action including your interaction with our staff and processes. For more information about our program or to complete our Regulatory Program national customer service survey, visit our website at [www.spk.usace.army.mil/Missions/Regulatory.aspx](http://www.spk.usace.army.mil/Missions/Regulatory.aspx).

Sincerely,



Travis Morse  
Senior Project Manager  
Colorado West Section  
Regulatory Division

Enclosure

cc: (w/ encl)

Mr. John Eklund, City of Grand Junction, [johne@gjcity.org](mailto:johne@gjcity.org)

Mr. Bret Guilory, JUB Engineering, [bguillory@jub.com](mailto:bguillory@jub.com)

Ms. Dana Brosig, Mesa County, [dana.brosig@mesacounty.us](mailto:dana.brosig@mesacounty.us)

Ms. Katie Stevens, Bureau of Land Management, [kasteven@blm.gov](mailto:kasteven@blm.gov)

## COMPLIANCE CERTIFICATION

**Permit File Name:** Purdy Mesa Flowline

**Action ID:** SPK-2018-00438

**Nationwide Permit Number:** 12 – Utility Line Activities

**Permittee:** City of Grand Junction  
Attn: Mr. John Eklund  
333 West Avenue, Building D  
Grand Junction, Colorado 81501

**County:** Mesa County

**Date of Verification:** September 27, 2018

Within 30 days after completion of the activity authorized by this permit, sign this certification and return it to the following address:

U.S. Army Corps of Engineers  
Sacramento District  
Colorado West Regulatory Branch  
400 Rood Avenue, Room 224  
Grand Junction, Colorado 81501  
(970) 243-1199  
Fax (970) 241-2358  
[DLL-CESPK-RD-Compliance@usace.army.mil](mailto:DLL-CESPK-RD-Compliance@usace.army.mil)

Please note that your permitted activity is subject to a compliance inspection by a U.S. Army Corps of Engineers representative. If you fail to comply with the terms and conditions of the permit your authorization may be suspended, modified, or revoked. If you have any questions about this certification, please contact the U.S. Army Corps of Engineers.

\* \* \* \* \*

***I hereby certify that the work authorized by the above-referenced permit, including all the required mitigation, was completed in accordance with the terms and conditions of the permit verification.***

\_\_\_\_\_  
Permittee Signature

\_\_\_\_\_  
Date

# U.S. Army Corps of Engineers South Pacific Division



## Nationwide Permit Pre-Construction Notification (PCN)

This form integrates requirements of the U.S. Army Corps of Engineers (Corps) Nationwide Permit Program within the South Pacific Division (SPD). Boxes 1-10 must be completed to include all information required by General Condition 32. Box 11 (or other sufficient information to show compliance with all General Conditions) must be completed for activities in Arizona, California, Nevada, and Utah, and is recommended for activities in Colorado and New Mexico. If additional space is needed, please provide as a separate attachment. Please refer to the *Instructions for the South Pacific Division Nationwide Permit Pre-Construction Notification (PCN)* (Instructions) for instructions for completing the PCN, as well as additional information on the attachments and tables included with this PCN that may be used.

### 0. To be filled by the Corps

Application Number:	Date Received:	Date Complete:
---------------------	----------------	----------------

### 1. Prospective Permittee and Agent Name and Addresses (see Instructions)

#### Prospective Permittee

First - Mr. John Middle - Last - Eklund  
 Company - City of Grand Junction Email Address - johne@gjcity.org  
 Address - 333 West Ave. Building D City - Grand Junction State - CO Zip - 81501  
 Phone (Residence/Mobile) - n/a Phone (Business) - 970-244-1558

#### b. Agent (if applicable)

First - Mr. Bret Middle - Last - Guillory  
 Company - JUB Engineers, Inc. Email Address - bguillory@jub.com  
 Address - 305 S. Main, Suite 6 City - Palisade State - CO Zip - 81526  
 Phone (Residence/Mobile) - 970-201-1341 Mobile Phone (Business) - 970-208-8508

c. **Statement of Authorization:** I hereby authorize Bret Guillory, PE, to act in my behalf as my agent for the proposed activity. (Optional, see instructions)

  
 Signature of Applicant

05/17/2018  
 Date

## 2. Name and Location of the Proposed Activity (see Instructions)

The proposed work would involve multiple-single and complete projects. See attachment for the information required in boxes 2 through 10, and 11, if applicable.

### a. Project Name or Title:

Purdy Mesa Flowline at Sullivan Draw

### b. County, State:

Mesa, CO

c. Name of Waterbody: Sullivan Draw

### d. Coordinates:

Unknown (please provide other location descriptions below)

Latitude - 38.956081

Longitude - 108.352386

### e. Other Location Description (optional, see instructions):

n/a

### f. Driving Directions to the site (optional, see instructions):

n/a

## 3. Specific NWP(s) you want to use to authorize the proposed activity (see Instructions)

Nation Wide Permit 12

## 4. Description of the Proposed Activity (see Instructions)

### a. Complete description of the Proposed Activity:

The project involves replacement of 1.25 miles of existing 18" and 20" diameter raw water flowline that has reached its design life. The proposed new 20" raw water flowline will be located adjacent to the existing line that is located within a 40 foot longitudinal easement crossing an area known as Sullivan Draw. There are two drainage ways that will be crossed with the new pipe line. There are existing culverts at both crossings that currently convey water which may be flowing in the draw. Both culverts will be maintained in place and utilized to convey any flows along the draw during construction. The new flowline pipe will have approximately three feet of cover over the top of pipe. Excavated trench depth needed to install the new pipe in this area is approximately six feet. The top two feet of material from the trench will be placed aside and replaced on the top of the trench when the new pipe trench is backfilled.

### Purpose of the Proposed Activity:

The 60 year old existing steel pipe line has reached its design life and is in questionable condition. This is one of the City of Grand Junction's main raw water conveyance pipe lines for supply of water to the City water treatment plant located on Orchard Mesa in Grand Junction.

**c. Direct and indirect adverse environmental effects the activity would cause, including the anticipated amount of loss of wetlands and other waters of the U.S. expected to result from the NWP(s) activity:**

We do not anticipate any fill material being placed within existing wetlands. Installation of the new pipe will require a trench be excavated through two drainages. We do not anticipate permanent impact to any wetlands with this project. We do anticipate temporary impact of not more than 0.07 ac of wetland materials while installing the new pipe line.

**d. Description of any proposed mitigation measures intended to reduce the adverse environmental effects caused by the proposed activity:**

The top two feet of material will be placed aside from the remaining materials excavated from the trench. This material will be replaced on top of the trench during back fill to maintain the viability of any wetland plant materials that may be present.

**e. Any other NWP(s), Regional/Programmatic General Permit(s) or Individual Permit(s) used or intended to be used to authorize any part of the proposed activity or any related activity:**

na

**f. Have sketches been provided containing sufficient detail to provide an illustrative description of the proposed activity?**

Yes, Attached  No

N/A; The activity is located in the Los Angeles District boundaries of Arizona and California, See Attachment 1

N/A, The activity is located in the San Francisco District boundaries of California, See Attachment 2

N/A, The activity is located in the Sacramento District boundaries of California, Nevada, or Utah, See Attachment 3

### **5. Aquatic Resource Delineation (see Instructions)**

**a. Has a delineation of aquatic resources been conducted in accordance with the current method required by the Corps?**  Yes  No

If yes, please attach a copy of the delineation

Note: If no, your PCN is not complete. In accordance with General Condition 32, you may request the Corps delineate the special aquatic sites and other waters on the project site, but there may be a delay. In addition, the PCN will not be considered complete until the delineation has either been submitted to or completed by the Corps, as appropriate.

**b. If a delineation has been submitted, would you like the Corps to conduct a jurisdictional determination (preliminary or approved)?**  Yes  No

If yes, please complete, sign and return the attached *Appendix 1 – Request for Corps Jurisdictional Determination (JD)* sheet or provide a separate attachment with the information identified in Appendix 1.

**6. Compensatory Mitigation (see Instructions)**

a. Will the proposed activity result in the loss of greater than 1/10-acre of wetlands?  Yes  No

If yes, describe how you propose to compensate for the loss of each type of wetland:

Note: for the loss of less than 1/10 acre of wetlands, or if no compensatory mitigation is proposed, the Corps may determine on a case-by-case basis that compensatory mitigation is required to ensure that the activity results in only minimal adverse environmental effects.

b. Will the proposed activity result in the loss of streams or other open waters of the U.S.?  Yes  No

If yes, provide a description of any proposed compensatory mitigation for the loss of each type of stream or other open water:

Note: if no compensatory mitigation is proposed, the Corps may determine on a case-by-case basis that compensatory mitigation is required to ensure that the activity results in no more than minimal adverse environmental effects.

**7. Endangered Species Act (ESA) Compliance (see Instructions)**

a. For non-Federal permittees (if Federal permittee, check N/A and skip to 7(d)):  N/A

(1) Is there any Federally-listed endangered or threatened species or critical habitat that might be affected or is in the vicinity of the activity?  Yes  No

(2) Is the activity located in designated critical habitat for Federally-listed endangered or threatened species?  Yes  No

If yes to either (1) or (2), include the name(s) of those endangered or threatened species that might be affected by the proposed activity or might utilize the designated critical habitat that might be affected by the proposed activity:

- |    |    |
|----|----|
| 1. | 2. |
| 3. | 4. |
| 5. | 6. |

If no to both (1) and (2), proceed to Box 8.

Note: If yes to either (1) or (2), note per General Condition 18(c), you shall not begin work on the activity until notified by the Corps that the requirements of the ESA have been satisfied and that the activity is authorized.

**b. Has information sufficient to initiate consultation with the U.S. Fish and Wildlife Service/National Marine Fisheries Service for compliance with Section 7 of the ESA been prepared?**  Yes  No

If yes, please attach a copy of the information.

**c. Additional information you wish to provide regarding compliance with the ESA, if applicable:**

We have provided an IPaC evaluation of the project site through United States Fish & Wildlife. Through this evaluation, no critical habitat was located within the project area.

**d. For Federal permittees, you must provide documentation demonstrating compliance with ESA as a separate attachment.**

### 8. Historic Properties (see Instructions)

**a. For non-Federal permittees** (if Federal permittee, check N/A and skip to 7(d)):  N/A

(1) Is there a known historic property listed on, determined to be eligible for listing on, or potentially eligible for listing on, the National Register of Historic Places that the NWP may have the potential to affect?  Yes  No

If yes to (1), state which historic property may have the potential to be affected by the proposed activity:

1.

2.

3.

4.

5.

6.

OR

A vicinity map indicating the location of the historic property is enclosed

(2) If no to (1), describe the potential for the proposed work to affect a previously unidentified historic property:

Based on findings of the Class III Cultural Resources Inventory it is unlikely that viable cultural resources will be discovered during the project.

Note: If yes to (1), note per General Condition 20(c), you shall not begin the activity until notified by the Corps that the activity has no potential to cause effects or that consultation under Section 106 of the National Historic Preservation Act (NHPA) has been completed.

**b. Has information sufficient to initiate consultation with the State Historic Preservation Officer/Tribal Preservation Officer for compliance with Section 106 of the National Historic Preservation Act (NHPA) been prepared?**

Yes  No

If yes, please attach a copy of the information.

**c. Additional information you wish to provide regarding compliance with the NHPA, if applicable:**

**d. For Federal permittees, you must provide documentation demonstrating compliance with NHPA in a separate attachment.**

## 9. National Wild and Scenic Rivers (see Instructions)

a. Will the proposed activity(s) occur in a component of the National Wild and Scenic River System or a river officially designated by Congress as a "Study River" for possible inclusion in the system while the river is in an official study status?

Yes, in a component of a National Wild and Scenic River System;  Yes, in a "study" river  No

If yes, identify the Wild and Scenic River or the "study river"

Note: per General Condition 16(b), you shall not begin the NWP activity until notified by the Corps that the Federal agency with direct management responsibility for that river has determined in writing that the proposed NWP activity will not adversely affect the Wild and Scenic River designation or study status. If you have received written notification from the Federal agency, please attach the correspondence.

## 10. Section 408 Permissions (see Instructions)

a. Will the NWP also require permissions from the Corps pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a Corps federally authorized Civil Works project?  Yes  No

If yes, have you received Section 408 permission to alter, occupy, or use the Corps project?  Yes  No

If yes, please attach the Section 408 permission

If yes, note per General Condition 31, an activity that requires Section 408 permission is not authorized by NWP until the Corps issues the Section 408 permission to alter, occupy, or use the Corps project, and the Corps issues a written NWP verification.



**11. Compliance with NWP General Conditions (see Instructions)**

Check	General Condition	Rationale for Compliance with General Condition
<input checked="" type="checkbox"/>	1. Navigation	These three drainages are not navigable
<input checked="" type="checkbox"/>	2. Aquatic Life Movements	Two of the three arroyo crossings are dry, one has very minor perennial flow that is currently conveyed in an existing culvert. We do not plan to disturb the drainage outside the existing culvert.
<input checked="" type="checkbox"/>	3. Spawning Areas	There are no identified spawning areas within the limits of the proposed project. Disturbance within the stream channel and the potential for turbidity associated with the work is not anticipated to be substantial.
<input checked="" type="checkbox"/>	4. Migratory Bird Breeding Areas	There are no known migratory breeding areas in or around the proposed project site.
<input checked="" type="checkbox"/>	5. Shellfish Beds	There are no concentrated shell fish populations located at this proposed project site.
<input checked="" type="checkbox"/>	6. Suitable Material	Local material will be utilized for backfill of the trench excavation. The top two feet of material from the trench will be placed aside and replaced as the top two feet when backfilling the trench excavation.

<input checked="" type="checkbox"/>	7. Water Supply Intakes	There are no water intake structures associated with these drainages.
<input checked="" type="checkbox"/>	8. Adverse Effects from Impoundments	Water will not be impounded as a result of this activity.
<input checked="" type="checkbox"/>	9. Management of Water Flows	Water will be conveyed in existing culverts. We do not anticipate a deviation from historical water conveyance at these locations.
<input checked="" type="checkbox"/>	10. Fills Within 100-Year Floodplains	There are no documented flood hazard areas for these drainages. The work will not result in alteration of the original contour of the site.
<input checked="" type="checkbox"/>	11. Equipment	Tracked equipment is anticipated to be utilized when constructing the proposed pipe line. Temporary wetland impact is expected to be less than 0.072 acres as a result of this project.
<input checked="" type="checkbox"/>	12. Soil Erosion and Sediment Controls	Storm water best management practices will be required for this project. The planned construction period is in the fall during historically low flow conditions.

<input checked="" type="checkbox"/>	13. Removal of Temporary Fills	The original drainage contour will be maintained as closely as possible upon completion of the project.
<input checked="" type="checkbox"/>	14. Proper Maintenance	Routine maintenance of the new pipe line will be accomplished as an annual inspection of the alignment. This will likely be foot traffic.
<input checked="" type="checkbox"/>	15. Single and Complete Project	The project is planned to be completed in the fall of 2018.
<input checked="" type="checkbox"/>	16. Wild and Scenic Rivers	There are no wild and scenic rivers in the vicinity of the project.
<input checked="" type="checkbox"/>	17. Tribal Rights	
<input checked="" type="checkbox"/>	18. Endangered Species	See Box 7 above.
<input checked="" type="checkbox"/>	19. Migratory Bird and Bald and Golden Eagle Permits	Vegetation removed as a component of this project will be smaller Tamarisk trees, grease brush, rabbit brush, etc. There are no known nesting sites in proximity to the project site.

<input checked="" type="checkbox"/>	20. Historic Properties	See Box 8 above.
<input checked="" type="checkbox"/>	21. Discovery of Previously Unknown Remains and Artifacts	If artifacts are discovered during the course of construction the District Engineer will be notified immediately.
<input checked="" type="checkbox"/>	22. Designated Critical Resource Waters	noted
<input checked="" type="checkbox"/>	23. Mitigation	See Boxes 4(d) and 6 above.
<input type="checkbox"/>	24. Safety of Impoundment Structures	n/a
<input checked="" type="checkbox"/>	25. Water Quality, including status of Section 401 Water Quality Certification	noted
<input checked="" type="checkbox"/>	26. Coastal Zone Management, including status of CZM Consistency Certification from the State of California (for projects in or affecting the Coastal Zone)	n/a

<input checked="" type="checkbox"/>	27. Regional and Case-by-Case Conditions	noted
<input checked="" type="checkbox"/>	28. Use of Multiple Nationwide Permits	This Nation Wide 12 permit will be the only permit associated with this project.
<input checked="" type="checkbox"/>	29. Transfer of Nationwide Permit Verifications	noted
<input checked="" type="checkbox"/>	30. Compliance Certification	A certification document will be provided to the district engineer within 30 day of completion of this activity.
<input checked="" type="checkbox"/>	31. Activities Affecting Structures or Works Built by the United States	See Box 10 above.
<input checked="" type="checkbox"/>	32. Pre-Construction Notification	noted



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THE LANGDON GROUP



GATEWAY MAPPING INC.

OTHER J-U-B COMPANIES

JOB NO. \_\_\_\_\_

SHEET 1/1

PROJECT PODDY MESA FLOWLINE

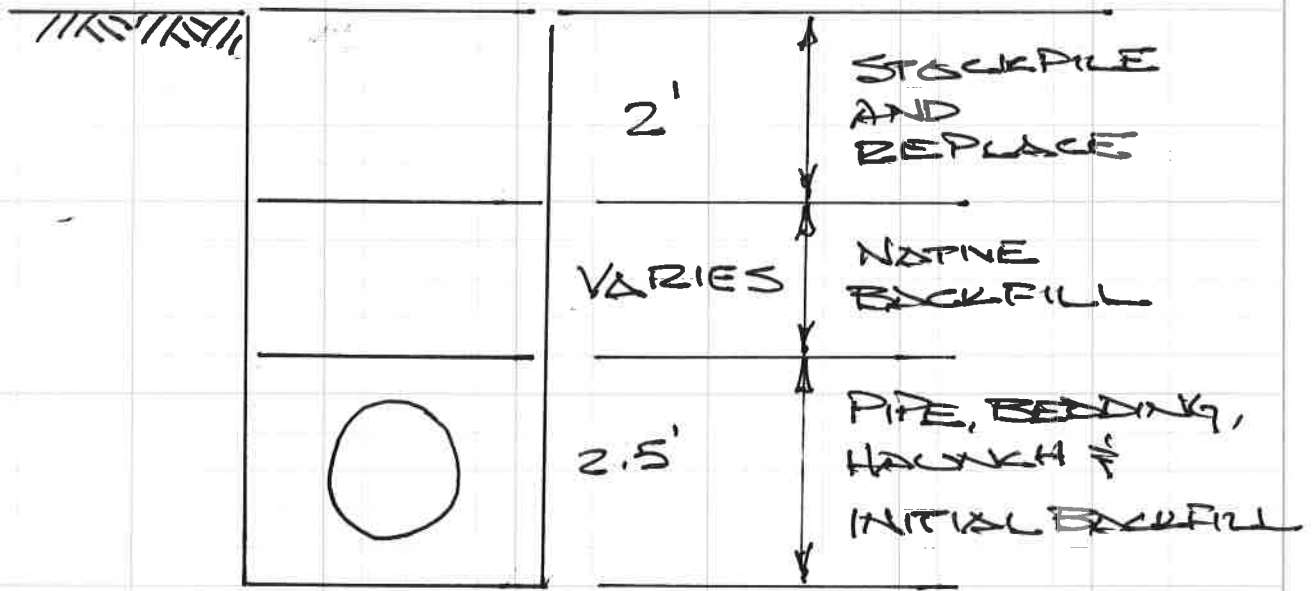
DESIGNED \_\_\_\_\_

DATE 5/17/18

ITEM WETLAND TRENCH DETAIL

CHECKED \_\_\_\_\_

DATE \_\_\_\_\_



TYPICAL TRENCH DETAIL  
AT WETLAND CROSSING

n.t.s.

# CITY OF Grand Junction COLORADO

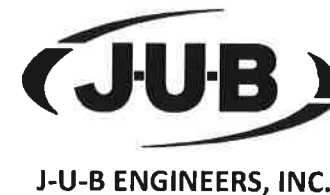
## BID ALTERNATE 1 - KANNAH CREEK INTAKE BID ALTERNATE 2 - PURDY MESA FLOWLINE - SULLIVAN DRAW REPLACEMENT BID ALTERNATE 3 - PURDY MESA FLOW CONTROL TANK OCTOBER 2018 BID SET

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G-003	LINE LEGEND & DETAIL KEY
G-004	SYMBOL LEGEND & ABBREVIATIONS
<b>CIVIL - Bid Alternate 1</b>	
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C1-102	PLAN & PROFILE
C1-201	DEMOLITION PLAN
C1-202	SITE PLAN
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5	DEMO PLAN
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8	SHEET NOT USED
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C2-204	PLAN AND PROFILE
C2-205	PLAN AND PROFILE
C2-206	PLAN AND PROFILE
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C2-211	PLAN AND PROFILE
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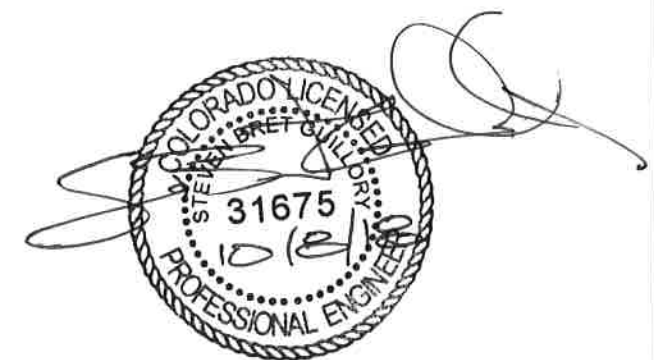
Sheet List Table	
Sheet Number	Sheet Title
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PROJECT NO. 81-18-011 & 81-18-013



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OTHER J-U-B COMPANIES



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LAST UPDATED: 10/8/2018  
SHEET NUMBER:  
**G-001**

Plot Date: 10/8/2018 | C:\GEMFILES\PUBLIC\PROJECTS\JUB\GRAND JUNCTION\81-18-013 - CITY OF GRAND JUNCTION - PURDY MESA FLOWLINE CAD\DWG\81-18-013\_G-001\_COVER.DWG



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NO.	REVISION	DESCRIPTION	BY	DATE

PURDY MESA FLOWLINE REPLACEMENT  
CITY OF GRAND JUNCTION  
VICINITY MAP & GENERAL NOTES

FILE: 81-18-013_G-002_VMAP
JUB PROJ. #: 81-18-013
DRAWN BY: JMM
DESIGN BY: ---
CHECKED BY: ---
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY
LAST UPDATED: 8/20/2018
SHEET NUMBER:

G-002

### EXISTING UTILITIES

- APPROXIMATE LOCATIONS OF UTILITIES ARE SHOWN ON THE PLANS. THEY ARE TO BE USED FOR GENERAL INFORMATION ONLY. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO NOTIFY THE APPROPRIATE UTILITY COMPANIES WHEN CONSTRUCTION MIGHT INTERFERE WITH NORMAL OPERATION OF ANY UTILITIES. IT SHALL ALSO BE THE CONTRACTOR'S RESPONSIBILITY TO HAVE THE APPROPRIATE UTILITY COMPANY FIELD-LOCATE ANY UTILITY INSTALLATIONS WHICH MIGHT BE AFFECTED BY CONSTRUCTION PRIOR TO BEGINNING WORK IN THAT AREA. THE CONTRACTOR SHALL BE RESPONSIBLE FOR RESTORING ANY UTILITIES DAMAGED DUE TO CONSTRUCTION AT NO ADDITIONAL COST TO THE OWNER. DEPTHS AND ELEVATIONS OF UTILITIES ARE UNKNOWN UNLESS OTHERWISE SHOWN. CONTRACTOR SHALL FIELD VERIFY UTILITY DEPTHS, ELEVATIONS, ANY DISCREPANCIES AND/OR CONFLICTS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.

### INSPECTION AND TESTING

- THE CONTRACTOR SHALL BE RESPONSIBLE FOR MATERIALS TESTING INCLUDING BUT NOT LIMITED TO CONCRETE, FLUSHING, LEAK, PRESSURE, AND COMPACTION. ALL TESTS SHALL MEET MINIMUM ENGINEER REQUIREMENTS. SEE THE CONTRACT DOCUMENTS AND DRAWINGS FOR FREQUENCY OF TESTING. RESULTS ARE TO BE DELIVERED TO SPECIAL INSPECTOR, OWNER AND ENGINEER.
- THE CONTRACTOR IS RESPONSIBLE TO COORDINATE WITH ENGINEER AND SPECIAL INSPECTOR FOR INSPECTIONS OF WORK AT APPROPRIATE INTERVALS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO PAY FOR ADDITIONAL INSPECTIONS THAT ARE THE RESULT OF HIS WORKMANSHIP.

### CONTACT PHONE NUMBERS

CITY OF GRAND JUNCTION – PROJECT ENGINEER – JOHN EKLUND	970-244-1558	john@gjcity.org
UTILITIES DIRECTOR – RANDI KIM	970-244-1429	randik@gjcity.org
WATER SYSTEM MANAGER – MARK RITTERBUSH	970-256-4185	markri@gjcity.org
J-U-B ENGINEERS INC – PROJECT MANAGER – BRET GUILLORY	970-208-8508	bguillory@jub.com
GRAND VALLEY POWER – PERRY RUPP	970-623-8571	prupp@gvp.org

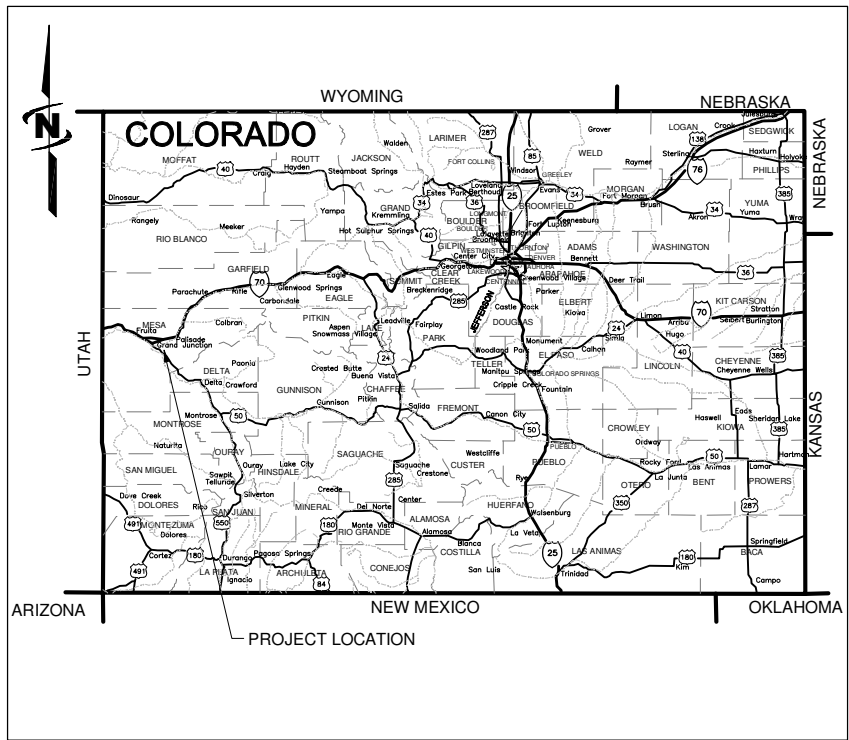


Know what's below.  
Call before you dig.

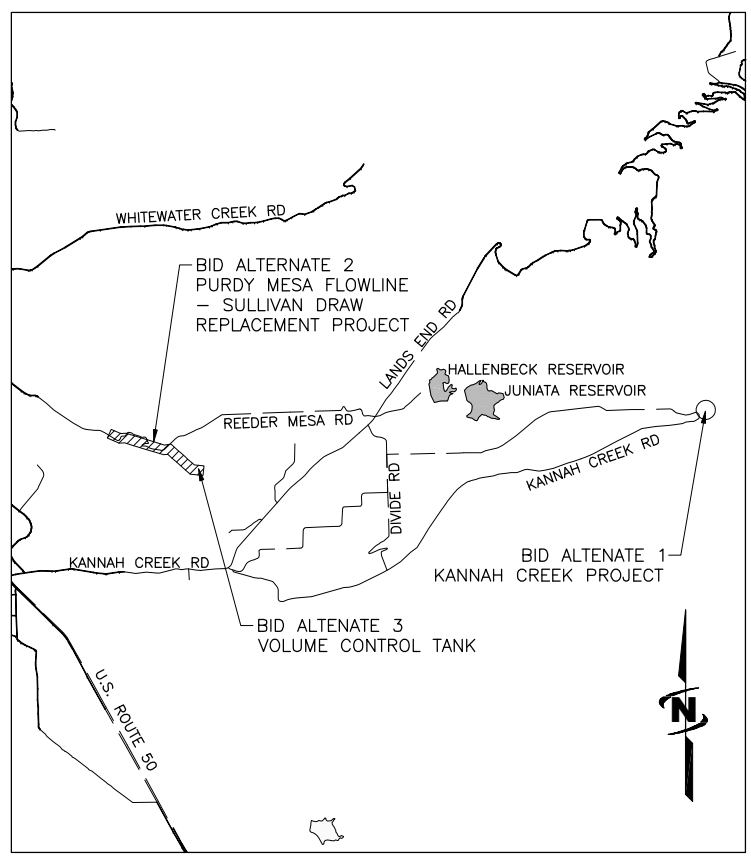
CALL 2 BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES

### GENERAL NOTES

- CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS AND BUSINESS LICENSES PRIOR TO CONSTRUCTION.
- CONTRACTOR IS RESPONSIBLE FOR DUST ABATEMENT AND ANY LIABILITY ISSUES RELATED TO DUST AT ANY LOCATION WHICH MAY BE CAUSED BY THIS PROJECT.
- THE CONTRACTOR IS RESPONSIBLE FOR TRAFFIC CONTROL AND PROTECTION OF PEDESTRIANS IN AND AROUND THIS WORK. REFERENCE THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD LATEST EDITION FOR WORK ZONE TRAFFIC CONTROL).
- ANY WORK DONE WITHIN A PUBLIC RIGHT-OF-WAY SHALL BE COORDINATED WITH THE APPROPRIATE TRANSPORTATION AGENCY AND SHALL MEET THE REQUIREMENTS OF THAT AGENCY AND, IN PARTICULAR, REQUIREMENTS OF ANY RIGHT-OF-WAY SPECIAL USE PERMIT, OR OTHER PERMIT. ALL WORK SHALL MEET CURRENT OSHA REQUIREMENTS.
- WHERE WORK IS PERFORMED ON EASEMENTS, THE CONTRACTOR SHALL TAKE EVERY PRECAUTION TO ELIMINATE ANY ADVERSE EFFECTS ON THE ADJACENT PROPERTY AND/OR TO RESTORE TO ITS ORIGINAL OR BETTER CONDITION. CONTRACTOR SHALL ALSO COMPLY WITH EASEMENT AGREEMENTS.
- ALL DISTANCES AND DATA SHALL BE CHECKED BY THE CONTRACTOR PRIOR TO THE START OF CONSTRUCTION. IN CASE OF CONFLICT THE ENGINEER SHALL BE NOTIFIED IMMEDIATELY SO THAT CLARIFICATION MAY BE MADE PRIOR TO THE START OF THE WORK.
- THE CONTRACTOR SHALL ARRANGE FOR, SECURE AND PAY FOR DIRECTLY, ANY AND ALL TEMPORARY UTILITY SUPPLIES (E.G. WATER POWER, AND TELEPHONE) IT MAY REQUIRE FOR PROSECUTION OF ITS WORK. THE COST OF SUCH UTILITIES SHALL BE INCLUDED IN THE APPROPRIATE BID ITEM WITH WHICH IT IS ASSOCIATED.
- SHOULD CONSTRUCTION BE HALTED BECAUSE OF INCLEMENT WEATHER CONDITIONS, THE CONTRACTOR WILL COMPLETELY CLEAN UP ALL AREAS AND MAINTAIN THE SURFACE IN GOOD CONDITION DURING THE SHUT-DOWN PERIOD.
- THE CONTRACTOR'S PERSONNEL, EQUIPMENT, AND OPERATIONS SHALL COMPLY FULLY WITH ALL APPLICABLE STANDARDS, REGULATIONS, AND REQUIREMENTS OF EXISTING FEDERAL, COLORADO STATE, AND LOCAL GOVERNMENTAL AGENCIES.
- ALL WORK SHALL BE CONTAINED IN OR LIMITED TO THE EXISTING PROPERTY, EASEMENTS, OR APPROVED STAGING AREAS.
- CONTRACTOR IS ALSO RESPONSIBLE FOR PROTECTION TO SAFE GUARD WORK SITE. PAY ITEM TO BE INCLUDED IN MOBILIZATION.
- THE ENGINEER WILL PROVIDE VERTICAL AND HORIZONTAL CONTROLS ONE TIME ON THE PROJECT SITE. ANY ADDITIONAL CONSTRUCTION STAKING REQUIRED TO COMPLETE THE PROJECT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
- CONTRACTOR SHALL LOCATE AND PROTECT ALL EXISTING UTILITIES AND BE RESPONSIBLE FOR DAMAGES TO EXISTING UTILITIES AND EXISTING IMPROVEMENTS AS A RESULT OF THE CONTRACTOR'S CONSTRUCTION ACTIVITIES.
- CONTRACTOR SHALL DISPOSE OF LARGE ROCKS ENCOUNTERED DURING EXCAVATION IN ABANDONED DITCH R.O.W., AT STRUCTURE SPILLWAY, OR OTHER NEPA/CITY APPROVED SITE.
- ALL BRANCH SADDLES TO BE ELECTROFUSED AND PRESSURE TESTED BEFORE REMOVING COUPON.
- ALL EXPOSED PVC PIPE TO BE COATED W/ 2 COATS OF ACRYLIC LATEX ENAMEL.
- ALL ELECTROFUSION AND WELD POINTS MUST BE COMPLETED BY CERTIFIED TECHNICIAN.
- ALL WORK SHALL BE ACCOMPLISHED IN ACCORDANCE WITH THE CITY OF GRAND JUNCTION STANDARD CONTRACT DOCUMENTS FOR CAPITAL IMPROVEMENTS CONSTRUCTION REVISED JULY 2010, AND THE PLANS AND SPECIFICATIONS FOR THIS PROJECT.



AREA MAP



VICINITY MAP

Plot Date: 8/20/2018 4:05 PM. Plotted By: Jubal Myers. Date Created: 8/17/2018 10:05 AM. PROJECT: JUB GRAND JUNCTION. PURDY MESA FLOWLINE. CAD SHEET: 81-18-013\_G-002\_VMAP.DWG





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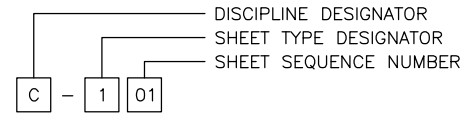
NO.	DESCRIPTION	BY	DATE

**PURDY MESA FLOWLINE REPLACEMENT  
CITY OF GRAND JUNCTION**

FILE: 81-18-013-G-003 LINE DET  
JUB PROJ. #: 81-18-013  
DRAWN BY: JMM  
DESIGN BY: ---  
CHECKED BY: ---  
AT FULL SIZE, IF NOT ONE  
INCH SCALE ACCORDINGLY  
LAST UPDATED: 8/17/2018  
SHEET NUMBER:  
**G-003**

**SHEET NUMBERING**

SAMPLE: C-101



**DISCIPLINE DESIGNATORS**

DISCIPLINE	DESIGNATOR	DESCRIPTION
GENERAL	G	ALL GENERAL
	GI	GENERAL INFORMATION
	GC	GENERAL CONTRACTUAL
	GR	GENERAL RESOURCE
SURVEY/MAPPING	V	ALL SURVEY
GEOTECHNICAL	B	ALL GEOTECHNICAL
CIVIL	C	ALL CIVIL
LANDSCAPE	L	ALL LANDSCAPE
STRUCTURAL	S	ALL STRUCTURAL
ARCHITECTURAL	A	ALL ARCHITECTURE
EQUIPMENT	Q	ALL EQUIPMENT
MECHANICAL	M	ALL MECHANICAL
ELECTRICAL	E	ALL ELECTRICAL
PLUMBING	P	ALL PLUMBING
PROCESS	D	ALL PROCESS
RESOURCE	R	ALL RESOURCE

**SHEET TYPE DESIGNATORS**

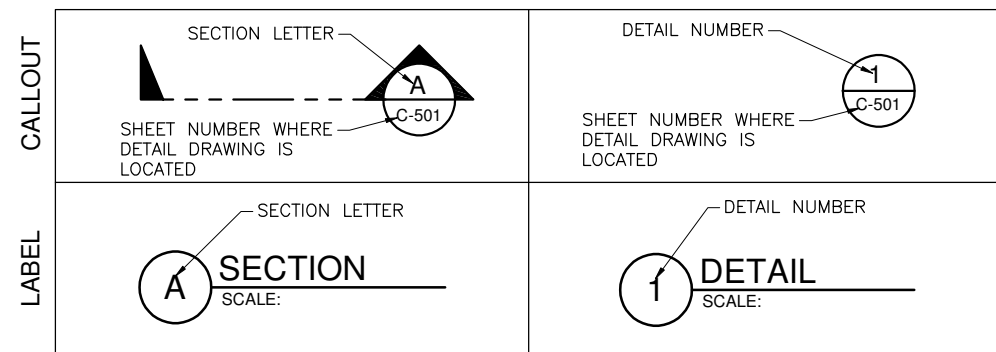
DESIGNATOR	SHEET TYPE
0	GENERAL (SYMBOLS, LEGENDS, NOTES, ETC.)
1	PLANS (HORIZONTAL VIEWS)
2	ELEVATIONS, PROFILES, COMBINED PLAN & PROFILES
3	SECTIONS (SECTIONAL VIEWS)
4	LARGE-SCALE VIEWS (PLANS, ELEVATIONS, ECT.)
5	DETAILS OR COMBINED DETAILS AND SECTIONS
6	SCHEDULES AND DIAGRAMS
7	USER DEFINED
8	USER DEFINED
9	3D REPRESENTATIONS (ISOMETRICS, PERSPECTIVES, PHOTOS)

**SECTION AND DETAIL IDENTIFIERS**

NOTE:  
A DASH MAY BE PLACED IN THE LOWER PORTION OF THE IDENTIFIER IF THE DETAIL DRAWING OR SECTION VIEW IS LOCATED ON THE SAME SHEET.

**SECTION IDENTIFICATION**

**DETAIL IDENTIFICATION**



**LINE LEGEND**

LINE DESCRIPTION	PROPOSED LINE	EXISTING LINE
<b>POWER / COMMUNICATIONS</b>		
OVERHEAD POWER	— OHP —	— OHP —
UNDERGROUND POWER	— UP —	--- UP ---
OVERHEAD TELEPHONE	— OHT —	--- OHT ---
UNDERGROUND TELEPHONE	— UT —	--- UT ---
FIBER OPTIC	— FO —	--- FO ---
CABLE TELEVISION	— CTV —	--- CTV ---
UNDERGROUND POWER, TEL, CABLE TV		--- P,T,CTV ---
UNDERGROUND POWER, TEL, CABLE TV, GAS		--- P,T,CTV,G ---
<b>STORM DRAIN</b>		
STORM DRAIN (GENERAL)	— SD —	--- SD ---
STORM DRAIN	— X*SD —	--- X*SD ---
ROOF DRAIN	— RD —	--- RD ---
<b>SANITARY SEWER</b>		
SANITARY SEWER (GENERAL)	— SS —	--- SS ---
SANITARY SEWER	— X*SS —	--- X*SS ---
SANITARY SEWER SERVICE	— SS — SS —	--- SS --- SS ---
SEWER FORCE MAIN	— FM —	--- FM ---
<b>WATER</b>		
WATER (GENERAL)	— W —	--- W ---
WATER (SPECIFIED SIZE)	— X*W —	--- X*W ---
WATER SERVICE	— WS — WS —	--- WS --- WS ---
<b>IRRIGATION</b>		
IRRIGATION	— IRR —	--- IRR ---
GRAVITY IRRIGATION	— GIRR —	--- GIRR ---
PRESSURE IRRIGATION	— PIARR —	--- PIARR ---
POTABLE WATER	— PW —	--- PW ---
NON-POTABLE WATER	— NPW —	--- NPW ---
<b>GAS</b>		
NATURAL GAS	— G —	--- G ---
NATURAL GAS SERVICE	— G — G —	--- G --- G ---
HIGH PRESSURE GAS	— HPG —	--- HPG ---
LIQUID GAS	— LG —	--- LG ---
<b>UTILITY</b>		
CHLORINE LINE	— CHL —	--- CHL ---
INDUSTRIAL WASTE WATER	— IWW —	--- IWW ---
DRAIN LINE		--- DL ---

LINE DESCRIPTION	PROPOSED LINE	EXISTING LINE
<b>BOUNDARY</b>		
PROPERTY LINE	— P/L —	--- P/L ---
PROPERTY LINE	— — — —	--- — — —
RIGHT OF WAY	— R/W —	--- R/W ---
TEMPORARY EASEMENT	— T/E —	--- T/E ---
PERMANENT EASEMENT	— P/E —	--- P/E ---
TOWNSHIP AND RANGE		--- — — —
SECTION LINE		--- — — —
QUARTER SECTION LINE		--- — — —
1/16 SECTION LINE		--- — — —
STATE LINE		--- — — —
COUNTY LINE		--- — — —
<b>SITE</b>		
FENCE	— X —	--- X ---
MAJOR CONTOUR	— 2521 —	--- — — —
MINOR CONTOUR		--- — — —
GRADE BREAK		— GB —
TOP OF BANK		— TOB —
TOE OF SLOPE		— TOE —
CUT LIMITS	— CUT —	--- — — —
FILL LIMITS	— FILL —	--- — — —
DITCH	— — — —	--- — — —
STORM SWALE	— — — —	--- — — —
EDGE OF WATER		--- — — —
HIGH WATER		--- — — —
WETLAND		— WET —
WETLAND BOG		— BOG —
WETLAND MARSH		— MRSH —
WETLAND SWAMP		— SWMP —
<b>ROADWAY</b>		
ROAD SHOULDER	— — — —	--- — — —
ROAD CENTERLINE	— — — —	--- — — —
ROAD ASPHALT	— — — —	--- EP ---
ROAD GRAVEL	— — — —	--- EG ---
TOP BACK OF CURB		--- — — —
LIP OF GUTTER		--- — — —
LANDSCAPING LIMITS	— LS —	--- LS ---

Plot Date: 8/20/2018 7:34 AM Plotted By: Juhai Myers  
 Date Created: 5/7/2018 10:06 AM Plotted By: Juhai Myers  
 JUB PURDY MESA FLOWLINE CAD SHEET 18-013 G-004 SYM ABBR.DWG

SYMBOL DESCRIPTION	EXISTING SYMBOL	PROPOSED SYMBOL
<b>SURVEY</b>		
CAP (ALUMINUM)		
CAP (BRASS)		
CHISELED X		
CTRL PT GENERIC		
CTRL PT 1/2" REBAR		
CTRL PT 5/8" REBAR		
CTRL PT 60D NAIL		
CTRL PT HUB & TACK		
CTRL PT PK NAIL		
CTRL PT TEMP BENCH MARK		
NAIL		
NAIL AND TAG		
NAIL (PK)		
BOLT		
DRILL STEEL		
REBAR (1/2")		
REBAR (5/8")		
STAINLESS STEEL ROD		
IRON PIPE		
RAILROAD SPIKE		
R/W MONUMENT		
STONE		
SECTION CORNER. MON.		
SECTION QUARTER MON.		
<b>SITE</b>		
BOLLARD		
BOULDER		
DRINKING FOUNTAIN		
FLAGPOLE		
GATE		
MAIL BOX		
PARKING METER		
POST		
SIGN		
SPOT ELEVATION		
TREE (SHRUB)		
TREE (STUMP)		
TREE (CONIFEROUS)		
TREE (DECIDUOUS)		
TEST HOLE		
WELL		
WELL (MONITORING)		

SYMBOL DESCRIPTION	EXISTING SYMBOL	PROPOSED SYMBOL
<b>UTILITIES</b>		
MANHOLE (GENERIC)		
PRESSURE CLEAN OUT AT GRADE		
THRUST BLOCK		
VAULT		
<b>COMMUNICATION</b>		
TELE. MANHOLE		
TELE. PEDASTAL		
TELE. POLE		
TV PEDASTAL		
GUY WIRE		
<b>DOMESTIC WATER</b>		
FIRE HYDRANT		
SPIGOT		
YARD HYDRANT		
WATER MANHOLE		
WATER METER		
WATER VALVE		
<b>ELECTRIC</b>		
ELEC. MANHOLE		
ELEC. METER		
ELEC. TRANS.		
JUNCTION BOX		
POWER POLE		
POWER STUB		
STREET LIGHT BASE		
TRAFFIC SIGNAL POLE		
<b>IRRIGATION</b>		
IRRIGATION VALVE		
IRRIGATION VALVE BOX		
SPRINKLER		
<b>NATURAL GAS</b>		
GAS METER		
GAS VALVE		
<b>SANITARY SEWER</b>		
CLEANOUT		
SEWER STUB		
SS MANHOLE		
<b>STORM DRAIN</b>		
CATCH BASIN		
DRY WELL		
FLARE END		
GREASE TRAP		
SD MANHOLE		

SYMBOL DESCRIPTION	EXISTING SYMBOL	PROPOSED SYMBOL
<b>FITTINGS</b>		
BEND (11.25')		
BEND (22.5')		
BEND (45')		
BEND (90')		
CAP		
COUPLING		
CROSS		
REDUCER (CONCENTRIC)		
REDUCER (ECCENTRIC)		
TEE		
TRUE UNION		
WYE		
<b>VALVES</b>		
AIR VALVE		
BLOW OFF		
COMBO VALVE		
BALL VALVE (N.C.)		
BALL VALVE (N.O.)		
BUTTERFLY VALVE		
CHECK VALVE		
CHECK VALVE (FLANGE)		
CHECK VALVE (MJ)		
GATE VALVE		
PLUG VALVE (N.C.)		
PLUG VALVE (N.O.)		
<b>ROAD MARKINGS</b>		
TURN ARROW		
ARROW STRAIGHT		
ARROW STRAIGHT/TURN		
BICYCLE ROUTE		
CAR		
HANDICAP SYMBOL		
<b>ROADWAY</b>		
INTERSTATE ROUTE		
MAST ARM		
PEDESTRIAN SIGNAL		
STATE ROUTE		
TRAFFIC LIGHT		

SYMBOL DESCRIPTION	EXISTING SYMBOL	PROPOSED SYMBOL
<b>ROADWAY (CONT.)</b>		
TYPE 2 BARRICADE		
US ROUTE		
TRAFFIC ATTENUATOR		
JERSEY BARRIER		

ABBREVIATIONS	
ASSY	ASSEMBLY
>	ANGLE
@	AT (MEASUREMENTS)
BLDG	BUILDING
BM	BENCH MARK
BSC	BITUMINOUS SURFACE COURSE
BSW	BACK OF SIDEWALK
BW	BOTH WAYS
C	CHANNEL (STRUCTURAL)
C/L	CENTER LINE
CMP	CORRUGATED METAL PIPE
CO	CLEANOUT
CONC	CONCRETE
CONT	CONTINUOUS
CPLG	COUPLING
CU FT	CUBIC FEET
CU YD	CUBIC YARD
DEG OR °	DEGREE
DET	DETAIL
DIA OR Ø	DIAMETER
DIP	DUCTILE IRON PIPE
DIST	DISTRIBUTION
DWG	DRAWING
EA	EACH
ELB	ELBOW
ELEV	ELEVATION
EW	EACH WAY
EXIST	EXISTING
FG	FINISH GRADE
FH	FIRE HYDRANT
FLG	FLANGE
FT OR '	FEET
GV	GATE VALVE
HORIZ	HORIZONTAL
ID	INSIDE DIAMETER
IN OR "	INCH
LB OR #	POUND
LF	LINEAL FEET
LN	LINEAL
MAX	MAXIMUM
MIN	MINIMUM
NO OR #	NUMBER
PE	POLYETHYLENE
PL	PLATE
PL	PROPERTY LINE
PVC	POLYVINYL-CHLORIDE
R	RADIUS
RP	RADIUS POINT
R&R	REMOVE & REPLACE
REM	REMOVE
REQ'D	REQUIRED
REV	REVISION
R/W	RIGHT-OF-WAY

S	SLOPE
SPEC	SPECIFICATION
STA	STATION
STD	STANDARD
STL	STEEL
ST STL	STAINLESS STEEL
TBC	TOP BACK OF CURB
TYP	TYPICAL
TFC	TOP FACE OF CONCRETE
W/	WITH
W/O	WITHOUT
W/REQ'D	WHERE REQUIRED



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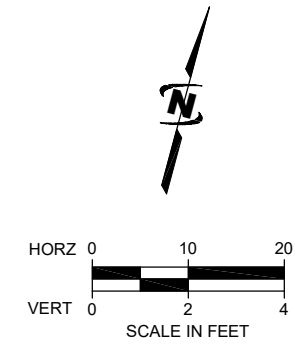
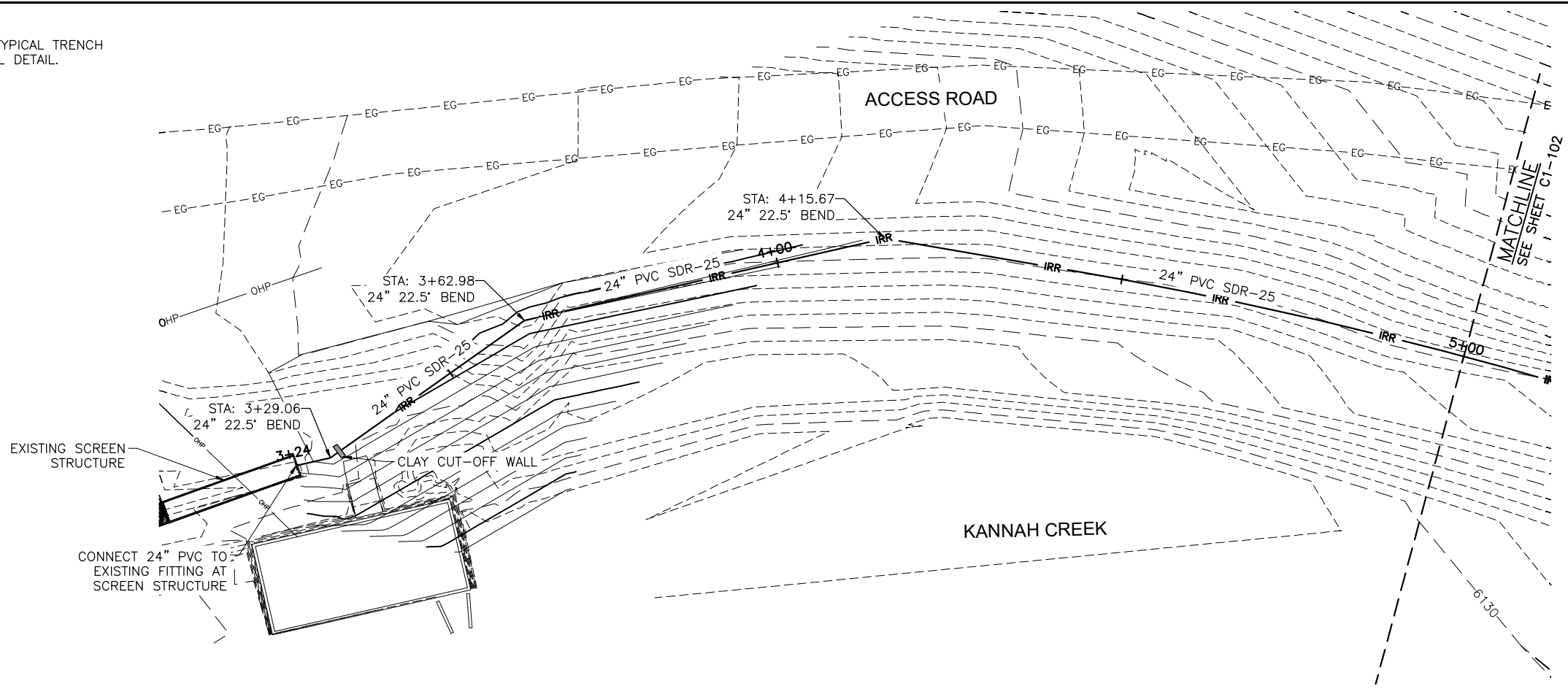
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PURDY MESA FLOWLINE REPLACEMENT  
 CITY OF GRAND JUNCTION

FILE: 81-18-013-G-004 SYM ABBR  
 JUB PROJ. #: 81-18-013  
 DRAWN BY: JMM  
 DESIGN BY: ---  
 CHECKED BY: ---  
 AT FULL SIZE, IF NOT ONE  
 INCH SCALE ACCORDINGLY  
 LAST UPDATED: 8/17/2018  
 SHEET NUMBER:

G-004

NOTES:  
 1. SEE (B1/C1-501) FOR TYPICAL TRENCH EXCAVATION AND BACKFILL DETAIL.

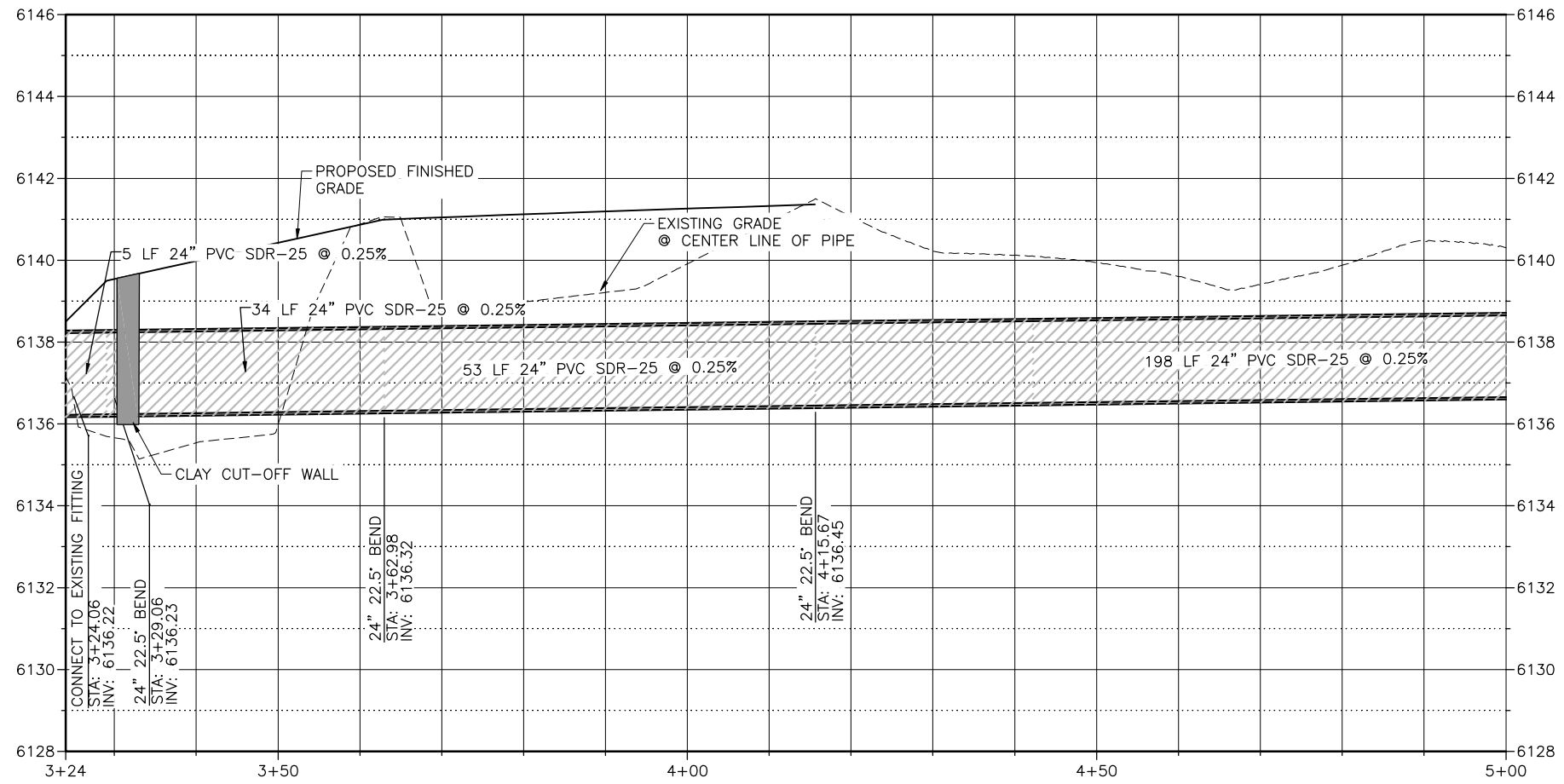


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 COLORADO LICENSED PROFESSIONAL ENGINEER  
 JIMMY W. FRANKS  
 8174  
 8/17/18

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NO.	REVISION	DESCRIPTION	BY	DATE

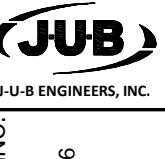
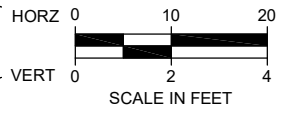
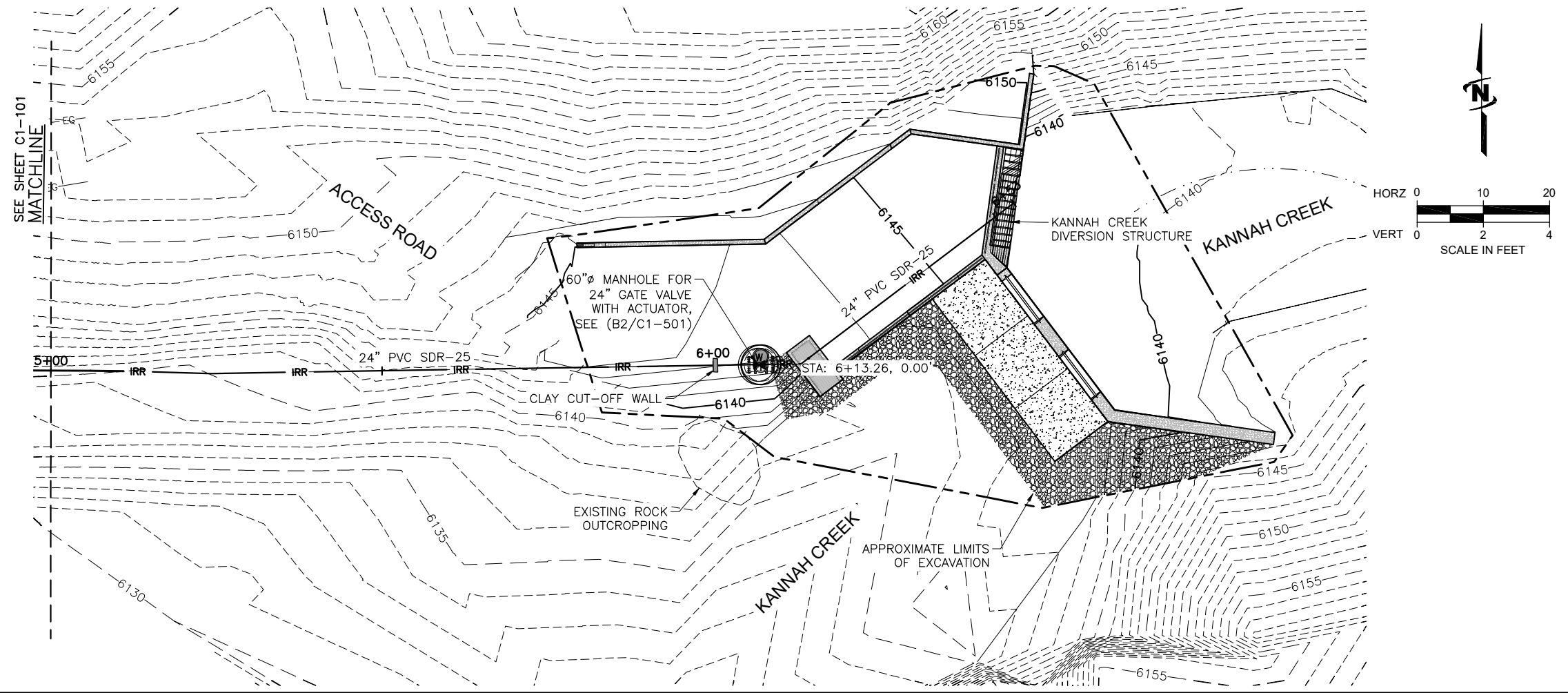


Plot Date: 10/19/2018 10:27 PM Plotted By: Juba Myers  
 Date Created: 10/22/18 10:51 AM PROJECT: JUB GRAND JUNCTION 8174 8174 KANNAH CREEK INTAKE CAD SHEET CIVIL 8174-18-011 C-101.DWG

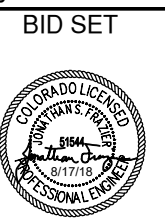
**KANNAH CREEK INTAKE REHABILITATION**  
 CITY OF GRAND JUNCTION  
 BID ALTERNATIVE 1  
 PLAN & PROFILE

FILE: 81-18-011 C-101  
 JUB PROJ #: 81-18-013  
 DRAWN BY: JMM  
 DESIGN BY: ---  
 CHECKED BY: ---  
 AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY  
 LAST UPDATED: 10/19/2018  
 SHEET NUMBER:  
**C1-101**

- NOTES:
1. SEE SHEET (C1-201) FOR EXISTING KANNAH CREEK INTAKE STRUCTURE DEMOLITION PLAN.
  2. SEE SHEET (C1-202) FOR KANNAH CREEK INTAKE STRUCTURE SITE PLAN.
  3. SEE (B1/C1-501) FOR TYPICAL TRENCH EXCAVATION AND BACKFILL DETAIL.



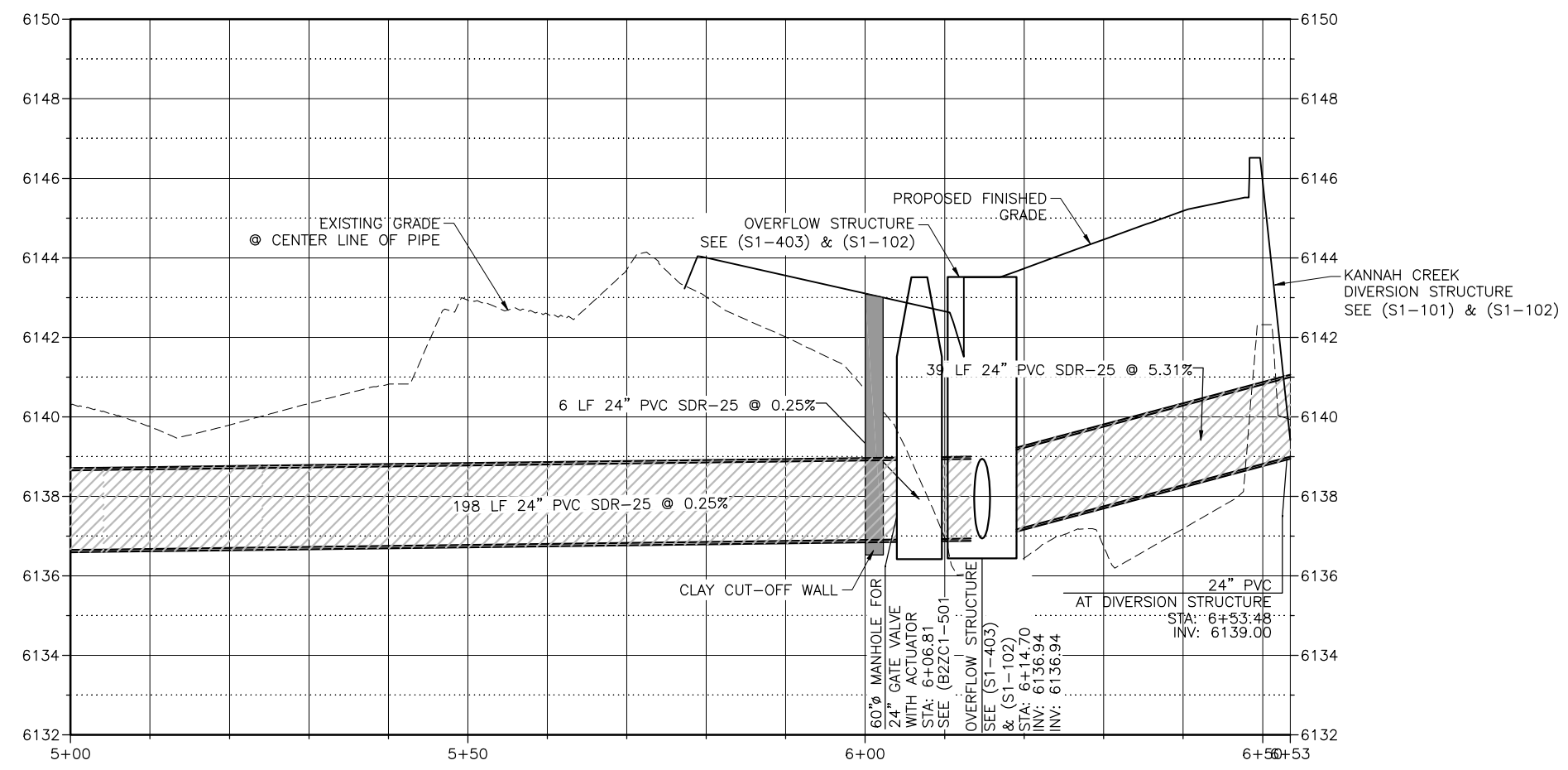
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NO.	REVISION	DESCRIPTION	BY	DATE



**KANNAH CREEK INTAKE REHABILITATION**  
**CITY OF GRAND JUNCTION**  
 BID ALTERNATIVE 1  
 PLAN & PROFILE

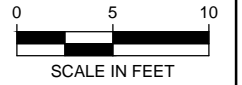
FILE: 81-18-011 C-101  
 JUB PROJ #: 81-18-013  
 DRAWN BY: JMM  
 DESIGN BY: ---  
 CHECKED BY: ---  
 AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY  
 LAST UPDATED: 10/9/2018  
 SHEET NUMBER:  
**C1-102**

- NOTES:
- SEE SHEET (C1-202) FOR KANNAH CREEK INTAKE STRUCTURE SITE PLAN.
  - CONTRACTOR TO PROVIDE A PLAN FOR CONTROL OF WATER IN KANNAH CREEK. SEE SPECIFICATION SECTION 02140 FOR TRENCH AND STRUCTURE DEWATERING REQUIREMENTS.

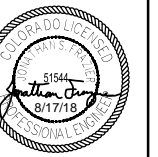


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NO.	REVISION	DESCRIPTION	BY	APPR.	DATE

KANNAH CREEK INTAKE REHABILITATION  
 CITY OF GRAND JUNCTION  
 BID ALTERNATIVE 1  
 DEMOLITION PLAN

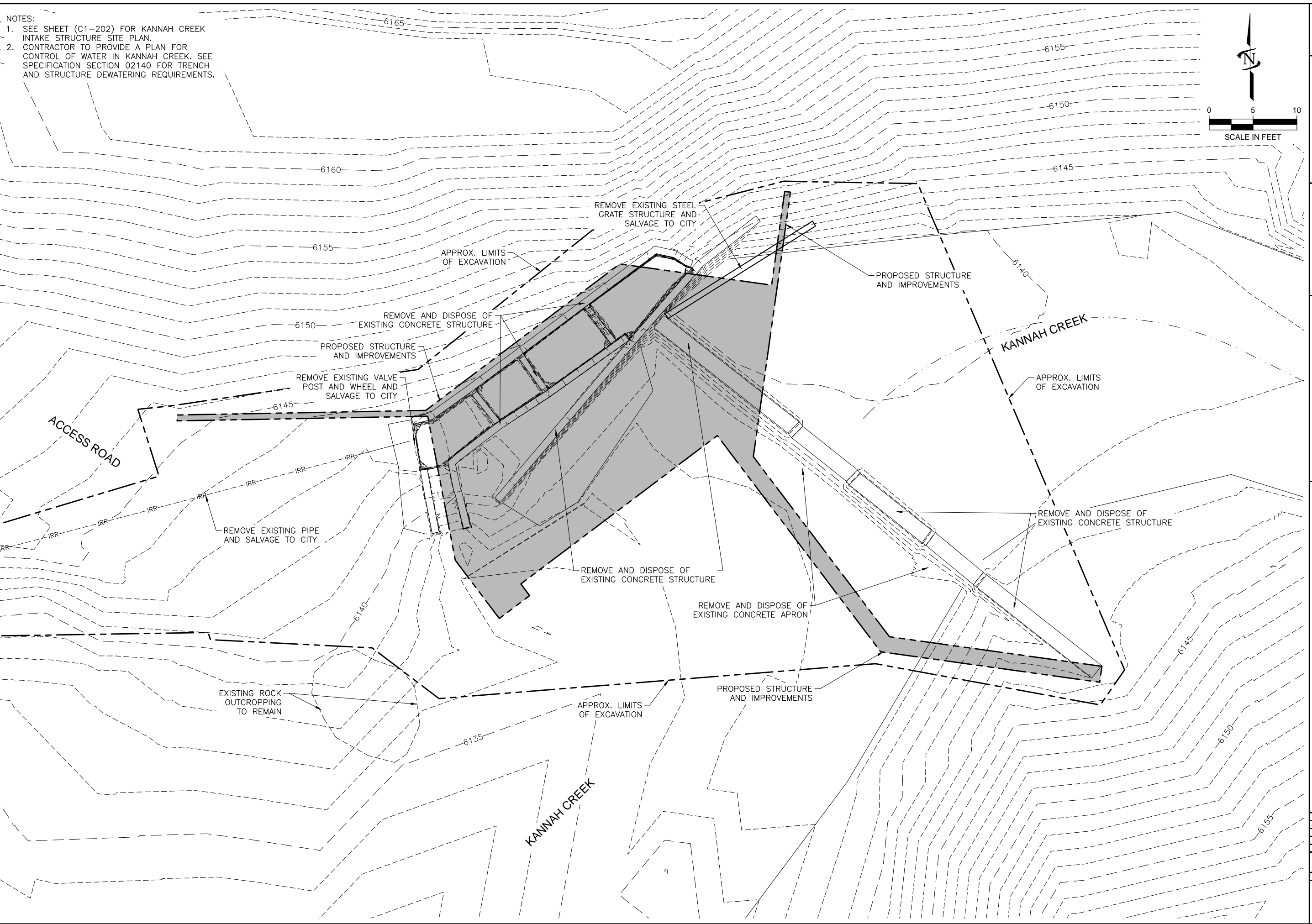
FILE: 81-18-011 C-201  
 JUB PROJ. #: 81-18-013  
 DRAWN BY: TAG  
 DESIGN BY: JSF  
 CHECKED BY: JSF

ONE INCH  
 AT FULL SIZE, IF NOT ONE  
 INCH, SCALE ACCORDINGLY  
 LAST UPDATED: 8/17/2018

SHEET NUMBER:

C1-201

Plotted: 8/17/2018 12:05 AM Plotted By: Travis Green  
 Date Created: 7/22/18 JUB PUBLIC PROJECTS/JUB GRAND JUNCTION/81-18-011 KANNAH CREEK INTAKE/DEMOLITION/81-18-011 C-201.DWG



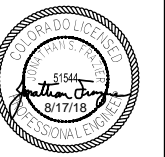
- NOTES:**
1. CJ INDICATES CONTROL JOINT, SEE TYPICAL CONCRETE DETAILS ON SHEET (S1-502).
  2. REFER TO SHEET (S1-101) FOR FOOTING AND FOUNDATION PLAN.
  3. REFER TO SHEET (S1-102) FOR FLOOR FRAMING PLAN.



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NO.	REVISION	DESCRIPTION	BY	APPR.	DATE

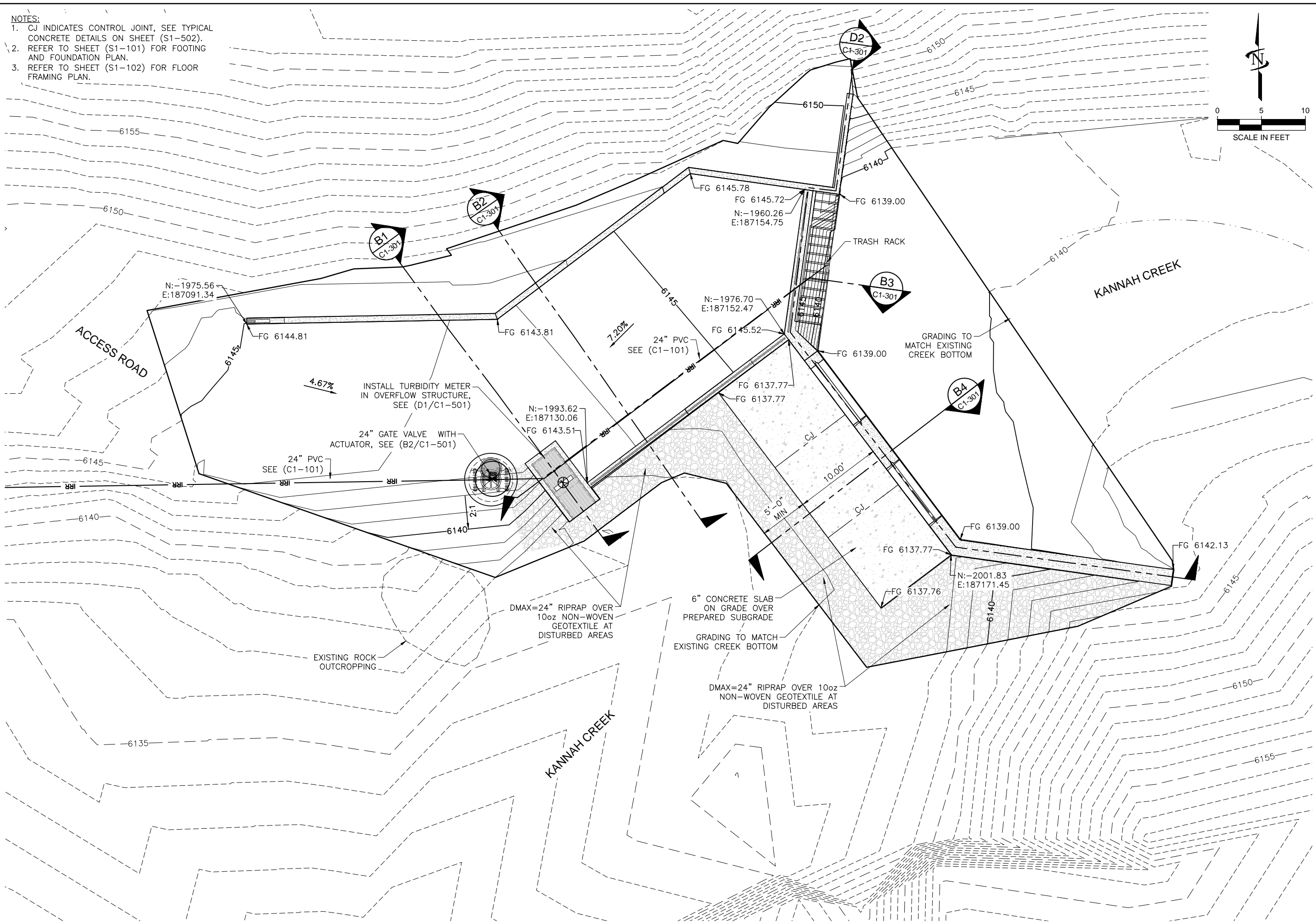
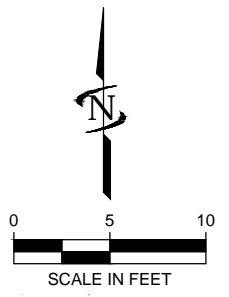
**KANNAH CREEK INTAKE REHABILITATION  
 CITY OF GRAND JUNCTION**

BID ALTERNATIVE 1  
 SITE PLAN

FILE: 81-18-011 C-202  
 JUB PROJ. #: 81-18-013  
 DRAWN BY: TAG  
 DESIGN BY: JSF  
 CHECKED BY: JSF

ONE INCH  
 AT FULL SIZE, IF NOT ONE  
 INCH, SCALE ACCORDINGLY  
 LAST UPDATED: 8/17/2018

SHEET NUMBER:  
**C1-202**

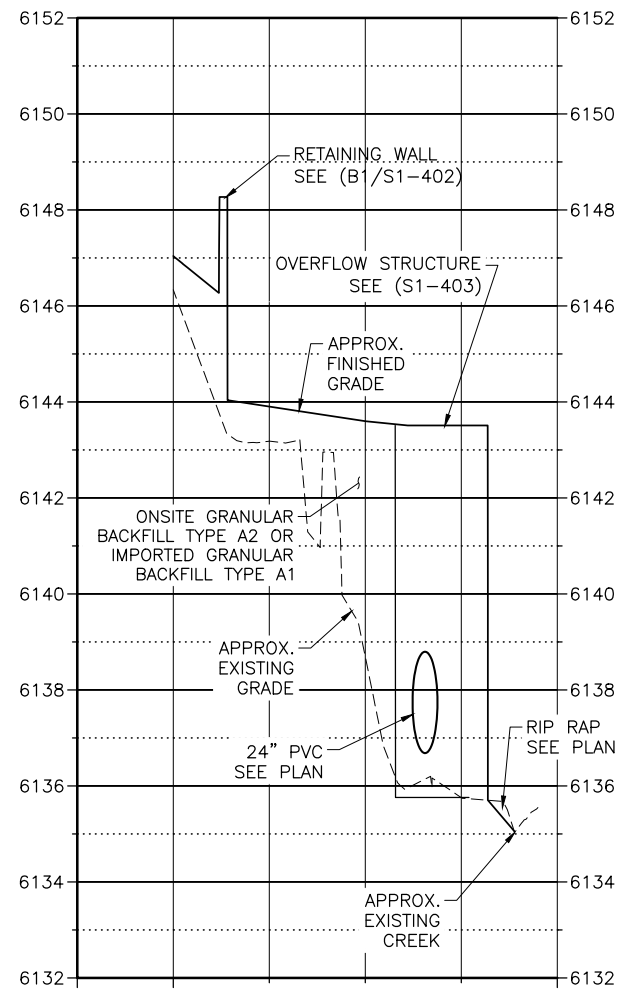
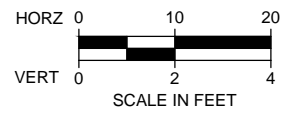


Plot Date: 8/17/2018 9:25 AM Plotted By: Travis Green  
 Date Created: 8/17/2018 10:45 AM Project: JUB GRAND JUNCTION 81-18-011 KANNAH CREEK INTAKE REHABILITATION SHEET C1-202.DWG

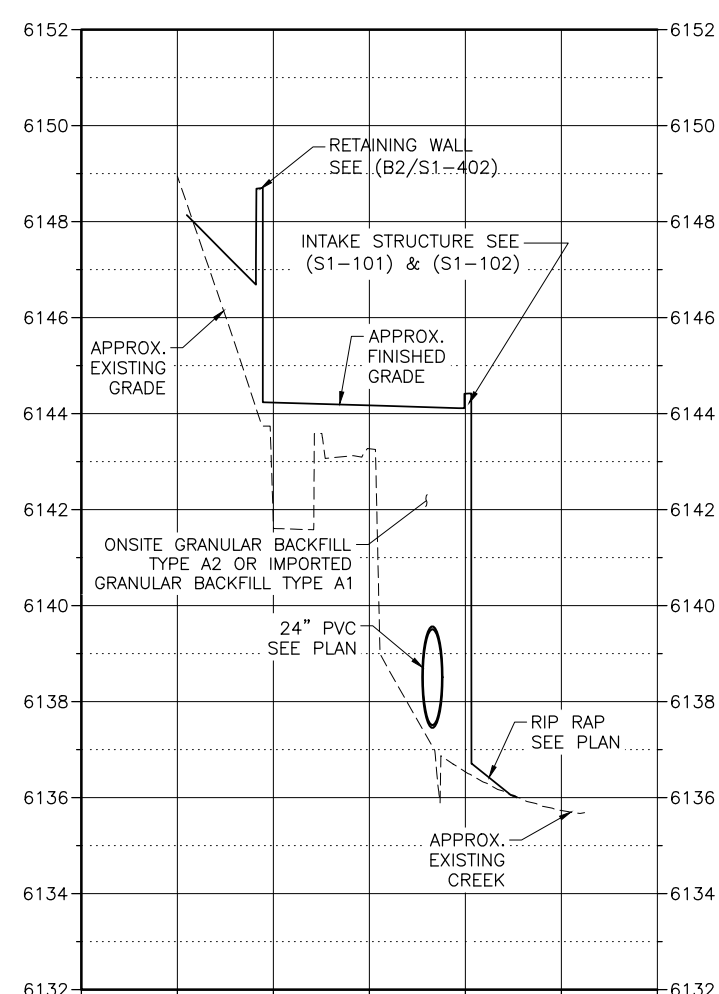
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NO.	REVISION	DESCRIPTION	BY	APPR.	DATE

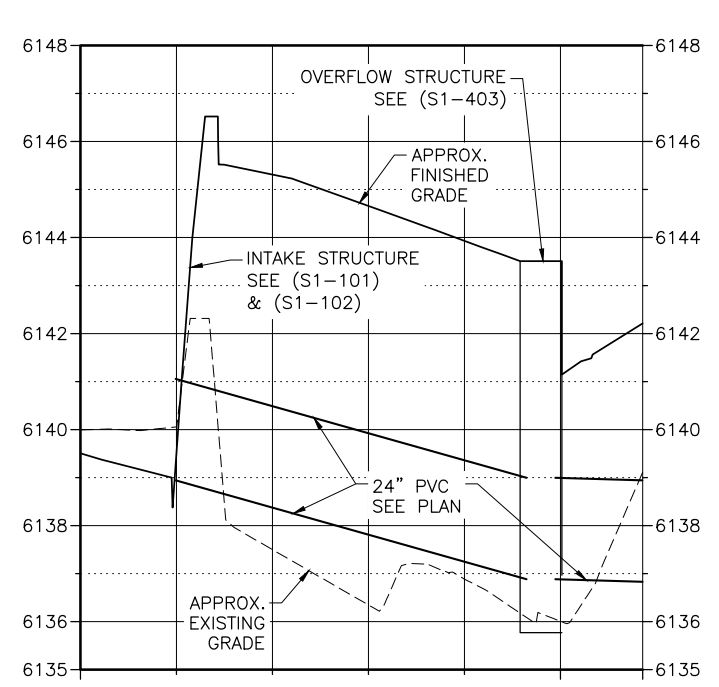
**KANNAH CREEK INTAKE REHABILITATION**  
**CITY OF GRAND JUNCTION**  
 BID ALTERNATIVE 1  
 SECTION VIEWS



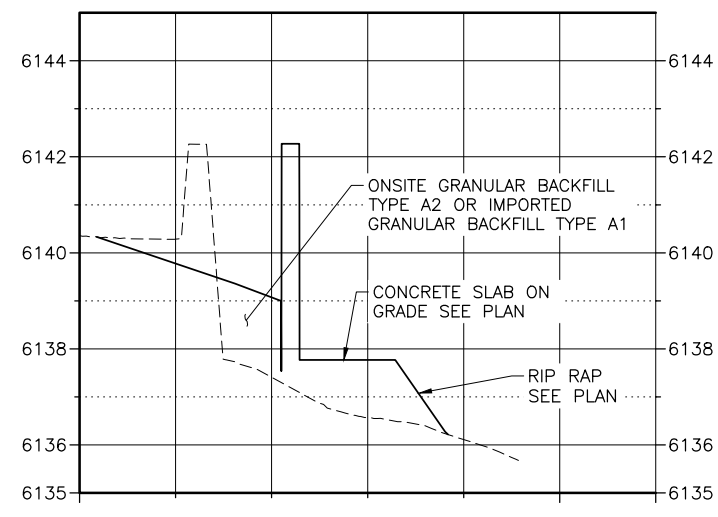
**B1 BYPASS SECTION**  
 SCALE: 1"=10'



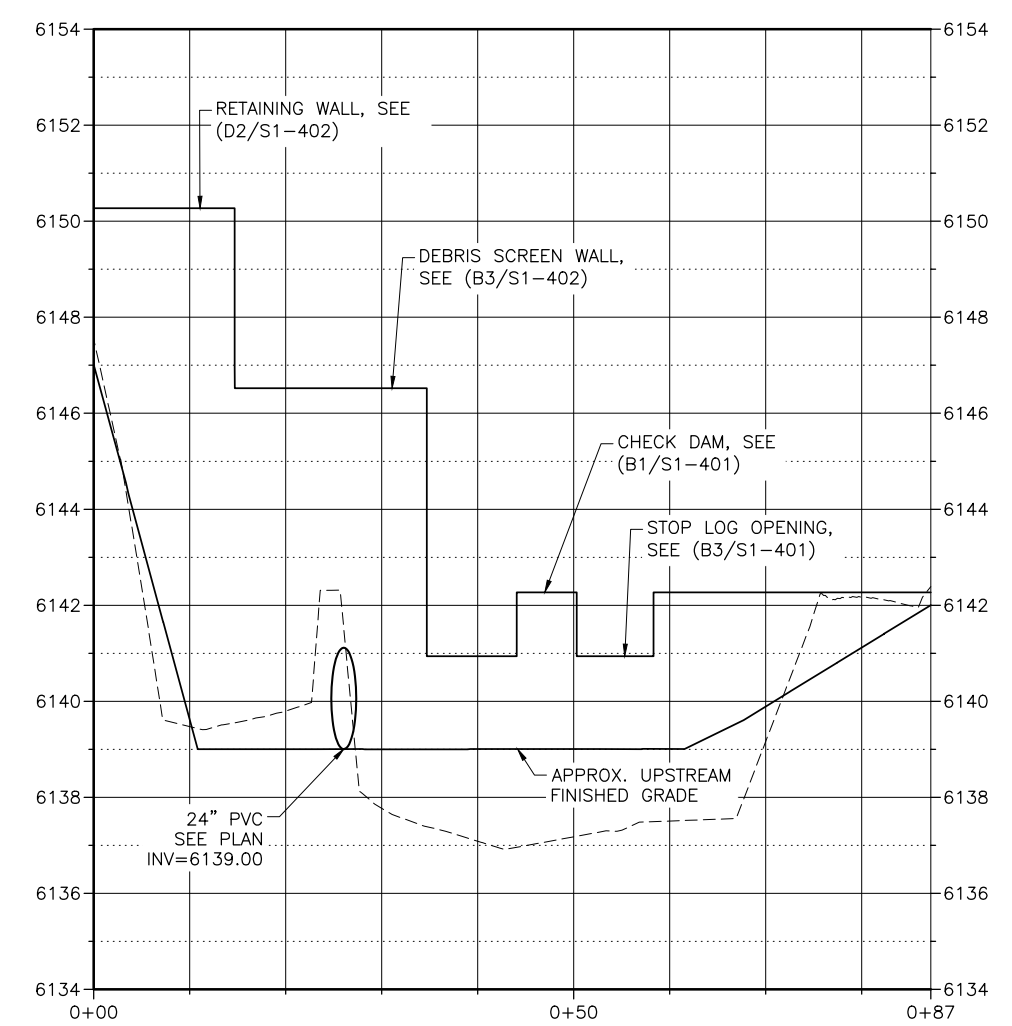
**B2 ACCESS SECTION**  
 SCALE: 1"=10'



**B3 INTAKE SECTION**  
 SCALE: 1"=10'

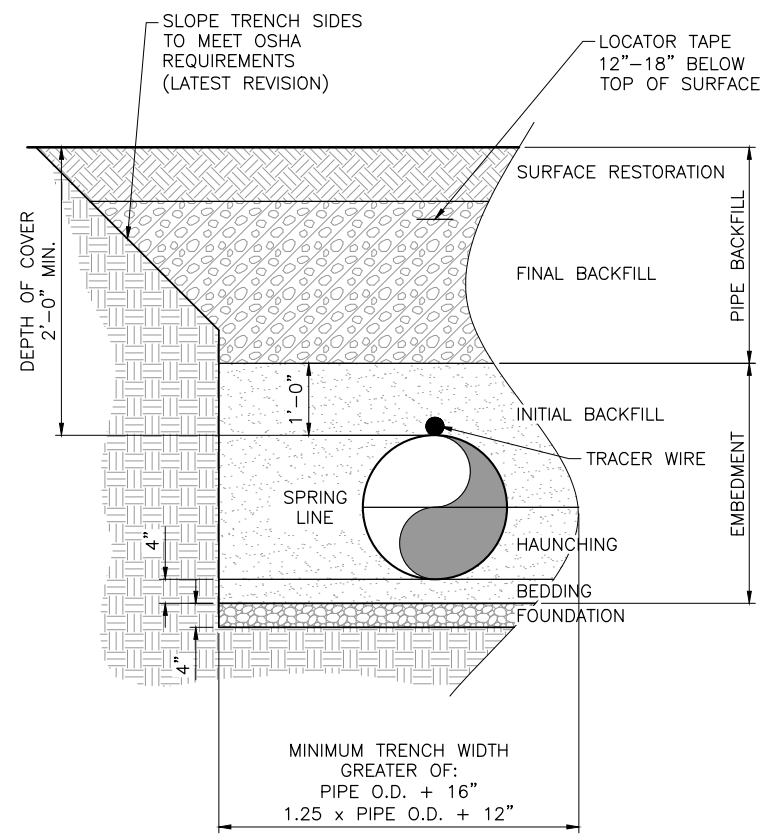


**B4 CREEK SECTION**  
 SCALE: 1"=10'



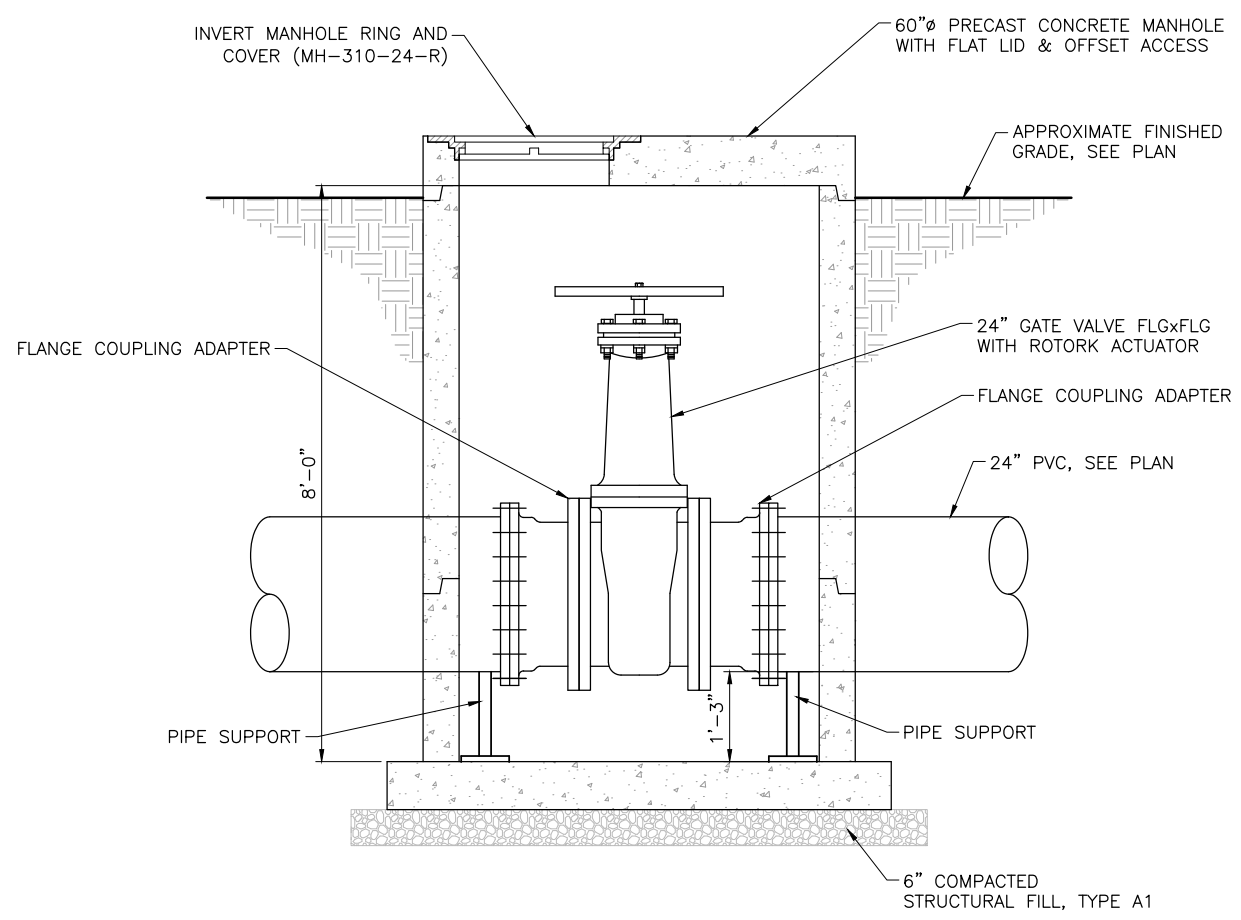
**D2 RETAINING WALL & DAM CREST SECTION**  
 SCALE: 1"=10'

Plot Date: 8/17/2018 9:58 AM Plotted By: Travis Green  
 Date Created: 7/17/2018 10:45 PUBLIC PROJECT: 25JUB GRAND JUNCTION: 81-18-011 KANNAH CREEK INTAKE: CAD SHEET: C1-301.DWG

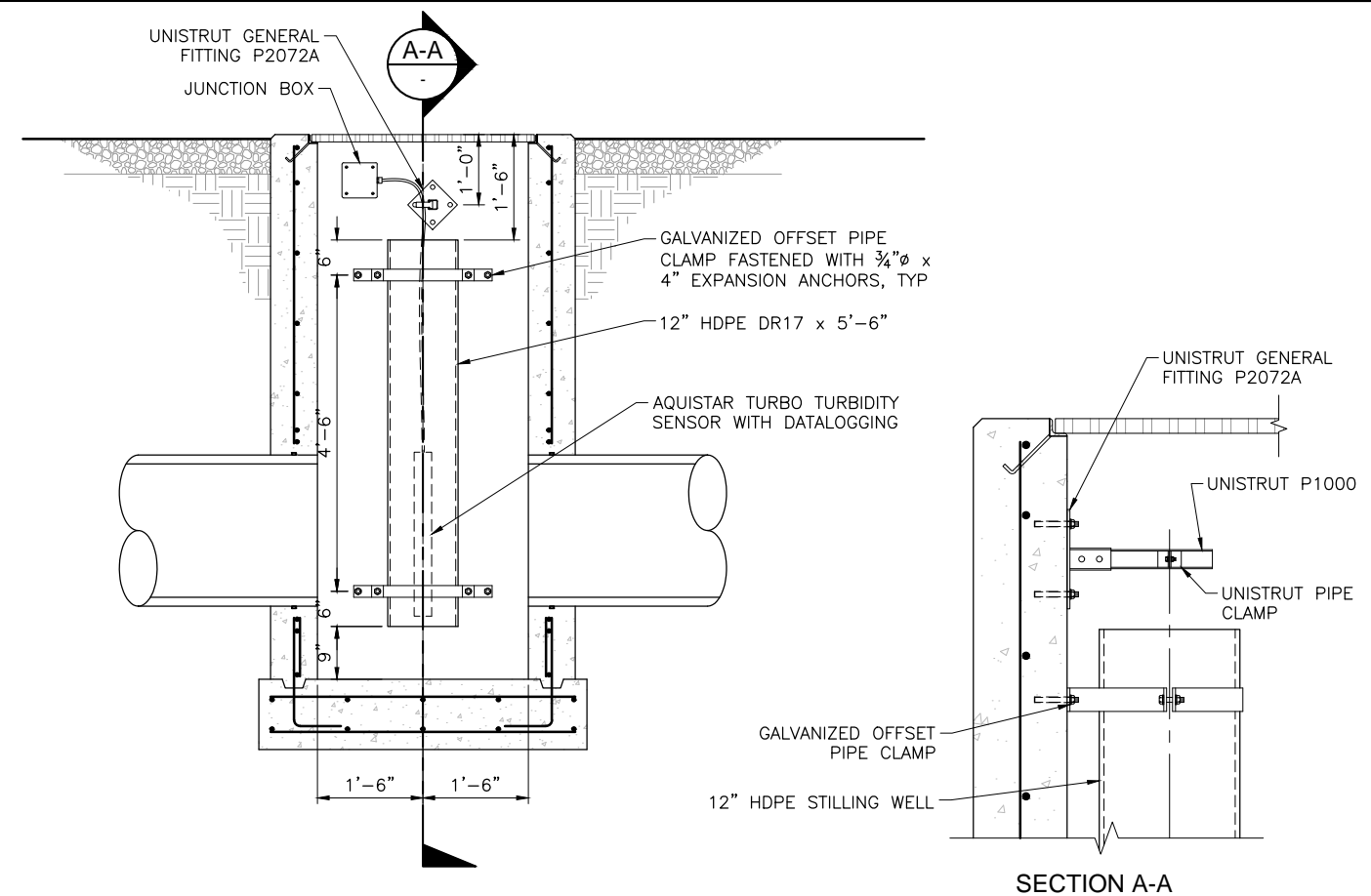


- TRENCH BACKFILL NOTES:**
- FINAL BACKFILL:
    - 90% TYPICAL
    - 95% COMPACTION IN ROAD RIGHT-OF-WAY AND DRIVEWAYS.
    - USE ASTM D 1557 MODIFIED PROCTOR FOR COUNTY ROADWAYS.
    - USE ASTM D 695 STANDARD PROCTOR FOR ALL OTHER AREAS.
    - SUBSOIL TYPE S1, ONSITE BACKFILL TYPE A2, IMPORTED GRANULAR FILL TYPE A1.
    - INSTALL MAGNETIC LOCATOR TAPE 12"-18" BELOW FINISHED SURFACE. CENTER TAPE IN TRENCH.
  - EMBEDMENT:
    - ONSITE EMBEDMENT TYPE A4, IMPORTED EMBEDMENT TYPE A3. LIMIT PARTICLE SIZE TO 1".
    - INITIAL BACKFILL:
      - 90% COMPACTION
      - FILL VOIDS BETWEEN PIPE AND TRENCH SIDES.
      - USE HAND HELD OR WALK BEHIND COMPACTION EQUIPMENT TO PROTECT PIPE.
      - LIFT THICKNESS: MAX. 8" UNCOMPACTED.
    - HAUNCHING:
      - 90% COMPACTION
      - SHOVEL-SLICE AND MANUAL TAMP EMBEDMENT MATERIAL TO ASSURE ALL VOIDS BETWEEN THE PIPE AND THE TRENCH BOTTOM AND SIDES ARE FILLED.
      - COMPACT MATERIAL TO PROVIDE COMPLETE CONTACT WITH PIPE BOTTOM.
    - BEDDING:
      - LEVEL EMBEDMENT MATERIAL TO PROVIDE CONTINUOUS FIRM SUPPORT ALONG FULL LENGTH OF PIPE. HIGH SPOTS SHOULD BE SHAVED OFF AND LOW SPOTS FILLED WITH WELL TAMPED SOIL. EXCAVATE A BELL HOLE, IF NECESSARY, TO ASSURE NO UNDUE WEIGHT IS PLACED ON BELL AND THAT THE PIPE BARREL IS SUPPORTED.
  - FOUNDATION:
    - IMPORTED FOUNDATION TYPE A5.
    - USE FOUNDATION MATERIAL AS REQUIRED TO PROVIDE STRUCTURAL SUPPORT FOR PIPE.

**B1 TRENCH EXCAVATION AND BACKFILL**  
SCALE: NOT TO SCALE



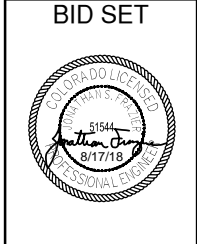
**B2 ACTUATED VALVE VAULT DETAIL**  
SCALE: 3/4" = 1'-0"



**D1 TURBIDITY METER DETAIL**  
SCALE: 3/4" = 1'-0"



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NO.	DESCRIPTION	BY	APPR.	DATE

KANNAH CREEK INTAKE REHABILITATION  
CITY OF GRAND JUNCTION  
BID ALTERNATIVE 1  
DETAILS

FILE: 81-18-011 C-501  
JUB PROJ. #: 81-18-013  
DRAWN BY: JSF  
DESIGN BY: JSF  
CHECKED BY: JSF  
ONE INCH  
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY  
LAST UPDATED: 8/17/2018  
SHEET NUMBER:  
**C1-501**

Plot Date: 8/17/2018 10:55 AM  
 Plot By: Travis Green  
 File Path: F:\PROJECTS\JUB\GRAND JUNCTION\81-18-011 KANNAH CREEK INTAKE CAD\DWG\81-18-011 C-501.DWG



SYMBOL DESCRIPTION	SYMBOL	ABBREVIATIONS	
<b>INSTRUMENT</b>		AE	ANALOG ELEMENT
PRIMARY LOCATION NORMALLY ACCESSIBLE SHARED DISPLAY		AV	AIR VALVE
FIELD PLC		BV	BALL VALVE
PRIMARY ACCESSIBLE PLC		CV	CONTROL VALVE
PRIMARY ACCESSIBLE DISCRETE INSTRUMENT		FE	FLOW ELEMENT
INSTRUMENT TAG		FIT	FLOW INDICATION TRANSMITTER
INSTRUMENT METER		HV	HAND VALVE
SCREEN		IRR	IRRIGATION
SOLENOID OPERATION		P	PUMP
MECHANICAL OPERATION		PCV	PNEUMATIC CONTROL VALVE
ANALOG SIGNAL TO PLC		PI	PRESSURE INDICATOR
ANALOG SIGNAL FROM PLC		PLC	PROGRAMMED LOGIC CONTROLLER
DISCRETE SIGNAL TO PLC		RIO	REMOTE INPUT/OUTPUT
DISCRETE SIGNAL FROM PLC		RW	RAW WATER
VALVES		U	EQUIPMENT
ANGLE VALVE		VFD	VARIABLE FREQUENCY DRIVE
BUTTERFLY VALVE		XS	IN-LINE SCREEN
CHECK VALVE		YIM	MOTOR CONTROL
THREE WAY VALVE		YIV	VALVE CONTROL
BALL VALVE			
<b>LINES</b>			
PRIMARY PIPE			
SECONDARY PIPE			
CONTROL LINE			
PNEUMATIC LINE			
TOP OF WATER			
<b>EQUIPMENT</b>			
PUMP			
VARIABLE VOLUME TANK			
CARTRIDGE FILTER			



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NO.	DESCRIPTION	BY	DATE

**KANNAH CREEK INTAKE REHABILITATION  
CITY OF GRAND JUNCTION**

**BID ALTERNATE 1  
PROCESS AND INSTRUMENTATION DIAGRAM  
LEGEND AND ABBREVIATIONS**

FILE: LEGEND  
 JUB PROJ. #: BG 81-018-011  
 DRAWN BY: ADHS  
 DESIGN BY: BG  
 CHECKED BY: BG

LAST UPDATED: 8/17/2018

SHEET NUMBER:  
**E1-001**

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NO.	REVISION	DESCRIPTION	BY	APPR.	DATE

KANNAH CREEK INTAKE REHABILITATION  
 CITY OF GRAND JUNCTION

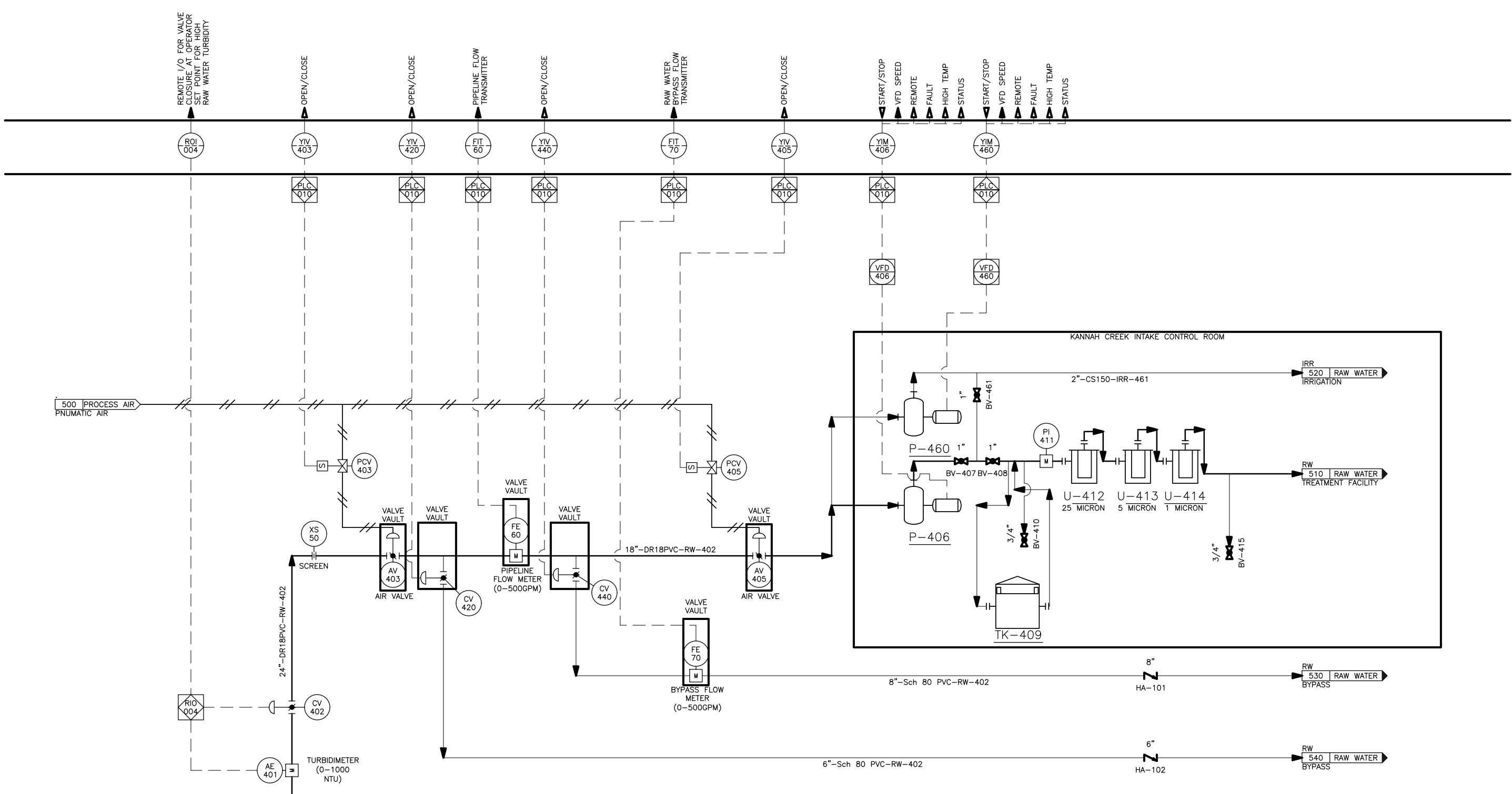
BID ALTERNATE 1  
 PROCESS AND INSTRUMENTATION DIAGRAM

FILE: KANNAH CREEK INTAKE  
 JUB PROJ. #: BG 81-018-011  
 DRAWN BY: ADHS  
 DESIGN BY: BG  
 CHECKED BY: BG

LAST UPDATED: 8/17/2018  
 SHEET NUMBER:

E1-101

Plot Date: 8/17/2018 9:56 AM Plotted By: Travis Green Date Created: 8/17/2018 10:45 AM Project: JUB-GRAND JUNCTION-18-011 - KANNAH CREEK INTAKE REHABILITATION MODEL KANNAH CREEK INTAKE DWG KANNAH CREEK INTAKE DWG



- NOTES:
1. VALVE CV-440 PROVIDES FINE ADJUSTMENTS OF FLOW BASED ON FE-60 AND FE-70.
  2. VALVE CV-402 PROVIDES FLOW CONTROL WITH BASIC SET POINTS.
  3. TURBIDIMETER AE-401 INDICATES OPEN AND CLOSE POINT FOR VALVE CV-402.

GENERAL STRUCTURAL NOTES & SPECIFICATIONS

1. GENERAL.

- A. These general structural notes and specifications supplement the project written technical specifications and the project structural drawings.
B. The Contractor is responsible for all construction bracing, temporary shoring, and other site safety controls required during construction in accordance with all applicable Local, State and Federal regulations, to insure the stability and safety of all construction until it is completed and self-supporting.
C. The Contractor is responsible for all water, both above and below ground, runoff and other environmental controls required during construction to insure the site is maintained in compliance with all applicable Local, State and Federal regulations.
D. Details on these plans are intended to depict the general construction details and methods for this structure. Connection details and conditions not specifically shown that are similar in nature to those that are specified shall be assumed one and the same. If questions regarding the application of details are encountered, notify the Engineer for clarification or instruction.
E. Prior to implementing any changes to these plans, the Engineer shall be notified in writing for their written approval. Changes implemented without the Engineers written approval shall relieve the Engineer of any claim or liability resulting from that portion of the structure changed or affected by the change.
F. Where these General Structural Notes, the Project Geotechnical Report and/or the Project Technical Specifications differ or conflict, the more stringent requirement shall apply, unless otherwise directed by the Project Engineer.

2. CONTRACTOR RESPONSIBILITY FOR COORDINATION

- A. It is the Contractor's prime responsibility to coordinate the work shown on all of the Project Drawings, general, special and technical specifications.
B. The Contractor is responsible to verify all existing construction material types dimensions, elevations and conditions.
C. The Contractor shall verify and coordinate the dimensions among all drawings and in the field prior to proceeding with any work or fabrication, any discrepancy shall be immediately reported to the Engineer.
D. It is the Contractor's responsibility to carefully study and coordinate the construction requirements shown on all of the Drawings. When conflicts or discrepancies are within these drawings, the Contractor shall report them immediately to the project Engineer for direction and/or clarification.
E. Any construction work done by the Contractor before obtaining such clarification from the Project Engineer shall be at the Contractor's own risk and cost. Furthermore; any work required to correct, replace and/or restore the work as directed by the Engineer shall be at the Contractor's own risk and cost.

3. CODES.

- A. International Building Code, IBC 2015 Edition.
B. Minimum Design Loads for Buildings and Other Structures, ASCE 7; current edition.
C. American Concrete Institute, ACI 318, Building Code Requirements for Structural Concrete; current edition.
D. American Concrete Institute, ACI 350, Code Requirements for Environmental Engineering Concrete Structures; current edition.
E. American Concrete Institute, ACI 301, Specifications for Structural Concrete.
F. American Welding Society, AWS D1.1 current edition, Structural Welding Code.

4. SPECIAL INSPECTIONS. Special Inspections per IBC Chapter 17 are required for the following items: C indicates Continuous, P indicates Periodic.

Table with 3 columns: MATERIAL, FREQUENCY, and description of inspection items such as Soils, Concrete, Post Installed Concrete Anchors, Structural steel, and Welding performed in the shop.

5. SUBMITTALS.

- A. Submit required copies, four (4) minimum, of product or material design information to the Engineer for review for the following items:
A.1. Concrete mix designs and admixtures.
A.2. Expansion bolts.
A.3. Epoxy Anchors.

6. DEFERRED SUBMITTALS. The following items to be designed by others are considered "Deferred Submittals". Deferred submittals shall be accompanied by design drawings, shop drawings and structural calculations, stamped and signed by a Professional Structural Engineer currently registered in the State of Colorado.

- A. Pre-engineered and shop fabricated galvanized steel floor grating, supports and connections.

7. SHOP DRAWINGS:

- A. Submit required copies of shop drawings, four (4) minimum, to the Engineer for review prior to fabrication of the following items:
A.1. Reinforcing steel for all concrete.
A.2. Miscellaneous steel fabrications including railing, bar-grating, and debris screen.

8. DESIGN CRITERIA.

- A. OCCUPANCY OR USE; IBC Table 1607.1: Water Treatment Facility
B. OCCUPANCY CATEGORY: IBC Table 1604.5: III
C. Floor Live Load 100 psf or 300 lb concentrated load
D. Snow Load: Ground Snow Load Pg=40 psf
E. Wind Load
E.1. Ultimate Wind Speed V = 120 mph
E.2. Wind Importance Factor Iw = 1.0
E.3. Wind Exposure C

10. FOUNDATIONS.

- A. All footings to be placed on properly prepared native soil, or on properly placed and compacted structural fill extending to native soil, verified by a geotechnical engineer to have an allowable minimum bearing capacity of 3,000 psf. Moisture condition and proof roll sub-grade prior to placing concrete where the material has been disturbed by the excavating equipment.
B. All piers and footings outside or at the perimeter of the structure, or in other unheated areas shall be set to a depth of at least 24" below finish grade, unless other wise noted on the plans.
C. All foundations and retaining walls below finish grade shall receive an approved damp-proof coating. Foundation walls below maximum anticipated ground water levels shall receive an approved water-proof coating; extend water-proofing to a minimum of 1'-0" above the maximum anticipated ground water level.
D. Allowable bearing pressure for all footings Qa = 3,000 psf
E. Local areas of soft and/or unacceptable material encountered at bottom of footing elevations indicated on the plans must be over-excavated and brought up to design grade with compacted "structural fill" or "lean concrete fill".
F. All structural fill and/or backfill shall be granular, free draining, material; Unified Soils Classification GW, GP, GM or SW;
F.1. Structural Fill at all locations and elevations above groundwater: maximum aggregate size of 3-in. 35%-60% passing a No. 4 sieve, and no more than 15% passing a number 200 sieve.
F.2. Free-Draining Granular Backfill at all locations and elevations below groundwater: maximum aggregate size of 1-1/2-in, 95%-100% 1-in or less, 25%-60% 1/2-in or less, and no more than 5% passing a number 200 sieve.
F.3. Stabilization Fill on soft subgrade: Clean crushed angular rock with a maximum size of 4-in and no more than 5% passing a number 200 sieve.
F.4. Material shall be placed in lifts no greater than 8-in. in depth and compacted to 95% of maximum density as determined per ASTM D1557.
G. Design for the mitigation of subsurface water flow and/or perched water tables shall be the responsibility of the contractor.
H. The Engineer shall be notified in writing if any ground water, clay type soils, debris or unconsolidated materials are encountered during excavations for foundations.
I. Do not backfill basement walls until supporting floors are in place and complete.
J. Refer to the final project Geotechnical Investigation, Kannah Creek Intake, Whitewater, Colorado, by Huddlestone-Berry Engineering & Testing, LLC. Huddlestone-Berry Project No. 00208-0079, dated May 4, 2018.

11. CONCRETE.

- A. GENERAL. Concrete shall be proportioned to provide an average compressive strength, fc, as prescribed in ACI 318 Section 26.4.3 and shall satisfy the durability criteria of ACI 318 Chapter 19.
B. PROJECT CONCRETE MIX TYPES: Concrete shall be proportioned and furnished for the various project uses as indicated on the plans and as follows:
B.1. M4500-std: Standard structural concrete mix for all structural concrete including footings, retaining walls, and all other structural concrete: f'c = 4,500 psi, Absolute water-cement ratio by weight = 0.45, Air Content = 6% (+/- 1.5%)
C. CONCRETE MIX COMPONENTS.
C.1. A water-reducing admixture conforming to ASTM C494, used in strict conformance with the manufacturers instructions, shall be incorporated in all concrete mix designs.
C.2. For all water-retaining concrete structural walls and slabs, a high-range water-reducing (HRWR) admixture conforming to ASTM C494, Type F or G, shall be used. The total slump shall be less than 10-in.
C.3. Higher water-cement ratios than shown above may be used if substantiated in accordance with ACI 318-89, Chapter 5.
C.4. Fly-ash conforming to ASTM C618 Type F or C, may replace up to 20% of the cement content, provided that the mix strength is substantiated by test data.
C.5. Cement: ASTM C150 Type II.
C.6. Water: Clean & Potable.
C.7. Air entraining agent: ASTM C260. Except where noted non-air entrained.
C.8. Aggregate: 0.75-inch Maximum aggregate per ASTM C33. Unless noted otherwise.
C.9. Mix Proportioning: ACI 211.1 and 350R.
D. CONCRETE ACCESSORIES:
D.1. REINFORCING STEEL: Reinforcing steel shall conform to ASTM A615 Grade 60; #3 bars may be Grade 40.
D.2. EXPANSION BOLTS: Bolts noted on the plans as Expansion Bolts shall be HILTI Kwik Bolt-II, stud anchors; size and embedment as noted on the drawings, installed per the manufacturers recommendations; or an approved equal.
D.3. EPOXY SET BOLTS & REBAR: Bolts and reinforcing steel bars noted on the plans as Epoxy or Construction Adhesive Set Bolts or Rebar shall be set in place utilizing the SIMPSON SET High Strength Epoxy system; size and embedment as noted on the drawings, installed per the manufacturers recommendations; or an approved equal.

- D.4. HEADED ANCHOR/STUDS: Headed Anchor/studs shall be Nelson headed anchors with fluxed ends or approved conforming to AWS D1.1, Type A headed studs made form ASTM A108, 1010-1020, low-carbon steel. Shear Connector/Studs shall be automatically end-welded with the manufacturers standard equipment in accordance with their recommendations.
D.5. JOINTING MATERIALS: In accordance with ACI 350 Section 4.5.2. All jointing materials including water-stops, expansion joints and sealants, shall be resistant to chemical attack for the design life of the facility. Sealants shall conform to ASTM C 920 and Federal Specification TT-S-00277E and PVC Water-stop shall conform to ASTM D 570, ASTM D 746, STM D 1149 and CRD-C572.
E. CONCRETE PROPORTIONS.
E.1. Concrete mix proportioning shall be in accordance with ACI 211.1; Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
F. CONCRETE MIX VERIFICATION: Concrete mix designs shall be verified by standard 28-day cylinder tests per ASTM C39.
G. EVALUATION AND ACCEPTANCE OF CONCRETE. Concrete shall be tested in accordance with the requirements of ACI 318 Section 26.12.
H. MIXING & PLACING CONCRETE. Concrete shall be prepared, mixed, placed and consolidated in accordance with ACI 318 Section 26.5 and as follows:
H.1. ACI 304; Guide for Measuring, Mixing, Transporting, and Placing Concrete.
H.2. ACI 309; Guide for Consolidation of Concrete.
I. CONCRETE CURING. Concrete shall be maintained above 50-degrees F and in a moist condition for at least 7 days after placement, except when cured in accordance with ACI 318 Section 26.5.3.
I.1. Curing of concrete shall be per the recommendations given in ACI 308; Guide to Curing Concrete.
J. COLD WEATHER REQUIREMENTS. Adequate equipment shall be provided for heating concrete materials and protecting concrete during freezing or near-freezing weather. The recommended procedures listed in ACI 306; Cold Weather Concreting shall be followed.
J.1. Cold weather is defined as a period when, for more than 3 consecutive days, the following conditions exist:
J.1.a. The average daily air temperature is less than 40-degrees F and
J.1.b. The air temperature is not greater than 50-degrees F for more than one-half of any 24-hour period.
K. HOT WEATHER REQUIREMENTS. During hot weather, proper attention shall be given to ingredients, production methods, handling, placing, protection, and curing to prevent excessive concrete temperatures or water evaporation that could impair required strength or serviceability of the member or structure. The recommended procedures listed in ACI 305; Hot Weather Concreting shall be followed.
K.1. Hot weather is any combination of the following conditions that tends to impair the quality of freshly mixed or hardened concrete by accelerating the rate of moisture loss and rate of cement hydration, or otherwise causing detrimental results:
K.1.a. High ambient temperature.
K.1.b. High concrete temperature.
K.1.c. Low relative humidity.
K.1.d. Wind speed.
K.1.e. Solar radiation.
L. WATER-RETAINING CONCRETE STRUCTURES:
L.1. Concrete tanks, vaults, wells and other structures intended to retain and hold water or other liquids shall be water-tight structures. The water-resisting walls and floor slabs shall be of monolithic concrete construction where indicated, with water-tight joints, constructed as indicated on the plans or as directed by the Project Engineer. Water-resisting walls and floors shall be uniform in finished construction free of spalls, pockets, blemishes and or cracks that may weep or leak.
L.2. Cracks found in water-resisting walls, floors and/or foundation slabs that may weep or leak shall be repaired and/or sealed per the Project Specifications, notes or as approved by the project engineer.

12. FORMWORK AND FINISHING.

- A. Forms shall result in a final structure that conforms to shapes, lines, and dimensions of the members as required by the design drawings and specifications.
A.1. Design of formwork shall be in accordance with ACI 318 Section 26.11.1.
A.2. Formwork shall be in accordance with ACI 347; Guide to Formwork for Concrete.
B. Tolerances for finished concrete surfaces shall meet the following requirements from ACI 117, class of surface is per Table 4.8.3:
B.1. Footings: Class C
B.2. Foundation walls: Class B
B.3. Above grade concrete not visible to sight: Class B
B.4. Above-grade concrete visible to sight: Class A
C. REMOVAL OF FORMS.
C.1. Concrete forms shall not be removed until the retained concrete has reached the following minimum percentage of the required 28 day compressive strength:
C.1.a. Footings and base slabs on grade: 50% of f'c.
C.1.b. Foundation walls and columns: 67% of f'c.
C.2. Where concrete cylinder tests are not available for strength verification the following guide may be used when permitted by the Project Engineer:
C.2.a. Footings and base slabs on grade: 12 hours.
C.2.b. Foundation walls and columns: 24 hours.
D. EMBEDMENTS IN CONCRETE.
D.1. Conduits, pipes, and sleeves of any material not harmful to concrete and within limitations of ACI 318 Sections 20.7 and 26.8 and shall be permitted to be embedded in concrete with approval of the Project Engineer, provided they are not considered to replace structurally the displaced concrete.
D.2. Conduits and pipes of aluminum shall not be embedded in structural concrete unless effectively coated or covered to prevent aluminum-concrete reaction or electrolytic action between aluminum and steel.
E. CONSTRUCTION JOINTS.
E.1. Construction joints shall only be placed where indicated on the project drawings or as approved by the Project Engineer.
E.2. Construction joints shall be constructed in accordance with ACI 318 Section 26.5.6.
E.3. Sawed contraction joints. Conform to ACI 301 Section 5.3.5.
F. CONCRETE FINISHING. All concrete surfaces shall be finished in accordance with ACI 301.

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BID SET logo and seal with date 8/17/18

Table with columns: NO., DESCRIPTION, BY, DATE, REVISION

KANNAH CREEK INTAKE REHABILITATION CITY OF GRAND JUNCTION BID ALTERNATIVE 1 GENERAL STRUCTURAL NOTES

FILE: 81-18-011\_S1-001X, JUB PROJ. #: 81-18-013, DRAWN BY: JSF, DESIGN BY: JSF, CHECKED BY: JSF, SHEET NUMBER: S1-001

Plot Date: 8/17/2018 9:12 AM, Plotted By: Jon Fisher, Date Created: 7/20/2018, P:\PROJECTS\JUB\GRAND JUNCTION\81-18-011\_KANNAH CREEK INTAKE\CAD\SHETS\STRUCT\01\81-18-011\_S1-001.DWG

GENERAL STRUCTURAL NOTES & SPECIFICATIONS CONTINUED

- G. Formed Concrete Surfaces. After removal of forms, give each formed surface one or more of the following finishes:
  - G.1. Non-liquid Retaining Concrete Structures:
    - G.1.a. Concrete footings and foundations not exposed to view. Provide a surface finish SF-1.0 per Section 5.3.3.3.a.
    - G.1.b. Foundation wall and other surfaces below grade and not exposed to view. Provide a surface finish SF-2.0 per Section 5.3.3.3.b.
    - G.1.c. Foundation wall and other surfaces above grade and exposed to view. Provide a surface finish SF-3.0 per setion 5.3.3.3.c.
  - G.2. Liquid Retaining Concrete Structures:
    - G.2.a. Interior surfaces from top of wall to floor slab, exterior and top surfaces exposed to view to 6-inches below grade. Provide a Grout-cleaned finish per ACI 301 Section 5.3.3.4.b.
    - G.2.b. Surfaces below grade and not exposed to view. Provide a "Smooth-rubbed finish per ACI 301 Section 5.3.3.4.a.
- H. Unformed Concrete Surfaces. Unformed concrete surfaces including the top surface of all concrete roof and floor slabs shall be finished in accordance with ACI 301 Section 5.3.4 and ACI 302 Chapter 8.
  - H.1. For the top surfaces of walls, provide a "Scratched finish" per Section 5.3.4.2.a.

16. DETAILS OF REINFORCEMENT.

- A. Placement of all reinforcing steel within concrete structures shall be in conformance with ACI 318 Chapter 25.
- B. Reinforcing steel hooks, bends, ties, splices and other reinforcement details shall be in accordance with ACI 315; Details and Detailing of Concrete Reinforcement.
- C. Spacing limits for reinforcement shall be in conformance with ACI 318 Section 25.2.
- D. Concrete protection for reinforcement. Unless noted elsewhere on the drawings, all reinforcing steel shall have the following concrete cover:
  - D.1. For non-liquid containing concrete structures; per ACI 318 Section 20.6.1.3:
    - D.1.a. Concrete cast against earth: 3.00 inch
    - D.1.b. Concrete exposed to earth or weather;
      - D.1.b.1. No. 5 or smaller bars: 1.50-inch
      - D.1.b.2. No. 6 or larger bars: 2.00-inch
    - D.1.c. Concrete not exposed to earth or weather;
      - D.1.c.1. No. 11 or smaller bars: 0.75-inch
      - D.1.c.2. No. 14 or larger bars: 1.50-inch
  - D.2. For liquid containing concrete structures; per ACI 350 Section 7.7:
    - D.2.a. Concrete cast against earth: 3.00 inch
    - D.2.b. Concrete exposed to earth, liquid or weather;
      - D.2.b.1. Slabs and joints: 2.00-inch
      - D.2.b.2. Walls: 2.00-inch
    - D.2.c. Footings and base slabs;
      - D.2.c.1. Formed surfaces: 2.00-inch
      - D.2.c.2. Top of footings and base slabs: 2.00-inch
- E. Concrete blocks or plastic-coated bar chairs shall be provided for support of all slab reinforcing steel, sufficient in number to prevent settlement or sagging, but in no case shall such support be continuous. Metal clips or supports shall not be placed in contact with the forms or the sub-grade.
- F. Dowels and anchor bolts shall be wired or otherwise held in correct position prior to placing concrete. Care shall be taken to insure that dowels and anchor bolts remain plum after concrete is poured and vibrated. In no case shall dowels or anchor bolts be stabbed into freshly poured concrete!
- G. Provide dowels in footings and at construction joints to match vertical reinforcing bar size and spacing, unless otherwise noted on the drawings.
- H. Where drilled in anchors are to be post-installed into concrete surfaces take care to locate reinforcing steel so that it will not interfere with the drilling operations. Move bars plus or minus 1 to 2 inches in order to avoid drilling conflicts.
- I. All bar bends, hooks, splices and other reinforcing steel details shall conform to the requirements of ACI 315.
- J. Unless otherwise noted on the plans all bars shall be spliced with a minimum Class A lap splice; lap splices of deformed bars and deformed wire in tension zones shall be Class B splices.
- K. At all corners and wall intersections provide bent bars to match the horizontal reinforcing steel and in accordance with the typical corner reinforcing details.
- L. Chamfer all exposed corners and fillet entrant angles 3/4" unless otherwise noted on the drawings.
- M. WATERSTOP. All control and construction joints in liquid-retaining structures shall be doweled, keyed and provided with continuous water-stop, per the typical details, technical specifications or as directed by the Project Engineer.
- N. At slab and wall openings provide a minimum of (4) #5 bars; over, under and at either side of the openings. Extend these bars a minimum of 24" past the opening edge. Provide (1) matt of (4) #5 bars for walls or slabs with single-layer reinforcing and (2) matts of (4) #5 bars for double-layer reinforcing walls or slabs. Provide #4, 4'-0" long diagonal bars at each re-entrant corner in slabs; (1) bar for slabs with single layer reinforcing and (2) bars for slabs with double layer reinforcing.

19. STRUCTURAL STEEL.

- A. STRUCTURAL STEEL SHAPES:
  - A.1. W & WT SHAPES: ASTM A572 Grade 50 with special requirements per AISC Technical Bulletin #3, dated March 1997; or ASTM A992 Grade 50, Fy=50 ksi.
  - A.2. M & S SHAPES: ASTM A36, Fy=36 ksi.
  - A.3. PLATES, BARS, CHANNELS & ANGLES: ASTM A36, Fy=36 ksi.
  - A.4. STEEL PIPE: ASTM A53 Grade B, Fy=35 ksi.
  - A.5. SQUARE, RECTANGULAR HSS, STEEL TUBING: ASTM A500 Grade B, Fy=46 ksi.
  - A.6. RAISED PATTERN FLOOR PLATE: ASTM A786. Fy=36 ksi.
- B. STRUCTURAL BOLTS: High Strength Bolts shall be ASTM A325, Type 1. Nuts for High Strength Bolts shall conform to ASTM A563, Grade DH, Heavy Hex.
- C. ANCHOR RODS: Anchor Rods (bolts set into concrete) shall be ASTM F1554, Fy=36 ksi. Nuts for anchor rods shall conform to ASTM A563, Grade A, Heavy Hex.
- D. THREADED STEEL RODS: Threaded steel rods shall conform to ASTM A36, Fy=36 ksi. Nuts for threaded rods shall conform to ASTM A563, Grade A, Heavy Hex.
- E. WASHERS: All washers shall conform to ASTM F436.
- F. BOLT PLACEMENT: All bolts shall be on member standard gage lines except as noted

- otherwise.
- G. WELDING OF STRUCTURAL STEEL. All welding shall conform to the requirements of the current AWS Structural Welding Code D1.1-02
  - G.1. Weld Metal: Fexx=70 ksi, typical unless otherwise noted or required by AWS.
  - G.2. All welders shall be tested and certified by an independent testing agency.
  - G.3. Qualification of welders shall be in accordance with the Specifications for Standard Qualification Procedure of the AWS.



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BID SET



NO.	DESCRIPTION	BY	DATE

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KANNAH CREEK INTAKE REHABILITATION  
 CITY OF GRAND JUNCTION  
 BID ALTERNATIVE 1  
 GENERAL STRUCTURAL NOTES

FILE: 81-18-011\_S1-001X  
 JUB PROJ. #: 81-18-013  
 DRAWN BY: JSF  
 DESIGN BY: JSF  
 CHECKED BY: JSF

ONE INCH  
 AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY  
 LAST UPDATED: 7/29/2018

SHEET NUMBER:  
**S1-002**

Plot Date: 8/17/2018 9:15 AM, Plotted By: Jon Fisher, Date Created: 7/29/2018, P:\PROJECTS\JUB\GRAND JUNCTION\81-18-011\_KANNAH CREEK INTAKE CAD SHEET\STRUCTURAL\81-18-011\_S1-001X.DWG

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**KANNAH CREEK INTAKE REHABILITATION  
CITY OF GRAND JUNCTION**

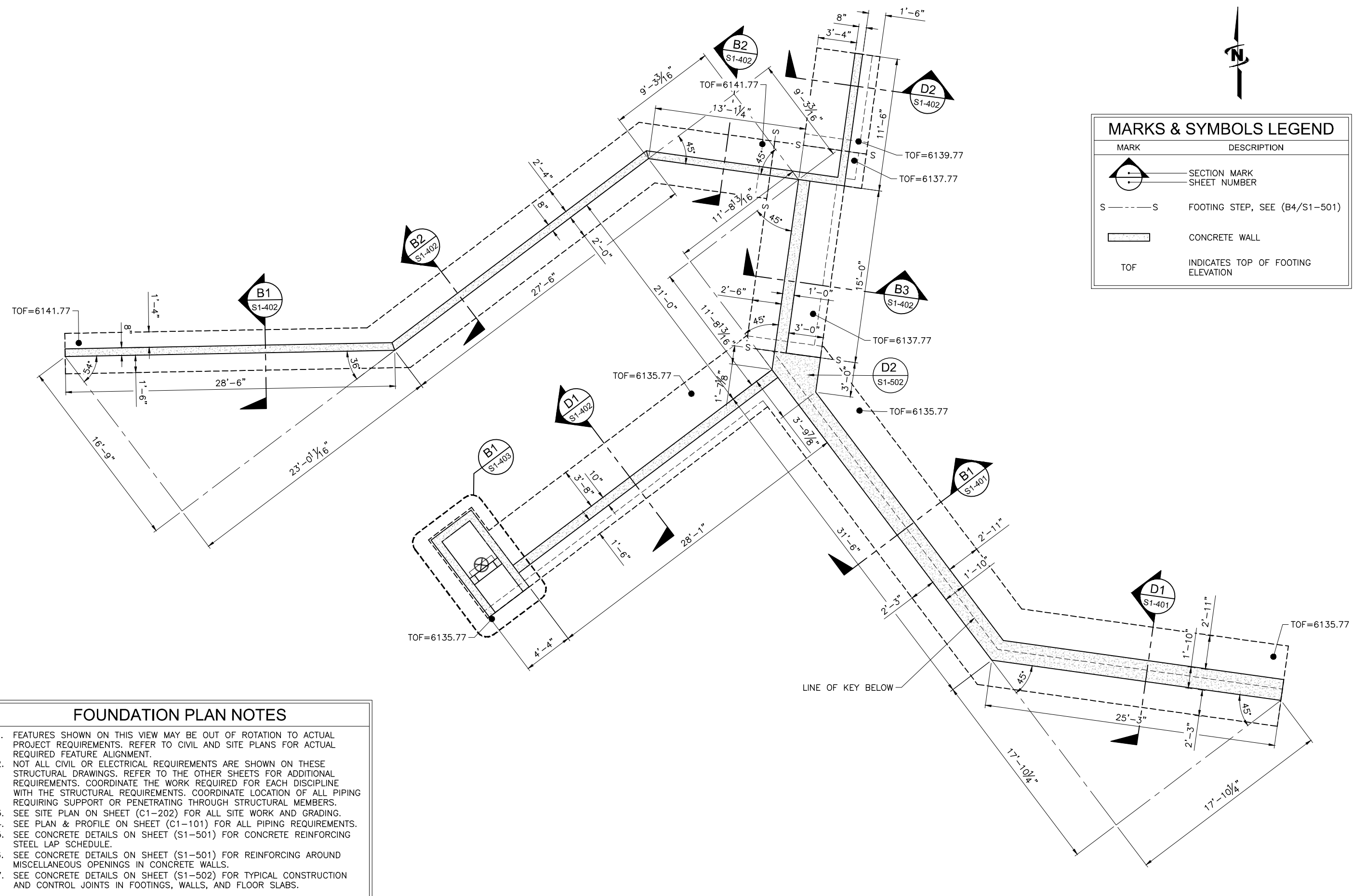
**BID ALTERNATIVE 1  
FOOTING & FOUNDATION PLAN**

FILE: 81-18-011\_S1-101X  
JUB PROJ. #: 81-18-013  
DRAWN BY: JSF  
DESIGN BY: JSF  
CHECKED BY: JSF  
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY  
LAST UPDATED: 7/29/2018  
SHEET NUMBER:  
**S1-101**



**MARKS & SYMBOLS LEGEND**

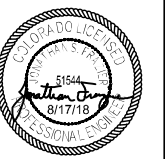
MARK	DESCRIPTION
	SECTION MARK SHEET NUMBER
S - - - - S	FOOTING STEP, SEE (B4/S1-501)
	CONCRETE WALL
TOF	INDICATES TOP OF FOOTING ELEVATION



**FOUNDATION PLAN NOTES**

1. FEATURES SHOWN ON THIS VIEW MAY BE OUT OF ROTATION TO ACTUAL PROJECT REQUIREMENTS. REFER TO CIVIL AND SITE PLANS FOR ACTUAL REQUIRED FEATURE ALIGNMENT.
2. NOT ALL CIVIL OR ELECTRICAL REQUIREMENTS ARE SHOWN ON THESE STRUCTURAL DRAWINGS. REFER TO THE OTHER SHEETS FOR ADDITIONAL REQUIREMENTS. COORDINATE THE WORK REQUIRED FOR EACH DISCIPLINE WITH THE STRUCTURAL REQUIREMENTS. COORDINATE LOCATION OF ALL PIPING REQUIRING SUPPORT OR PENETRATING THROUGH STRUCTURAL MEMBERS.
3. SEE SITE PLAN ON SHEET (C1-202) FOR ALL SITE WORK AND GRADING.
4. SEE PLAN & PROFILE ON SHEET (C1-101) FOR ALL PIPING REQUIREMENTS.
5. SEE CONCRETE DETAILS ON SHEET (S1-501) FOR CONCRETE REINFORCING STEEL LAP SCHEDULE.
6. SEE CONCRETE DETAILS ON SHEET (S1-501) FOR REINFORCING AROUND MISCELLANEOUS OPENINGS IN CONCRETE WALLS.
7. SEE CONCRETE DETAILS ON SHEET (S1-502) FOR TYPICAL CONSTRUCTION AND CONTROL JOINTS IN FOOTINGS, WALLS, AND FLOOR SLABS.

Plot Date: 8/17/2018 9:26 AM, Plotted By: Jon Fisher  
 Date Created: 7/29/2018, P:\PROJECTS\JUB\GRAND JUNCTIONS\81-18-011\_KANNAH CREEK INTAKE CAD\DWG\STRUCTURAL\81-18-011\_S1-101.DWG



NO.	REVISION	DESCRIPTION	BY	APPR	DATE

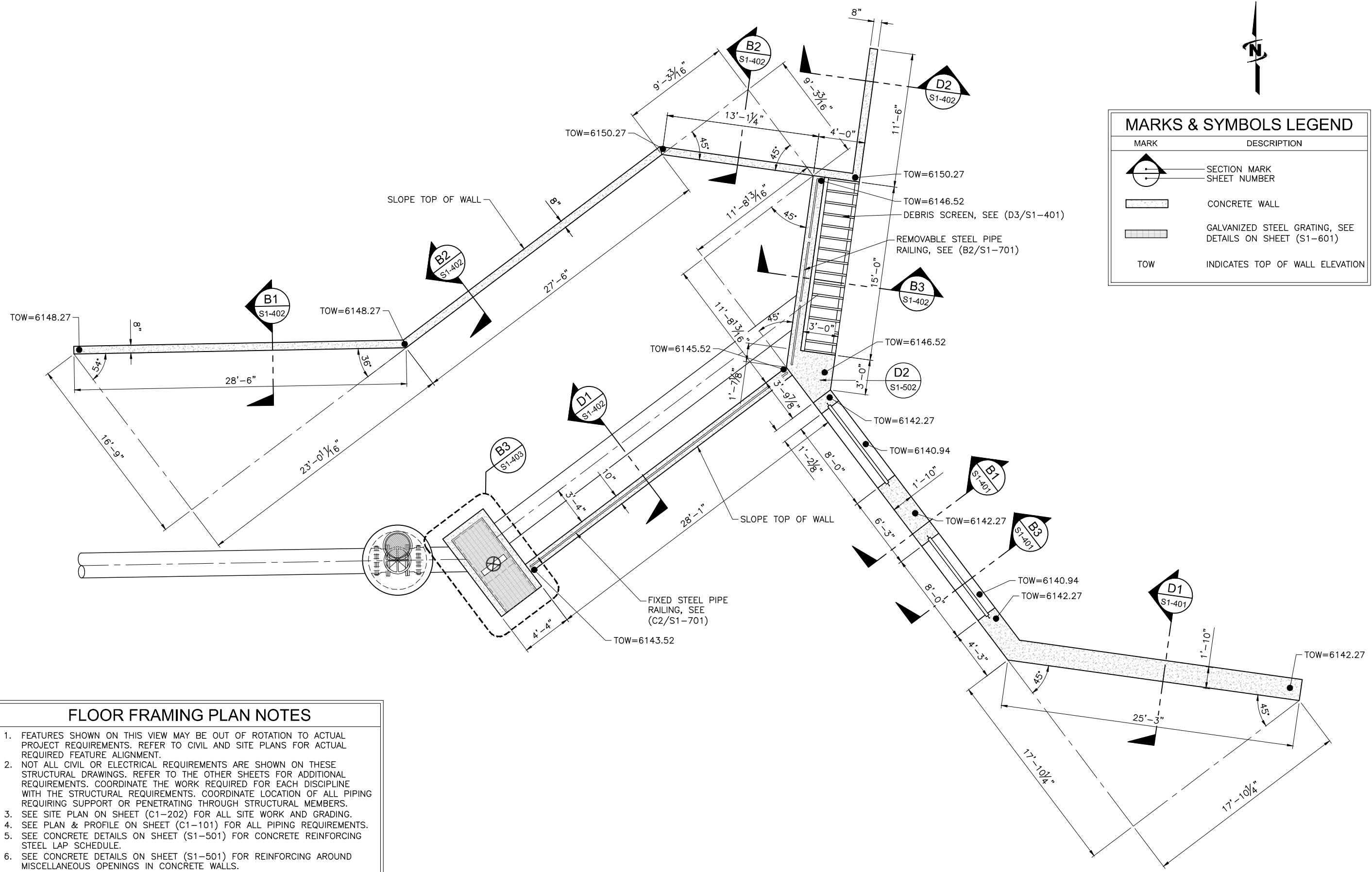
**KANNAH CREEK INTAKE REHABILITATION**  
**CITY OF GRAND JUNCTION**  
 BID ALTERNATIVE 1  
 FLOOR FRAMING PLAN

FILE: 81-18-011\_S1-101X  
 JUB PROJ. #: 81-18-013  
 DRAWN BY: JSF  
 DESIGN BY: JSF  
 CHECKED BY: JSF  
 AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY  
 LAST UPDATED: 7/20/2018  
 SHEET NUMBER:  
**S1-102**



**MARKS & SYMBOLS LEGEND**

MARK	DESCRIPTION
	SECTION MARK SHEET NUMBER
	CONCRETE WALL
	GALVANIZED STEEL GRATING, SEE DETAILS ON SHEET (S1-601)
TOW	INDICATES TOP OF WALL ELEVATION



**FLOOR FRAMING PLAN NOTES**

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3. SEE SITE PLAN ON SHEET (C1-202) FOR ALL SITE WORK AND GRADING.
4. SEE PLAN & PROFILE ON SHEET (C1-101) FOR ALL PIPING REQUIREMENTS.
5. SEE CONCRETE DETAILS ON SHEET (S1-501) FOR CONCRETE REINFORCING STEEL LAP SCHEDULE.
6. SEE CONCRETE DETAILS ON SHEET (S1-501) FOR REINFORCING AROUND MISCELLANEOUS OPENINGS IN CONCRETE WALLS.
7. SEE CONCRETE DETAILS ON SHEET (S1-502) FOR TYPICAL CONSTRUCTION AND CONTROL JOINTS IN FOOTINGS, WALLS, AND FLOOR SLABS.

Plot Date: 8/17/2018 8:37 AM, Plotted By: Jon Fisher, Date Created: 7/20/2018, P:\PROJECTS\JUB\GRAND JUNCTIONS - 81-011\_KANNAH CREEK INTAKE\CAD\STRUCTURAL\81-18-011\_S1-101.XDWS

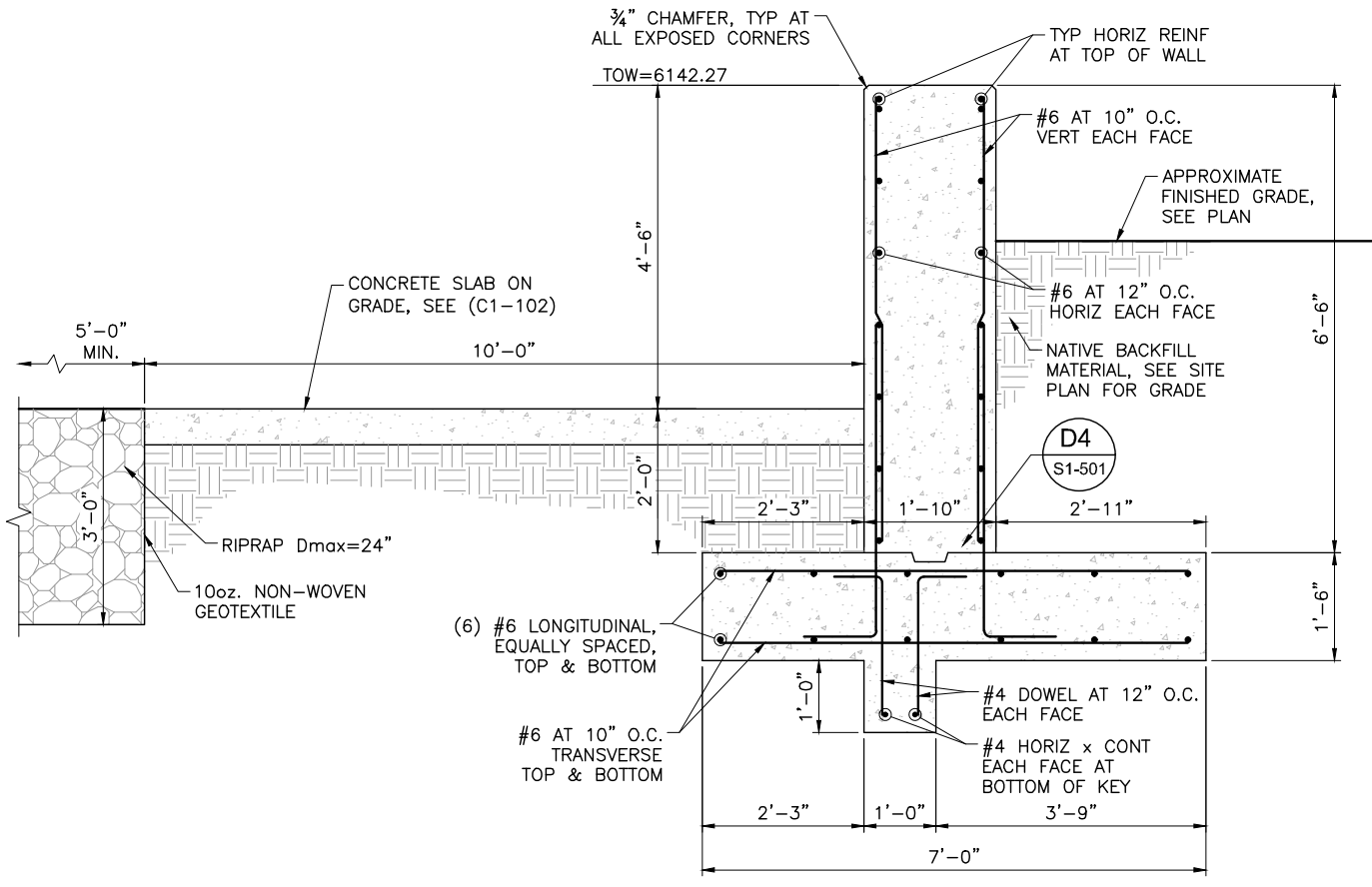


REUSE OF DRAWINGS

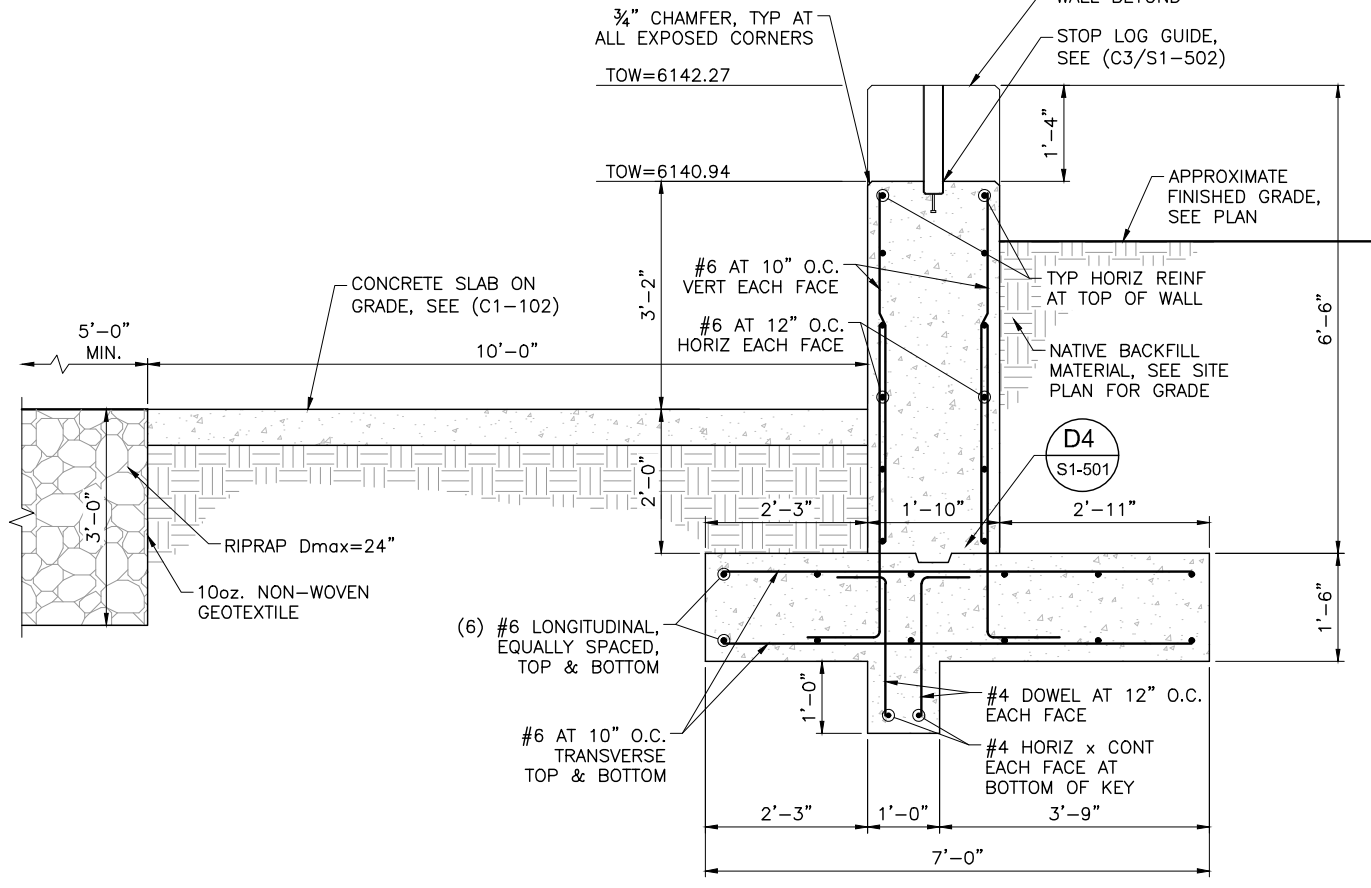
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NO.	REVISION	DESCRIPTION	BY	DATE

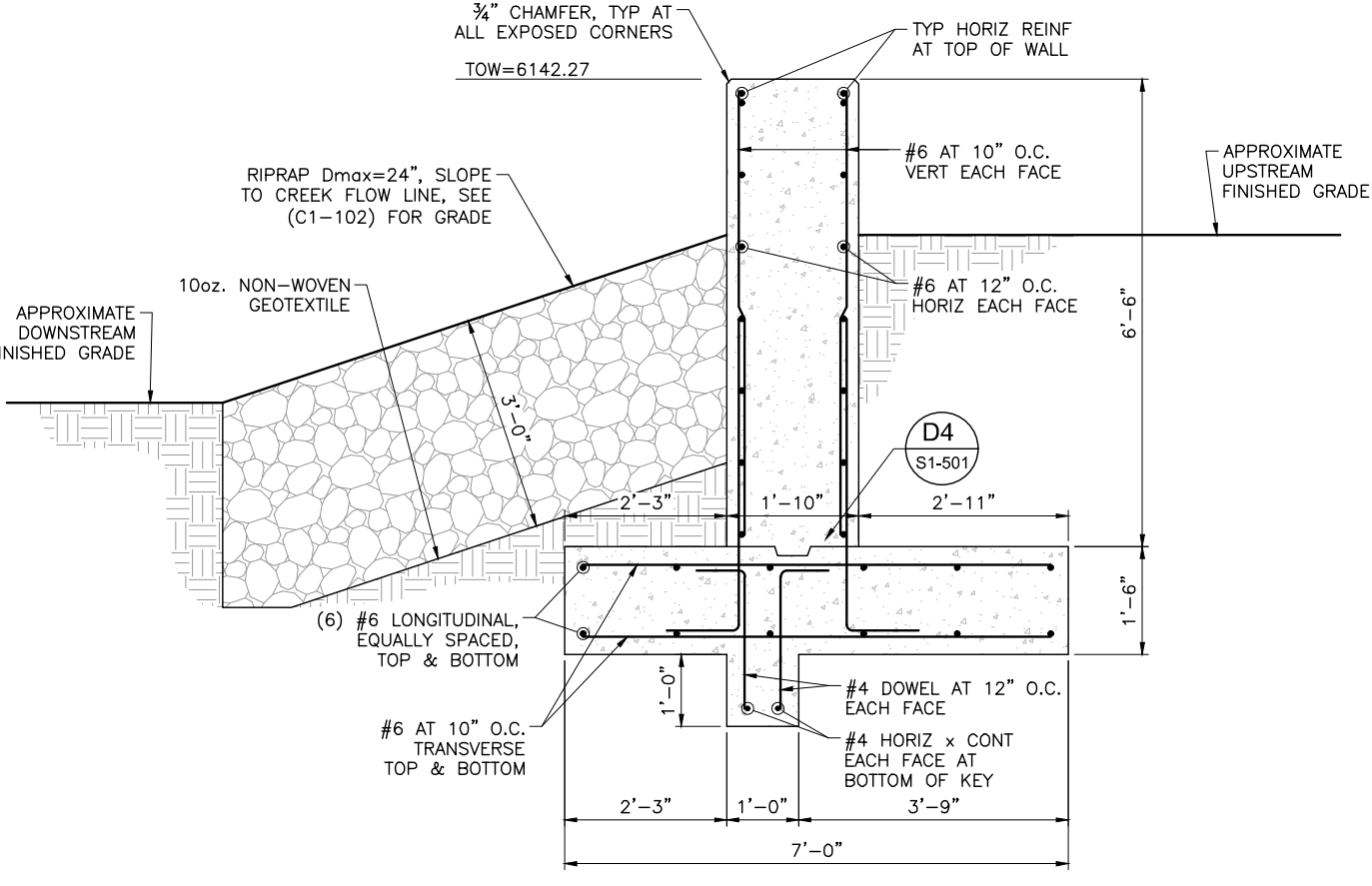
KANNAH CREEK INTAKE REHABILITATION  
 CITY OF GRAND JUNCTION



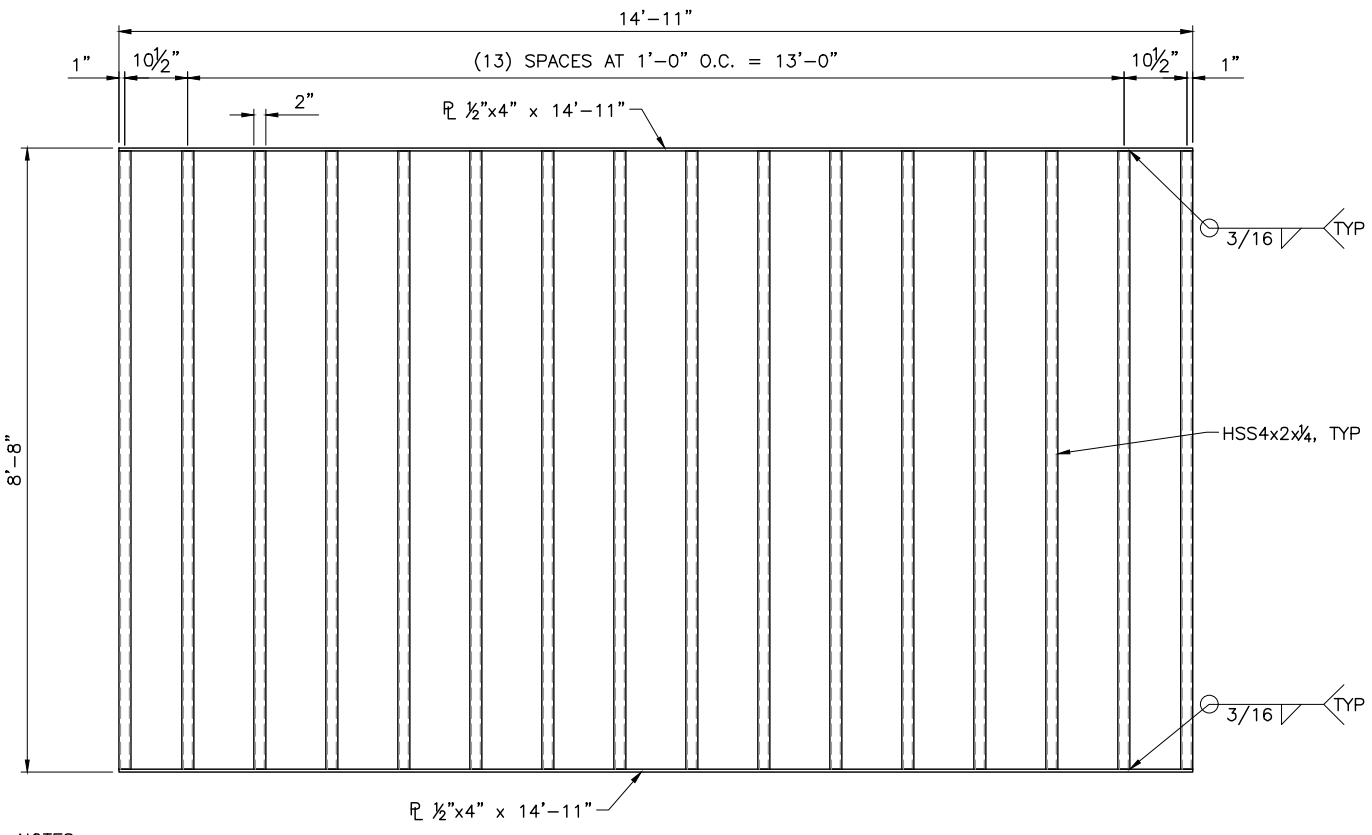
**B1** CHECK DAM CENTER SECTION  
 SCALE: 1/2" = 1'-0"



**B3** CHECK DAM STOP LOG SECTION  
 SCALE: 1/2" = 1'-0"



**D1** CHECK DAM END SECTION  
 SCALE: 3/4" = 1'-0"



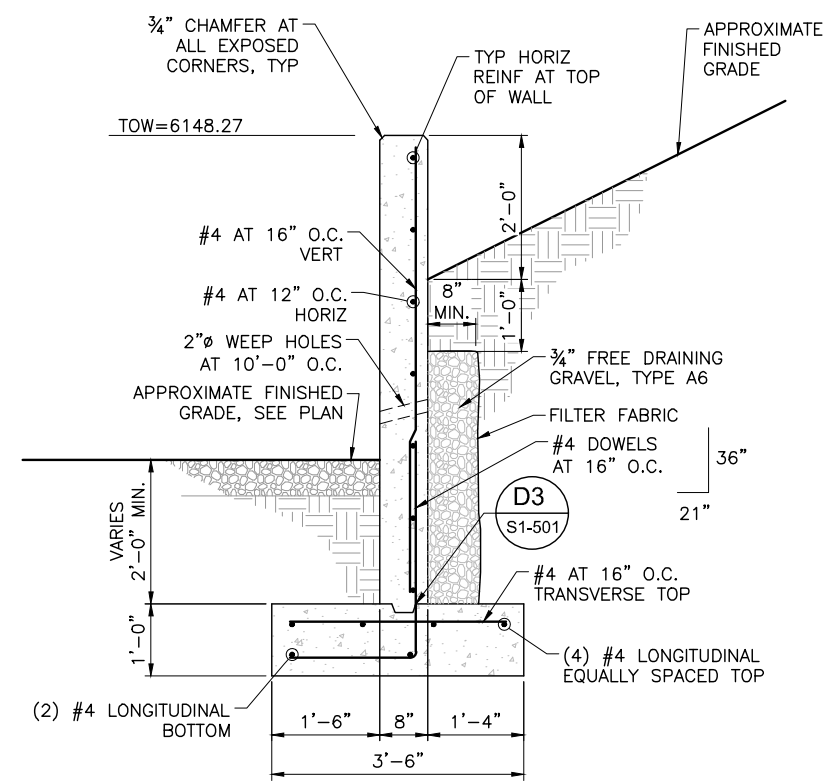
**D3** DEBRIS SCREEN  
 SCALE: 3/4" = 1'-0"

NOTES:  
 COMPLETE SCREEN ASSEMBLY SHALL BE HOT-DIP GALVANIZED AFTER FABRICATION.

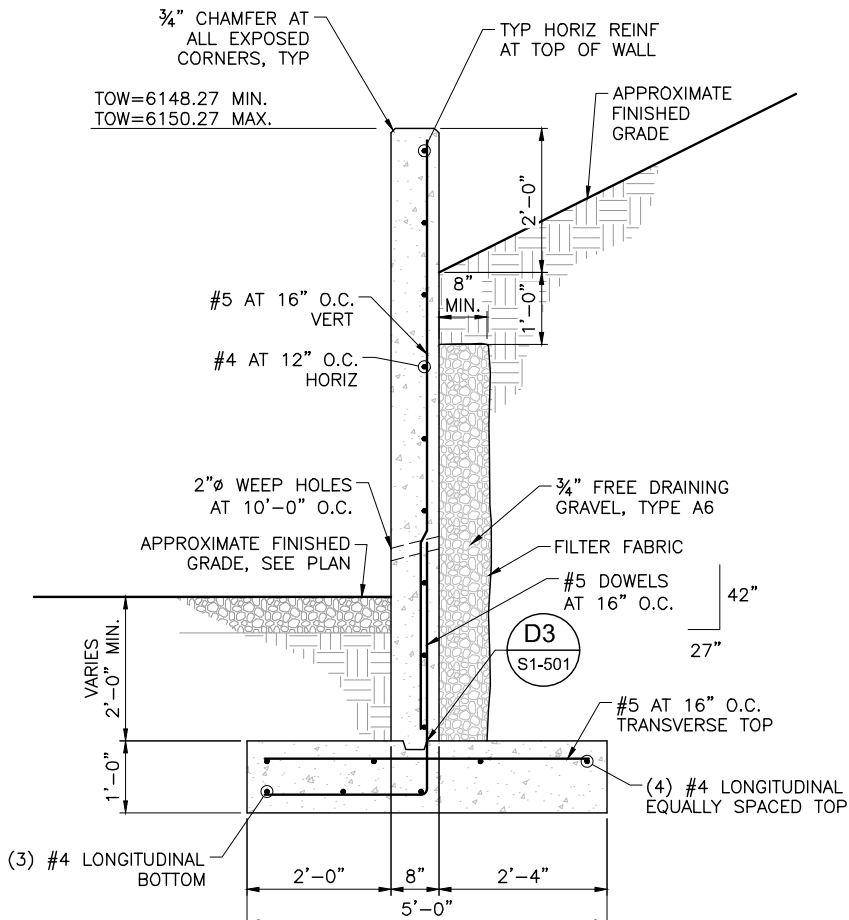
Plot Date: 8/17/2016 9:41 AM Plotted By: Jon Fisher  
 Date Created: 7/29/2016 File Path: C:\Users\jfisher\Documents\81-18-011\_KANNAH\_CREEK\_INTAKE\_REHABILITATION\81-18-011\_S1-101X.DWG

NO.	DESCRIPTION	DATE

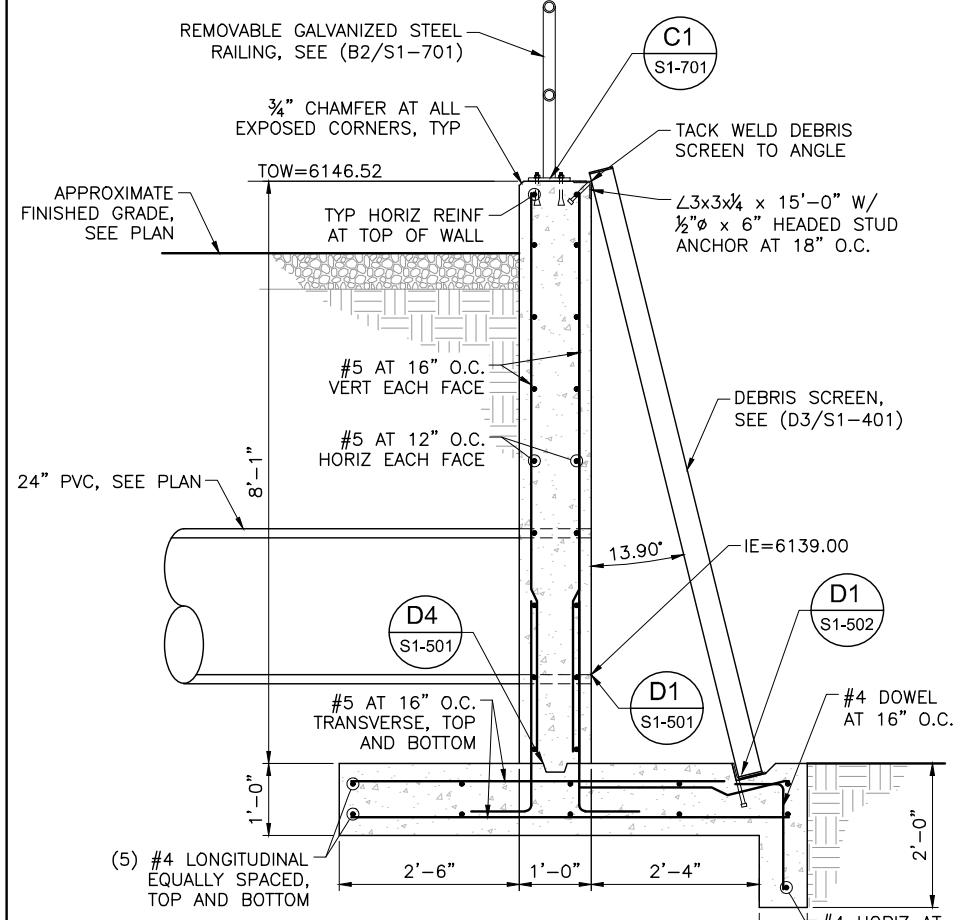
KANNAH CREEK INTAKE REHABILITATION  
 CITY OF GRAND JUNCTION  
 BID ALTERNATIVE 1  
 STRUCTURAL SECTIONS



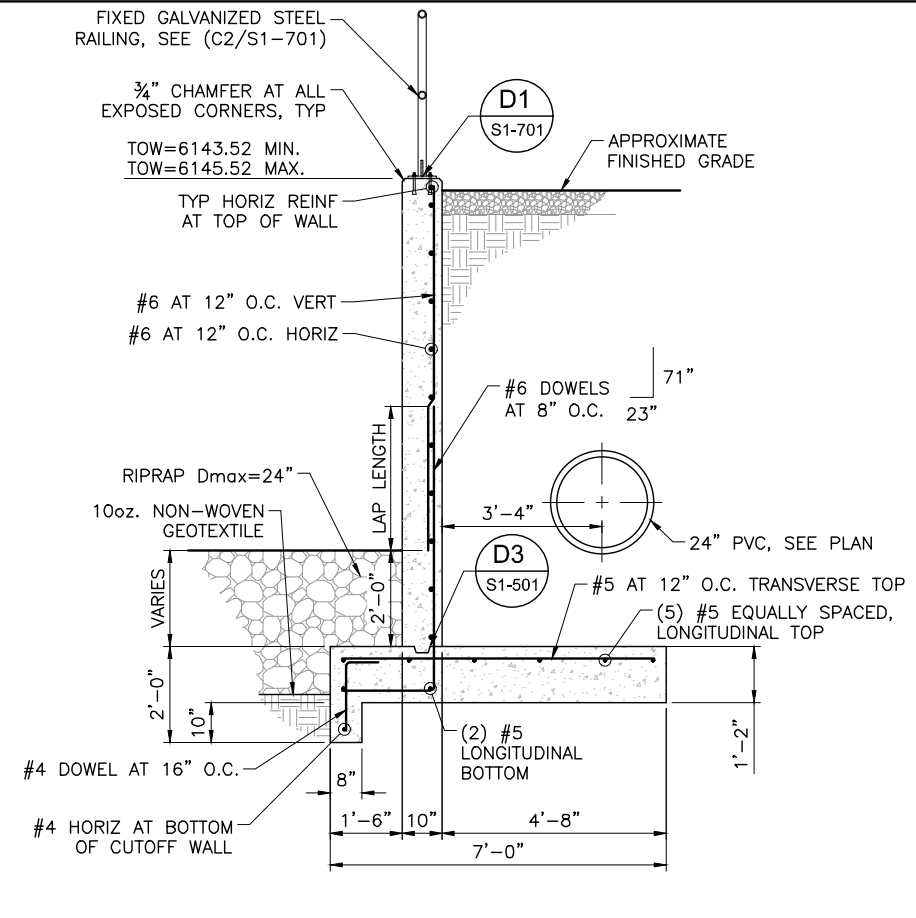
**B1 HILLSIDE RETAINING WALL-01**  
 SCALE: 3/4" = 1'-0"



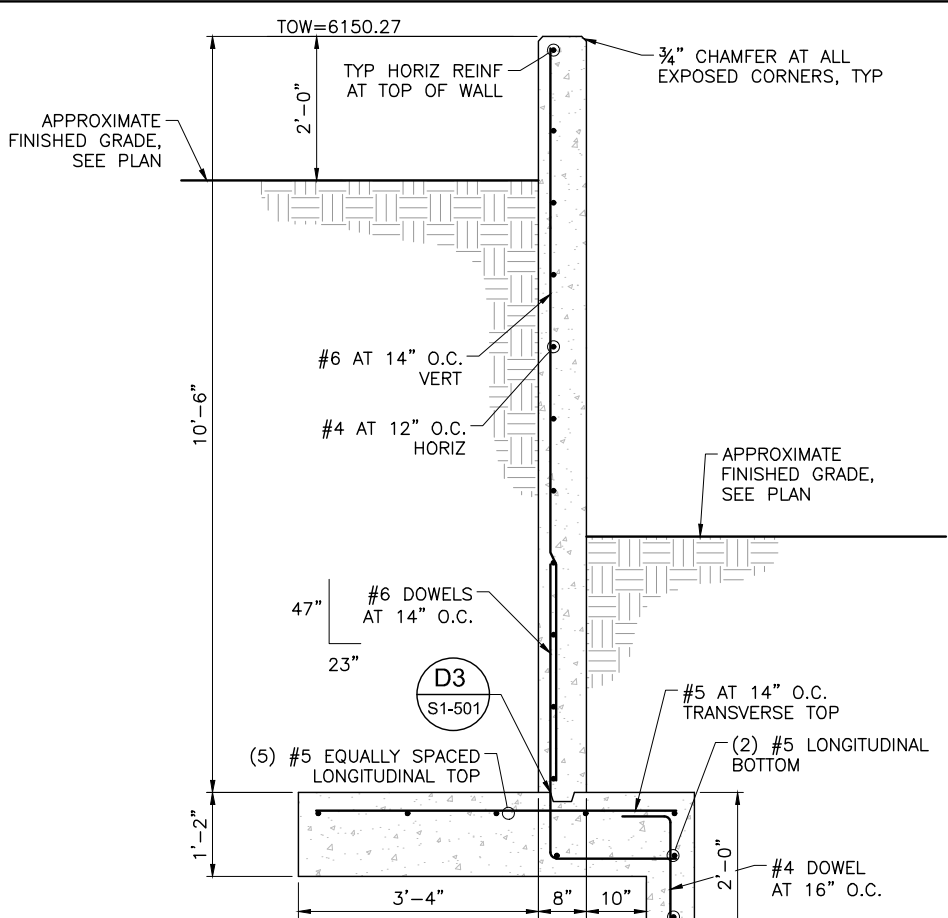
**B2 HILLSIDE RETAINING WALL-02**  
 SCALE: 3/4" = 1'-0"



**B3 DEBRIS SCREEN WALL SECTION**  
 SCALE: 3/4" = 1'-0"



**D1 DOWNSTREAM CREEK RETAINING WALL SECTION**  
 SCALE: 1/2" = 1'-0"



**D2 HEADWALL SECTION**  
 SCALE: 3/4" = 1'-0"

Plot Date: 8/17/2018 10:51 AM, Plotted By: Jon Fisher  
 Date Created: 7/20/2018, P:\PROJECTS\JUB\GRAND JUNCTIONS - 81-18-011\_KANNAH CREEK INTAKE CAD SHEET STRUCTURAL\81-18-011\_S1-101.XDWS

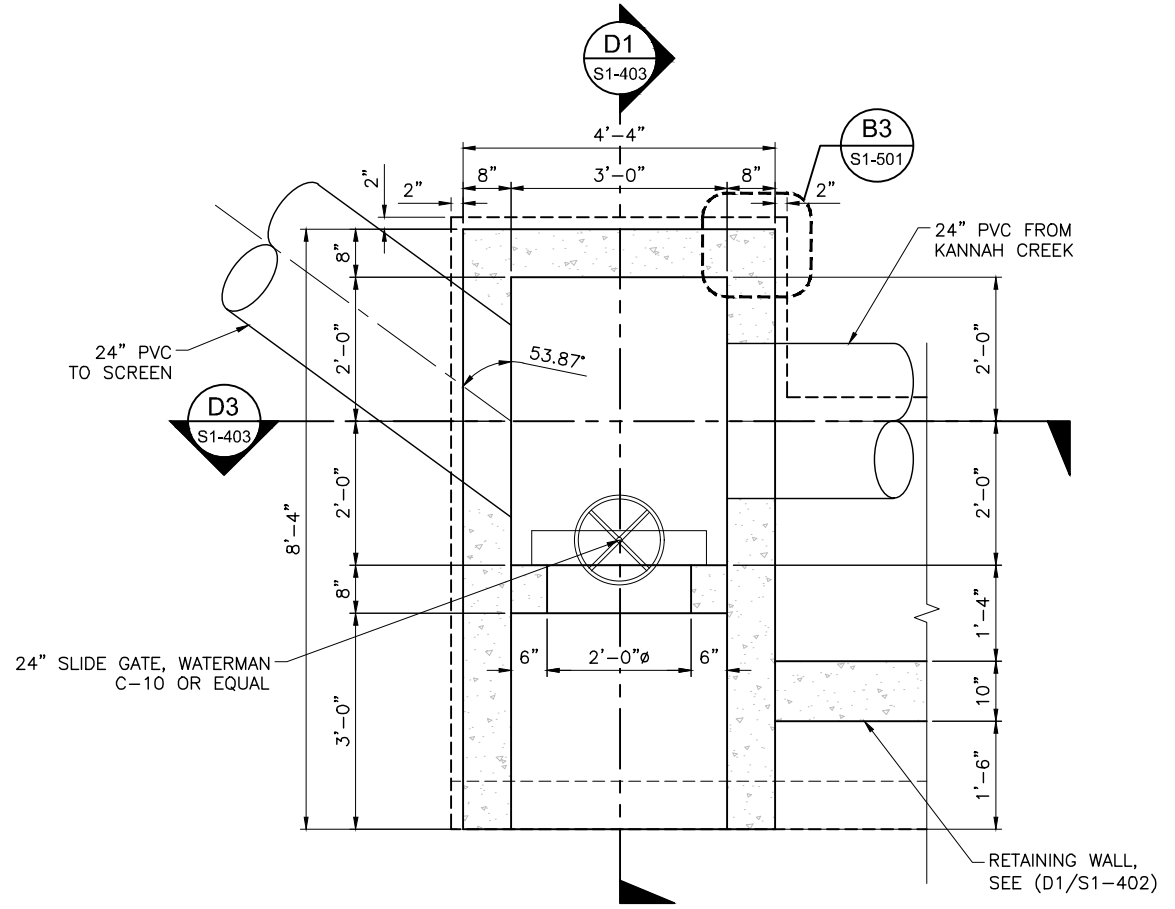


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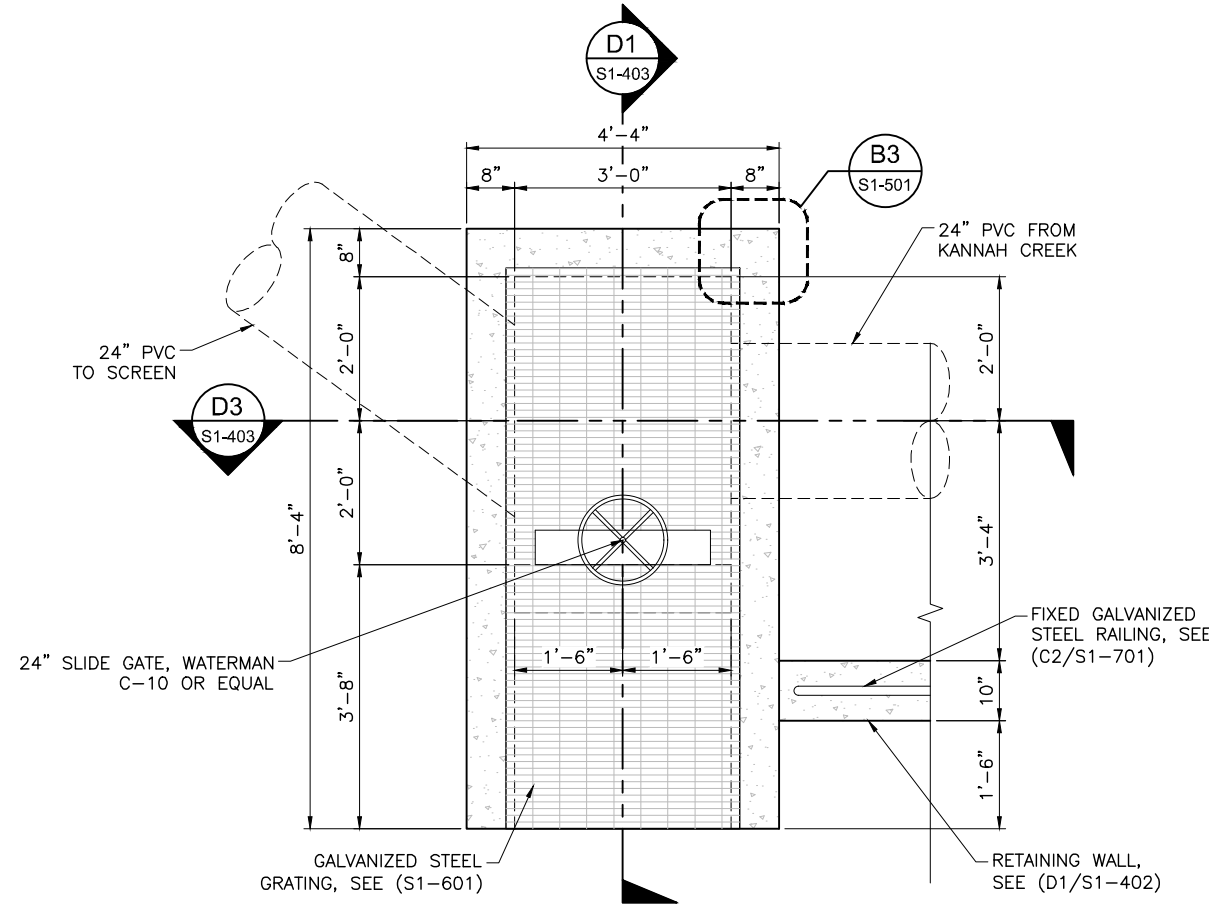
NO.	REVISION	DESCRIPTION	BY	DATE

**KANNAH CREEK INTAKE REHABILITATION  
CITY OF GRAND JUNCTION**

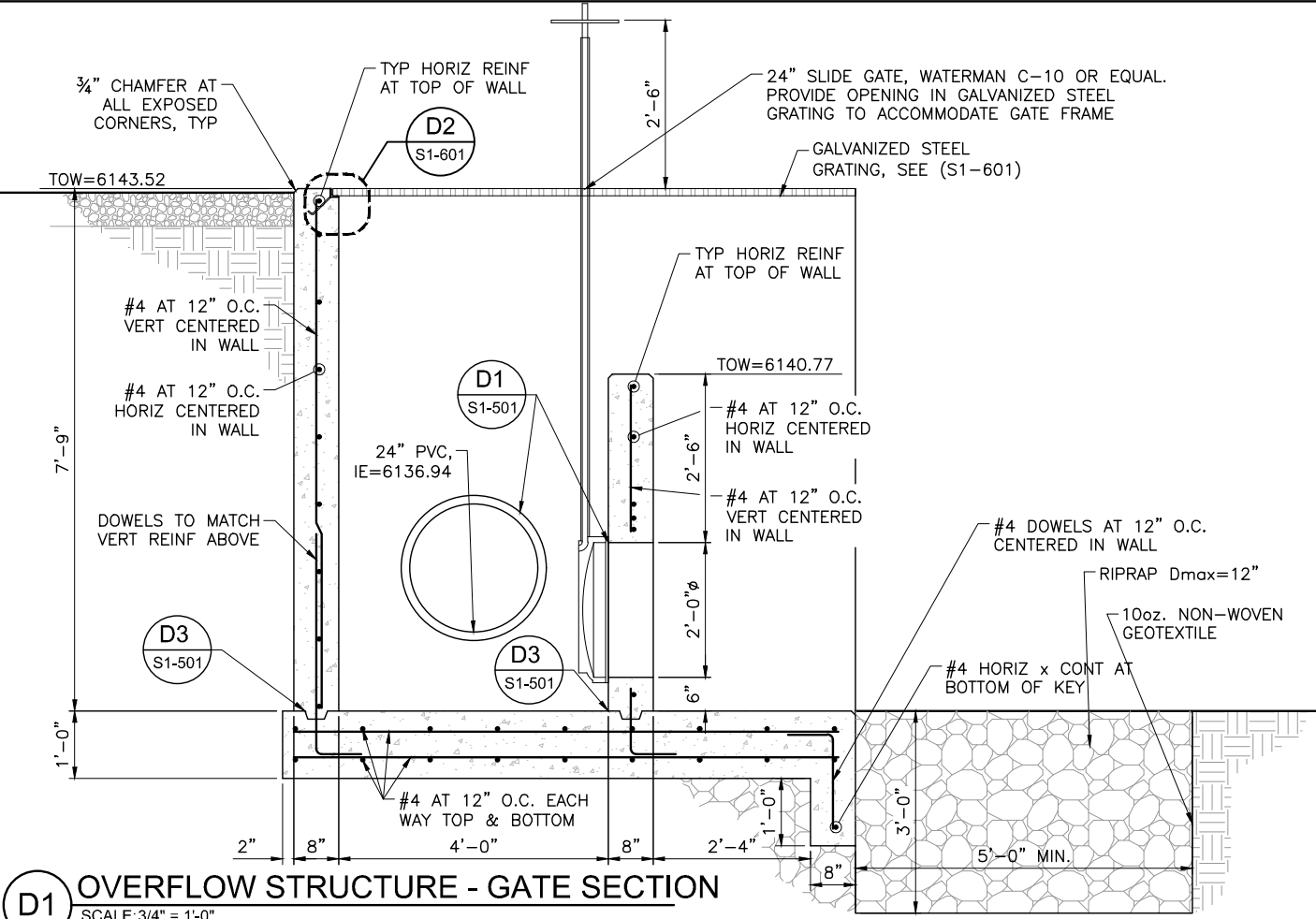
BID ALTERNATIVE 1  
OVERFLOW STRUCTURE



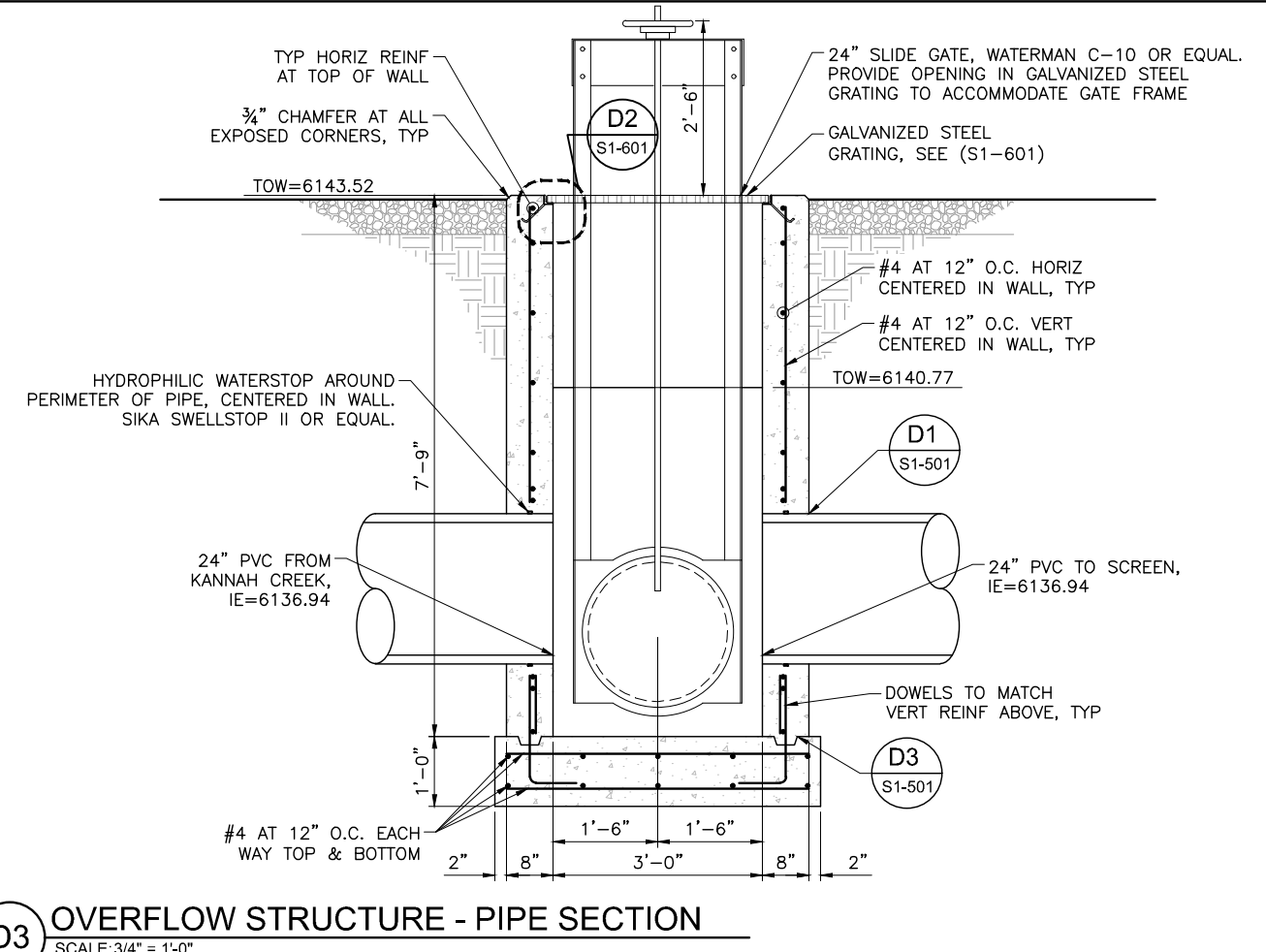
**B1** OVERFLOW STRUCTURE - FOOTING AND FOUNDATION PLAN  
SCALE: 3/4" = 1'-0"



**B3** OVERFLOW STRUCTURE - FLOOR FRAMING PLAN  
SCALE: 3/4" = 1'-0"



**D1** OVERFLOW STRUCTURE - GATE SECTION  
SCALE: 3/4" = 1'-0"



**D3** OVERFLOW STRUCTURE - PIPE SECTION  
SCALE: 3/4" = 1'-0"

Plot Date: 8/17/2018 10:05 AM Plotted By: John Frazier  
 Date Created: 7/20/18 File Path: C:\Users\jbf\OneDrive\Documents\81-18-011\_KANNAH CREEK INTAKE CAD SHEET STRUCTURAL\81-18-011\_S1-101X.DWG

### CONC REINFORCING LAP SCHEDULE

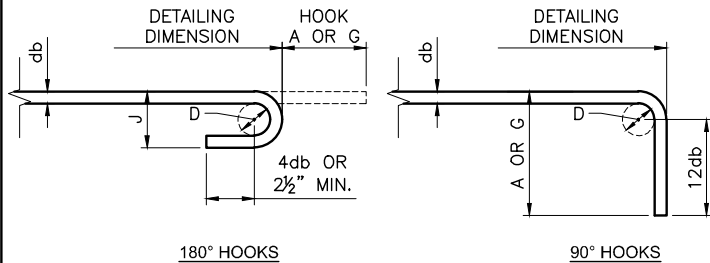
BAR SIZE	LAP CLASS	f <sub>c</sub> = 3,000 psi		f <sub>c</sub> = 4,000 psi		f <sub>c</sub> = 4,500 psi		f <sub>c</sub> = 5,000 psi	
		CAT. 1	CAT. 2	CAT. 1	CAT. 2	CAT. 1	CAT. 2	CAT. 1	CAT. 2
#4	A	22"	33"	19"	28"	18"	27"	17"	25"
	B	28"	43"	25"	37"	24"	35"	22"	33"
#5	A	27"	41"	24"	36"	23"	34"	21"	32"
	B	36"	53"	31"	46"	30"	44"	28"	41"
#6	A	33"	49"	28"	43"	27"	41"	25"	38"
	B	43"	64"	37"	55"	36"	53"	33"	50"
#7	A	48"	72"	42"	62"	40"	59"	37"	56"
	B	62"	93"	54"	81"	51"	77"	48"	72"
#8	A	55"	82"	47"	71"	45"	68"	42"	64"
	B	71"	106"	61"	92"	58"	88"	55"	83"
#9	A	62"	92"	53"	80"	51"	76"	48"	72"
	B	80"	120"	69"	104"	66"	99"	62"	93"
#10	A	80"	120"	61"	92"	57"	86"	54"	81"
	B	90"	135"	79"	119"	74"	111"	70"	105"

#### CONCRETE REINFORCING LAP NOTES:

- FOR GRADE 60 REINFORCING BARS.
- ALL LAP SPLICES SHALL BE CLASS B, UNLESS NOTED OTHERWISE.
- CATEGORY 1: CLEAR COVER  $\geq$  db & CLR. SPACING  $\geq$  db, AND STIRRUPS OR TIES THROUGHOUT L<sub>d</sub> ARE PROVIDED.  
CATEGORY 1: CLEAR COVER  $\geq$  db & CLR. SPACING  $\geq$  2db.  
CATEGORY 2: CLEAR COVER < db OR CLR. SPACING < 2db.
- FOR TOP BARS MULTIPLY LAP LENGTH LISTED BY 1.30. TOP BARS ARE HORIZONTAL BARS WITH MORE THAN 12" OF CONCRETE CAST BELOW THE BARS.

### B1 CONCRETE REINFORCING LAP SCHEDULE

SCALE: NOT TO SCALE

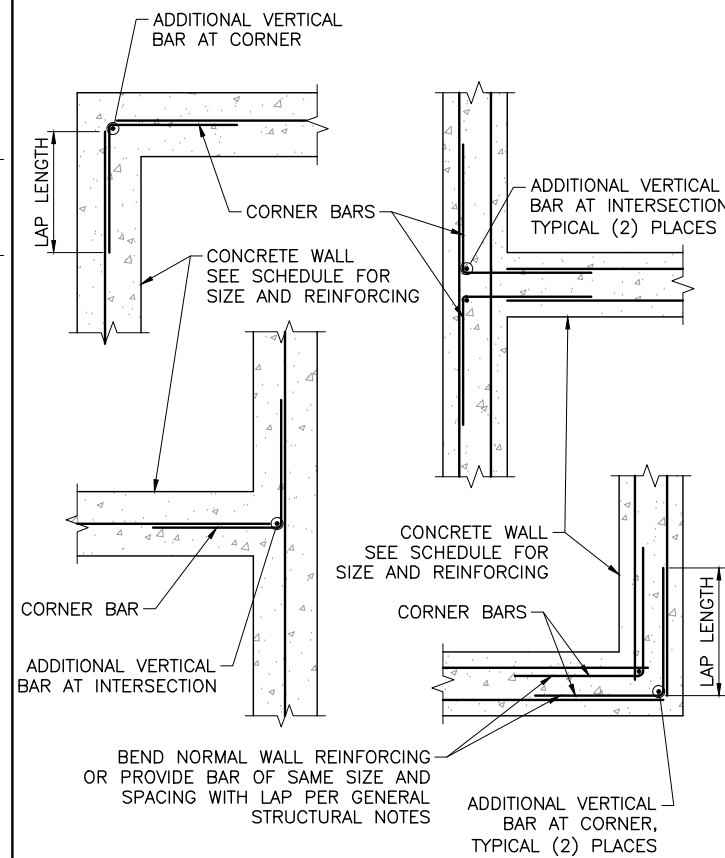


BAR SIZE	D	180° HOOKS		90° HOOKS
		A OR G	J	A OR G
#3	2 1/4"	5"	3"	6"
#4	3"	6"	4"	8"
#5	3 3/4"	7"	5"	10"
#6	4 1/2"	8"	6"	1'-0"
#7	5 1/4"	10"	7"	1'-2"
#8	6"	11"	8"	1'-4"
#9	9 1/2"	1'-3"	11 3/4"	1'-7"
#10	10 3/4"	1'-5"	1'-1 1/4"	1'-10"
#11	12"	1'-7"	1'-2 3/4"	2'-0"

NOTES: db = NOMINAL BAR DIAMETER  
D = FINISHED INSIDE BEND DIAMETER  
MINIMUM D = 6db FOR #3 TO #8 BARS  
MINIMUM D = 8db FOR #9 TO #11 BARS  
MINIMUM D = 10db FOR #14 AND #18 BARS

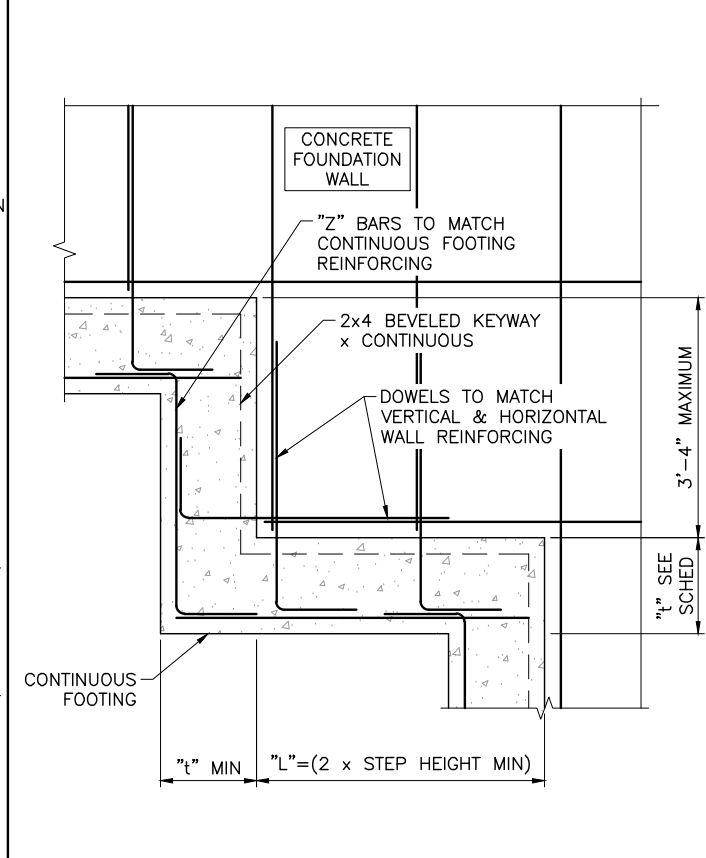
### B2 TYPICAL REBAR HOOK SCHEDULE

SCALE: NOT TO SCALE



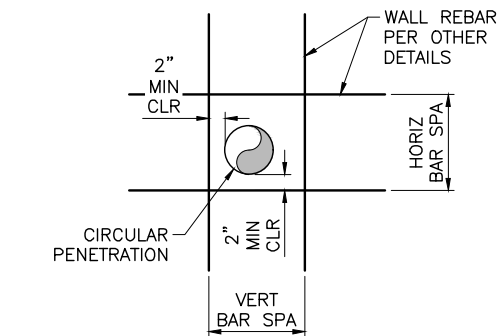
### B3 CORNER REINFORCEMENT DETAIL FOR CONCRETE WALLS

SCALE: NOT TO SCALE

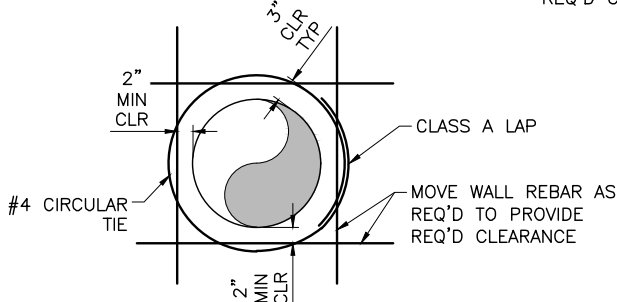


### B4 TYPICAL FOOTING STEP AT CONCRETE FOUNDATION WALL

SCALE: NOT TO SCALE

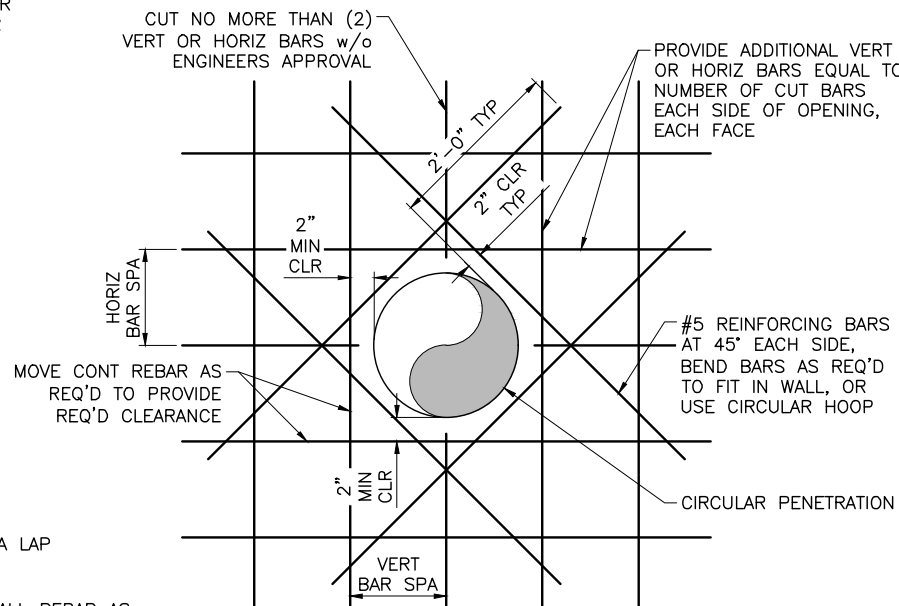


FOR HOLES w/ DIA. < BAR SPA. +4"  
NOTE: NO SPECIAL REINFORCEMENT IS REQUIRED AROUND THE PENETRATION.



FOR HOLES w/ DIA. > BAR SPA. +4"  
AND w/ DIA. < 1.5 x BAR SPA.

NOTE: PROVIDE (1) CIRCULAR TIE FOR WALLS w/ ONE MAT OF REBAR & (2) TIES FOR WALLS w/ TWO MATS OF REBAR



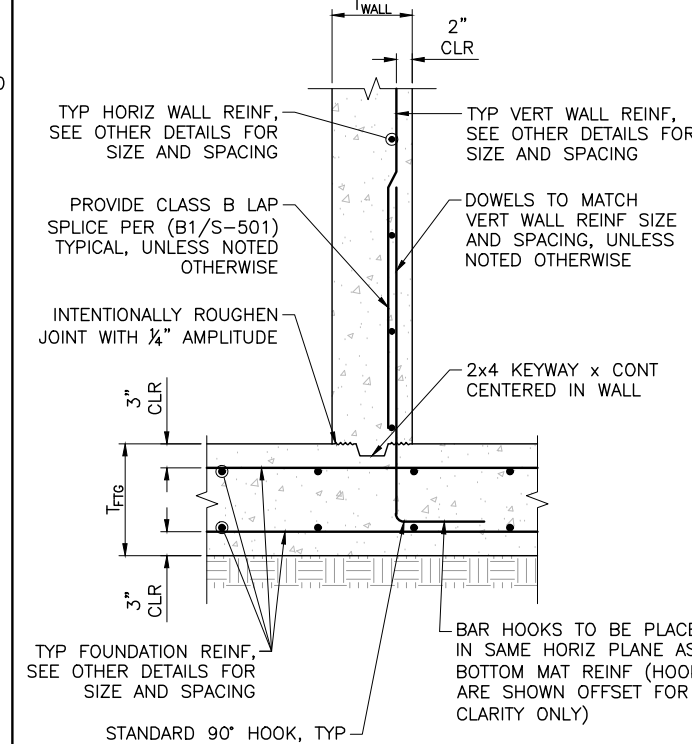
NOTE: PROVIDE (4) #5 DIAGONAL REINFORCING BARS FOR WALLS w/ ONE MAT OF REBAR & (4) #5 DIAGONAL REINFORCING BARS EACH FACE FOR WALLS w/ TWO MATS OF REBAR.

#### NOTES:

- REFER TO GENERAL NOTES FOR REBAR CLEARANCE REQUIREMENTS.
- REFER TO OTHER DETAILS FOR WALL/SLAB REINFORCING SIZE AND SPACING.
- BAR SPACING REFERS TO THE LESSER OF THE VERT OR HORIZ BAR SPACING.
- DETAIL IS SIMILAR FOR EITHER VERTICAL WALL OR HORIZONTAL SLAB LOCATIONS.

### D1 TYPICAL CONCRETE WALL OR SLAB PENETRATION DETAIL

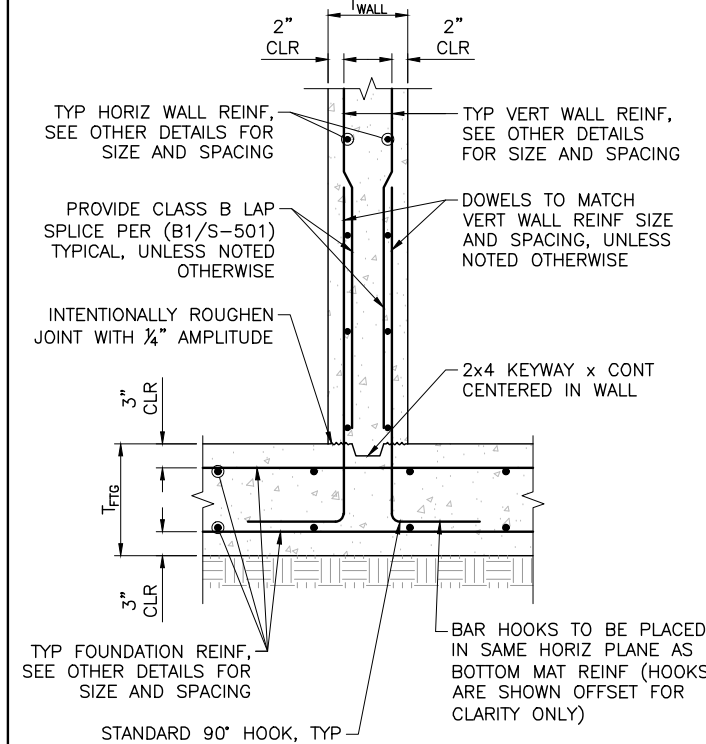
SCALE: NOT TO SCALE



- NOTES:
- REFER TO OTHER PLANS & DETAILS FOR WALL & FOUNDATION THICKNESSES, T, AND ALL REINFORCING BAR SIZE AND SPACING REQUIREMENTS.
  - REFER TO GENERAL NOTES FOR BAR CLEARANCE REQUIREMENTS.

### D3 TYP SINGLE MAT REINF VERTICAL WALL TO FOUNDATION JOINT

SCALE: NOT TO SCALE



- NOTES:
- REFER TO OTHER PLANS & DETAILS FOR WALL & FOUNDATION THICKNESSES, T, AND ALL REINFORCING BAR SIZE AND SPACING REQUIREMENTS.
  - REFER TO GENERAL NOTES FOR BAR CLEARANCE REQUIREMENTS.

### D4 TYP DOUBLE MAT REINF VERTICAL WALL TO FOUNDATION JOINT

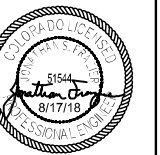
SCALE: NOT TO SCALE



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NO.	DESCRIPTION	DATE

KANNAH CREEK INTAKE REHABILITATION  
CITY OF GRAND JUNCTION  
BID ALTERNATIVE 1  
CONCRETE DETAILS

FILE: 81-18-011\_S1-501X  
JUB PROJ. #: 81-18-013  
DRAWN BY: JSF  
DESIGN BY: JSF  
CHECKED BY: JSF  
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDING TO LAST UPDATED: 7/20/2018  
SHEET NUMBER:

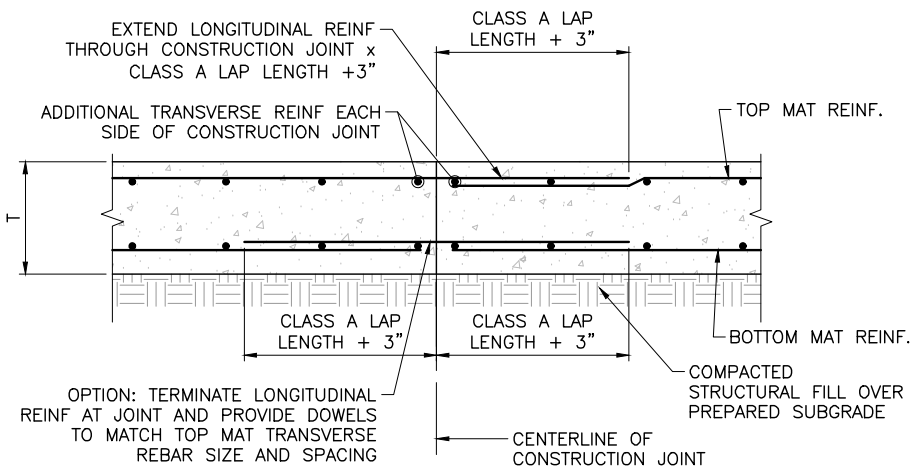
S1-501

NO.	REVISION	DESCRIPTION	BY	DATE

KANNAH CREEK INTAKE REHABILITATION  
 CITY OF GRAND JUNCTION  
 BID ALTERNATIVE 1  
 CONCRETE DETAILS

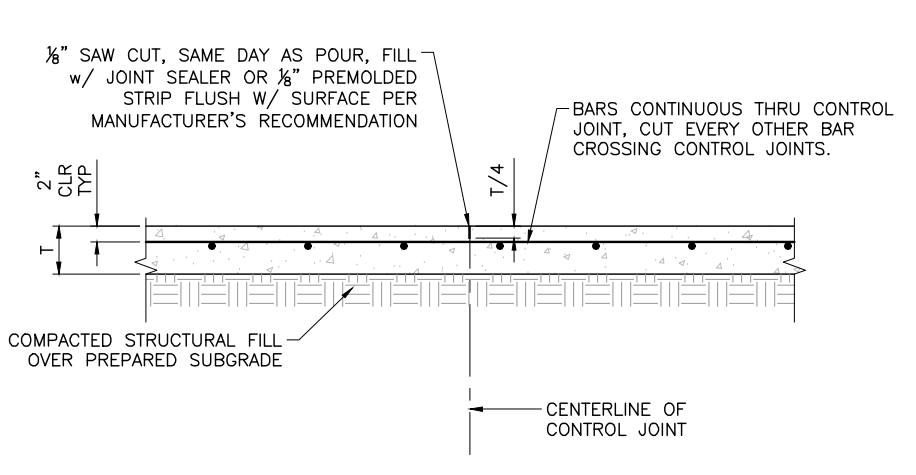
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 CHECKED BY: JSF  
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 LAST UPDATED: 7/20/2018  
 SHEET NUMBER:

S1-502



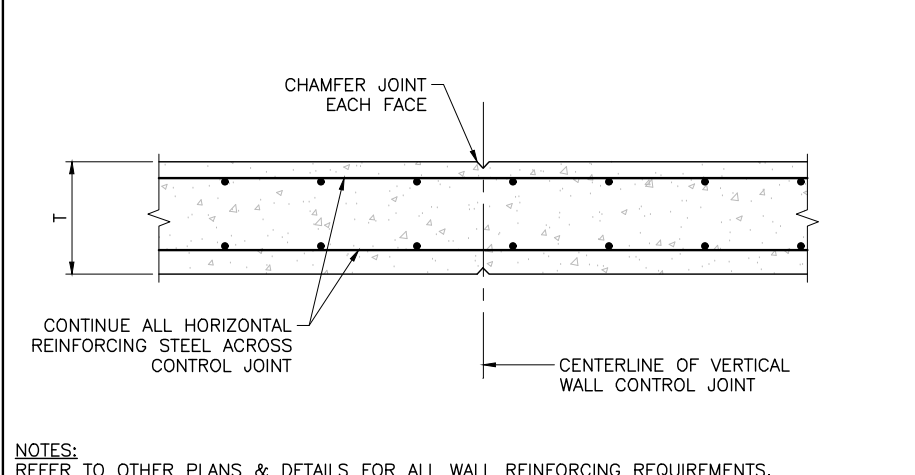
**NOTES:**  
 REFER TO OTHER PLANS & DETAILS FOR ALL FOOTING THICKNESS, REINFORCING REQUIREMENTS, SLAB THICKNESS, FINISH ELEVATIONS, SLOPES AND OTHER INFORMATION.

**B1** TYP WALL FOOTING CONSTRUCTION JOINT DETAIL  
 SCALE: NOT TO SCALE



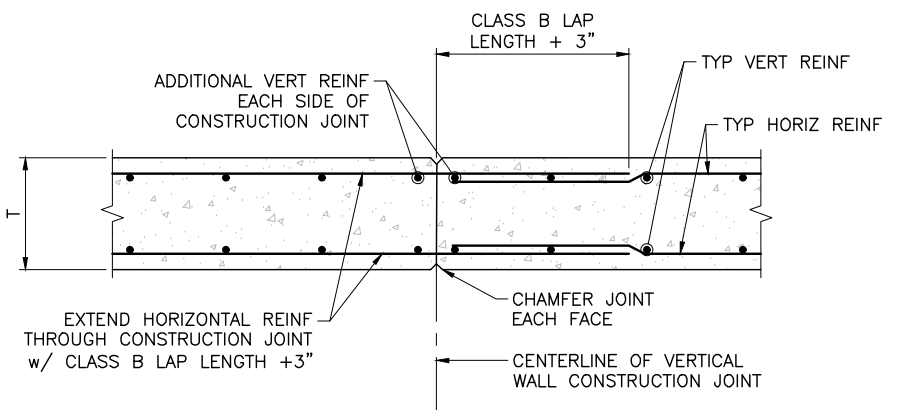
**NOTES:**  
 REFER TO OTHER PLANS & DETAILS FOR ALL SLAB THICKNESS, REINFORCING REQUIREMENTS, FINISH ELEVATIONS, SLOPES AND OTHER INFORMATION.

**B2** TYPICAL SLAB ON GRADE CONTROL JOINT DETAIL  
 SCALE: NOT TO SCALE



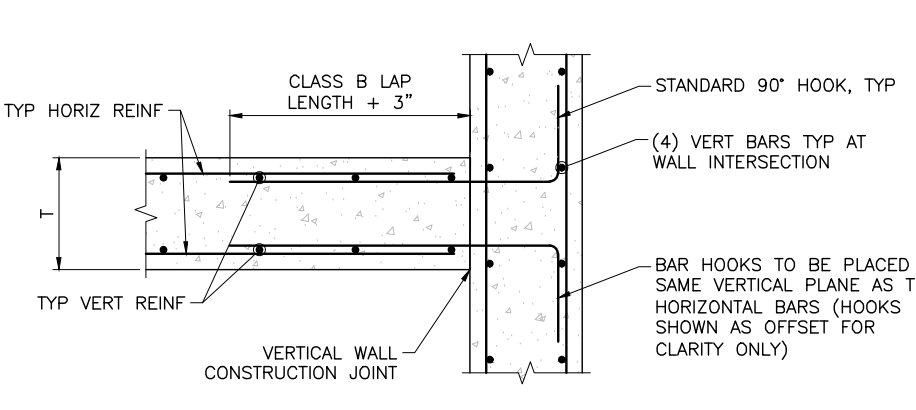
**NOTES:**  
 REFER TO OTHER PLANS & DETAILS FOR ALL WALL REINFORCING REQUIREMENTS. REFER TO OTHER DETAILS FOR PERMISSIBLE REINFORCING STEEL LAP SPlicing LENGTHS AND LOCATIONS.

**B3** TYPICAL VERTICAL WALL CONTROL JOINT  
 SCALE: NOT TO SCALE



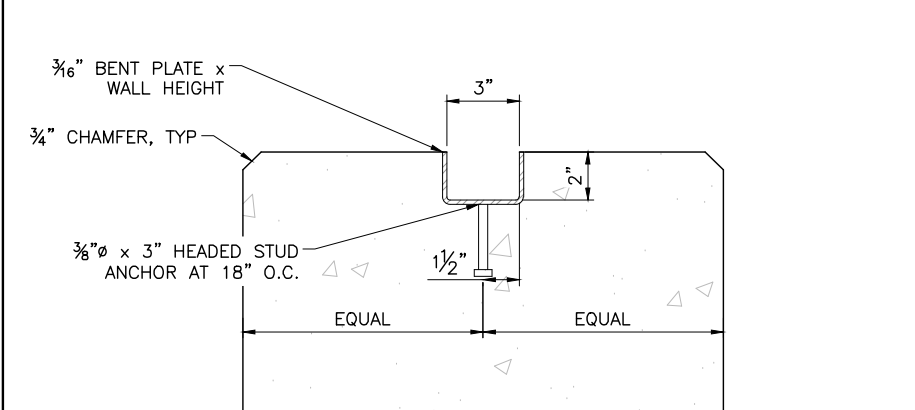
**NOTES:**  
 REFER TO OTHER PLANS & DETAILS FOR ALL WALL REINFORCING REQUIREMENTS. REFER TO OTHER DETAILS FOR PERMISSIBLE REINFORCING STEEL LAP SPlicing LENGTHS AND LOCATIONS.

**C1** TYPICAL VERTICAL WALL CONSTRUCTION JOINT  
 SCALE: NOT TO SCALE



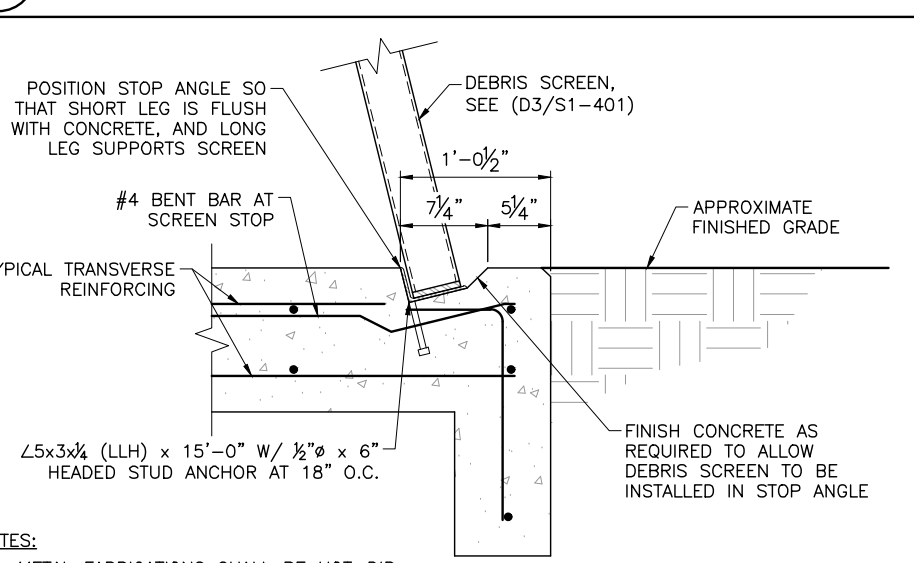
**NOTES:**  
 REFER TO OTHER PLANS & DETAILS FOR ALL WALL REINFORCING REQUIREMENTS. REFER TO OTHER DETAILS FOR PERMISSIBLE REINFORCING STEEL LAP SPlicing LENGTHS AND LOCATIONS.

**C2** TYPICAL VERTICAL WALL CONSTRUCTION JOINT AT 3-WAY WALL INTERSECTION  
 SCALE: NOT TO SCALE



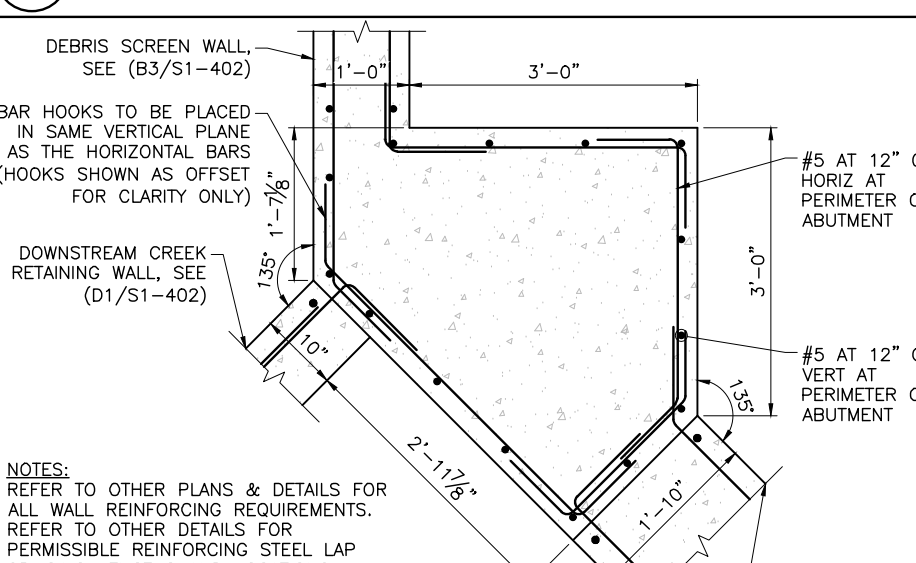
**NOTES:**  
 REFER TO OTHER DETAILS FOR ALL CONCRETE REINFORCING REQUIREMENTS. ALL METAL FABRICATIONS SHALL BE HOT-DIP GALVANIZED AFTER FABRICATION.

**C3** STOP LOG GUIDE DETAIL  
 SCALE: 3" = 1'-0"



**NOTES:**  
 ALL METAL FABRICATIONS SHALL BE HOT-DIP GALVANIZED AFTER FABRICATION.

**D1** DEBRIS SCREEN STOP  
 SCALE: 1-1/2" = 1'-0"



**NOTES:**  
 REFER TO OTHER PLANS & DETAILS FOR ALL WALL REINFORCING REQUIREMENTS. REFER TO OTHER DETAILS FOR PERMISSIBLE REINFORCING STEEL LAP SPlicing LENGTHS AND LOCATIONS.

**D2** DEBRIS SCREEN ABUTMENT  
 SCALE: 1" = 1'-0"

File Date: 8/17/2018 10:14 AM Plotted By: Jon Frazier  
 Date Created: 7/20/2018 File Path: C:\PROJECTS\SUB\GRAND JUNCTION\81-18-011\_KANNAH CREEK INTAKE\CAD\SET\STRUCTURAL\81-18-011\_S1-501X.DWG

**GENERAL CONSTRUCTION NOTES FOR GALVANIZED STEEL BAR GRATE FLOORING**

1. STEEL PIPE TO BE ASTM A53 GRADE B; WITH  $F_y = 35$  KSI.
2. STEEL PLATES, CHANNELS, AND ANGLES TO BE ASTM A36; WITH  $F_y = 36$  KSI.
3. ALL WELDING TO CONFORM TO CURRENT AWS D1.1 REQUIREMENTS.
4. COMPLETE ASSEMBLY OR SUB-ASSEMBLIES, BRACKETS, AND MISCELLANEOUS STEEL PIECES SHALL BE HOT-DIP GALVANIZED AFTER FABRICATION.
5. STRUCTURAL BOLTS, NUTS, AND WASHERS SHALL BE HOT-DIP GALVANIZED OR STAINLESS STEEL.
6. EXPANSION ANCHORS TO BE HILTI KWIK-BOLT II OR APPROVED EQUAL. INSTALL EXPANSION ANCHORS PER MANUFACTURER'S WRITTEN INSTRUCTIONS.
7. EXPANSION ANCHOR BOLTS, NUTS, AND WASHERS SHALL BE STAINLESS STEEL.
8. REFER TO OTHER DETAILS FOR CONCRETE REINFORCING REQUIREMENTS.
9. COORDINATE REBAR PLACEMENT IN CONCRETE TO MISS ANCHOR BOLTS AND INSERTS.
10. GALVANIZED AREAS THAT ARE DAMAGED DURING CONSTRUCTION SHALL BE REPAIRED WITH AN APPROVED COLD-GALVANIZING COMPOUND.
11. EPOXY SET ANCHORS SHALL UTILIZE HILTI HIT HY 150 CONSTRUCTION ADHESIVE AND HAS GALVANIZED OR STAINLESS STEEL THREADED RODS.
12. MINIMUM BAR GRATE FLOOR SUPPORTED LIVE LOAD IS 100 PSF UNIFORM LOAD AND/OR 300-LB CONCENTRATED LOAD.

**B1 GENERAL GALVANIZED STEEL BAR GRATE FLOORING NOTES**

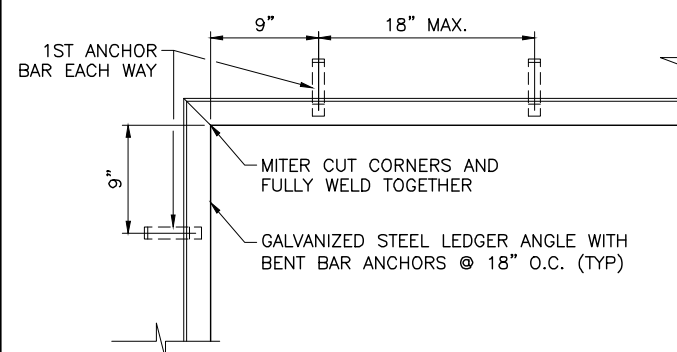
SCALE: NOT TO SCALE

GRATE SPAN "S"	BEARING BAR SIZE "D"	"T"
UP TO 2'-0"	$\frac{3}{4}$ "	$\frac{1}{8}$ "
2'-1" TO 3'-0"	1"	$\frac{3}{16}$ "
3'-1" TO 4'-0"	$1\frac{1}{4}$ "	$\frac{3}{16}$ "
4'-1" TO 5'-0"	$1\frac{1}{2}$ "	$\frac{3}{16}$ "
5'-1" TO 6'-0"	$1\frac{3}{4}$ "	$\frac{3}{16}$ "
6'-1" TO 7'-0"	2"	$\frac{3}{16}$ "
7'-1" TO 8'-0"	$2\frac{1}{4}$ "	$\frac{3}{16}$ "

**NOTE:**  
BAR GRATE SHALL SUPPORT A MINIMUM LIVE LOAD OF 100 PSF FOR GALVANIZED STEEL WITH AN ALLOWABLE BENDING STRESS OF 18 KSI. FOR  $1\frac{3}{16}$ " CENTER TO CENTER BAR SPACING, TYPICAL. REFER TO TYPICAL GALVANIZED STEEL BAR GRATE DETAIL.

**B2 TYPICAL GALVANIZED STEEL BAR GRATE SCHEDULE**

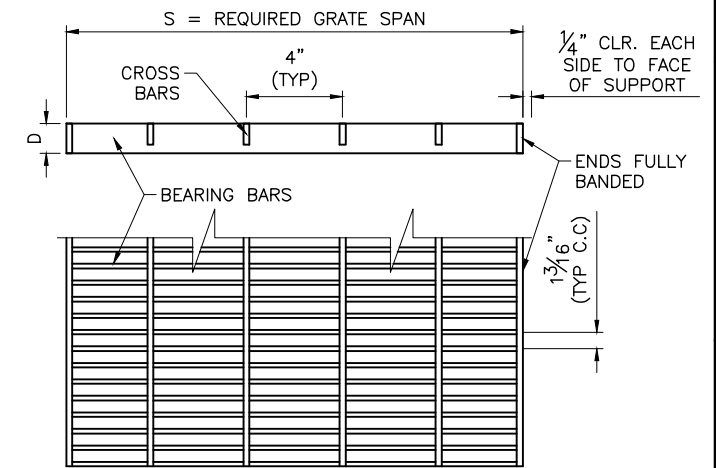
SCALE: NOT TO SCALE



- NOTE:**
1. REFER TO GENERAL GALVANIZED STEEL BAR GRATE FLOOR CONSTRUCTION NOTES.
  2. SET TOP OF EMBEDMENT ANGLE LEVEL WITH ADJACENT CONCRETE SURFACES.

**B3 TYPICAL BAR GRATE EMBEDDED LEDGER CORNER DETAIL**

SCALE: NOT TO SCALE

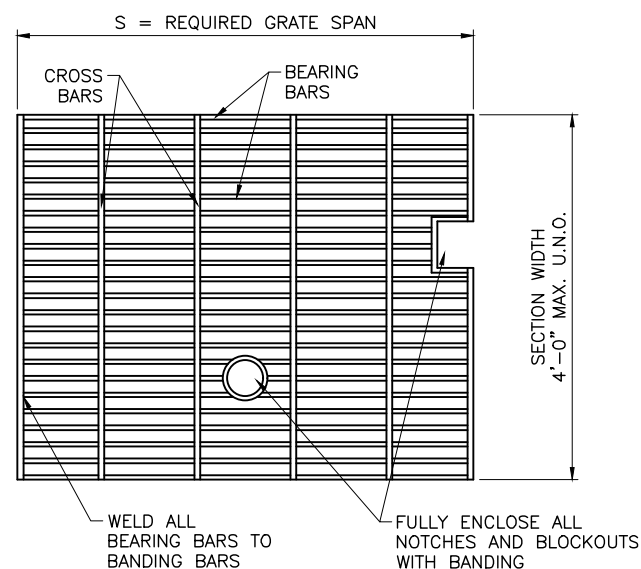


- NOTES:**
- |                 |   |
|-----------------|---|
| BAR GRATE TYPE: | GW (PER McNICHOLS COMPANY)              |
| BEARING BARS:   | "D" DEEP BY "T" THICK                   |
| CROSS BARS:     | WELDED OR PRESS-LOCKED                  |
| MATERIAL:       | HOT-DIP GALVANIZED STEEL                |
| FINISH:         | MILL FINISH                             |
| WIDTH:          | REFER TO FLOOR PLANS                    |
| SPAN:           | REFER TO FLOOR PLANS                    |
| DEPTH, D:       | PER GALVANIZED STEEL BAR GRATE SCHEDULE |

\*\*FURNISH BAR GRATE IN SECTIONS NOT TO EXCEED 4'-0" IN LENGTH AND/OR 200 LBS PER SECTION UNLESS OTHERWISE NOTED.

**B4 TYPICAL GALVANIZED STEEL BAR GRATE DETAIL**

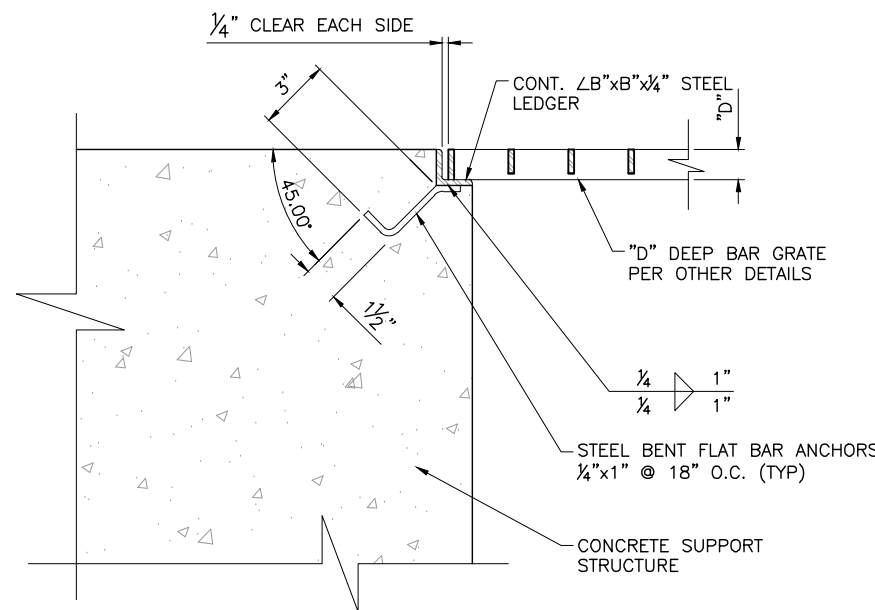
SCALE: NOT TO SCALE



- NOTES:**
1. REFER TO OTHER TYPICAL DETAILS FOR ADDITIONAL REQUIREMENTS.
  2. REFER TO PLAN VIEWS FOR LOCATION OF OPENINGS AND NOTCHES.
  3. ALL MATERIALS TO BE HOT-DIP GALVANIZED AFTER FABRICATION.

**D1 TYPICAL BAR GRATE FLOOR OPENING/NOTCH DETAIL**

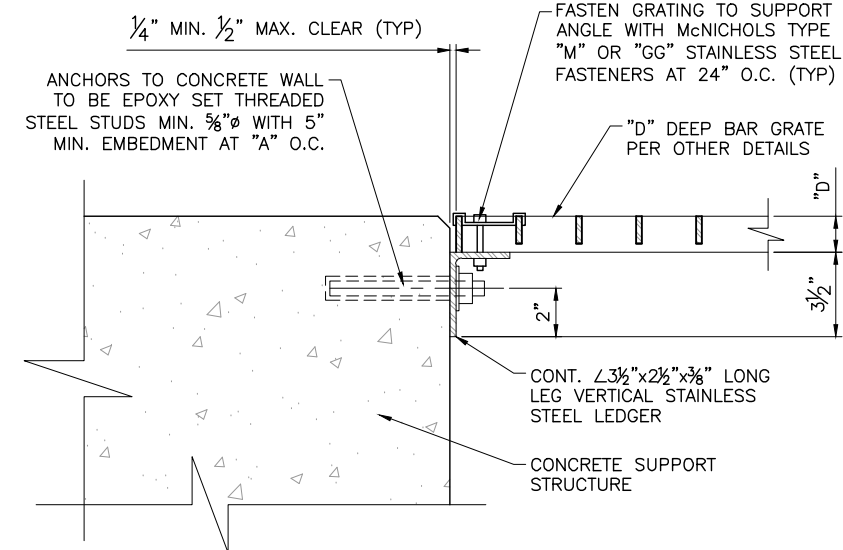
SCALE: NOT TO SCALE



- NOTES:**
1. ANGLE LEG "B" SHALL BE EQUAL TO "D" +  $\frac{1}{4}$ ".
  2. SET GRATE AND EMBEDDED ANGLE FLUSH WITH TOP CONCRETE SURFACE.
  3. REFER TO OTHER DETAILS FOR ALL CONCRETE REINFORCING REQUIREMENTS.
  4. SUPPORT LEDGER AND ANCHORS SHALL BE HOT-DIP GALVANIZED AFTER FABRICATION.

**D2 TYPICAL BAR GRATE EMBEDDED LEDGER SUPPORT DETAIL**

SCALE: NOT TO SCALE



BAR GRATE SPAN "S"	UP TO 4'-0"	4'-1" TO 6'-0"	6'-1" TO 8'-0"
ANCHOR ROD SPACING "A"	24" O.C.	18" O.C.	12" O.C.

- NOTES:**
1. SET TOP OF BAR GRATE FLUSH WITH CONCRETE SURFACE.
  2. COAT SIDE OF ALUMINUM LEDGER IN CONTACT WITH CONCRETE WITH BITUMINOUS PAINT.
  3. PROVIDE (1) ANCHOR BOLT 6" FROM EACH END OF LEDGER ANGLE.
  4. ANCHOR RODS, NUTS, WASHERS AND MISC. ITEMS SHALL BE STAINLESS STEEL.
  5. REFER TO OTHER DETAILS FOR CONCRETE REINFORCING REQUIREMENTS.

**D3 TYPICAL BAR GRATE FACE-MOUNT LEDGER SUPPORT DETAIL**

SCALE: NOT TO SCALE



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**BID SET**



NO.	DESCRIPTION	BY	APPR.	DATE

**KANNAH CREEK INTAKE REHABILITATION  
CITY OF GRAND JUNCTION**

**BID ALTERNATIVE 1  
GALVANIZED STEEL GRATING DETAILS**

FILE: 81-18-011\_S1-501X  
JUB PROJ. #: 81-18-013  
DRAWN BY: JSF  
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CHECKED BY: JSF  
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LAST UPDATED: 7/20/2018  
SHEET NUMBER:

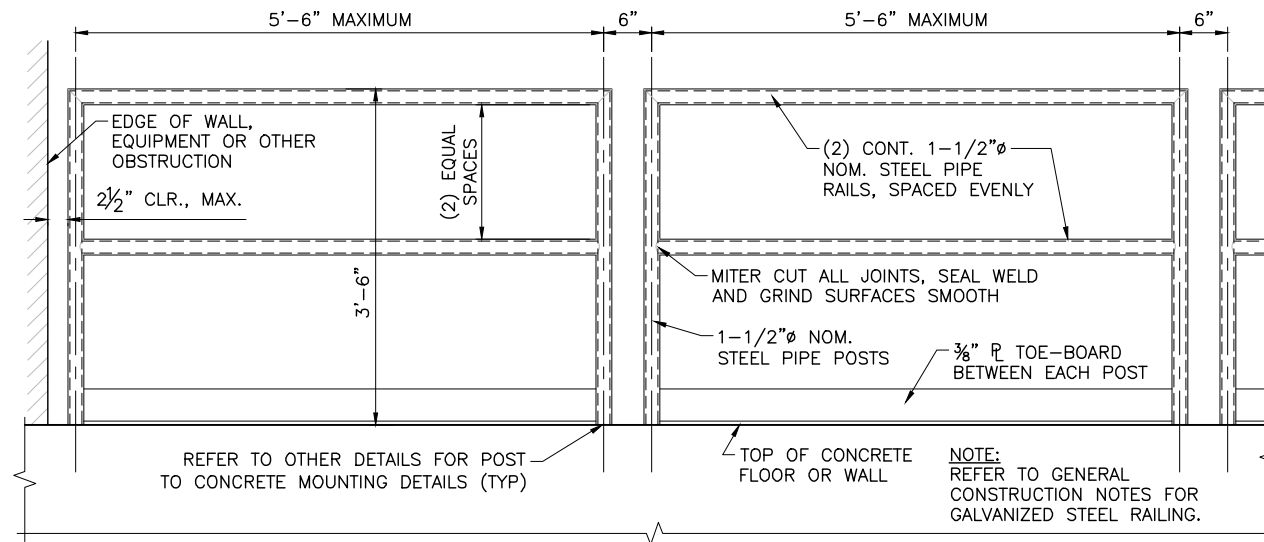
**S1-601**

**GENERAL CONSTRUCTION NOTES FOR GALVANIZED STEEL RAILING**

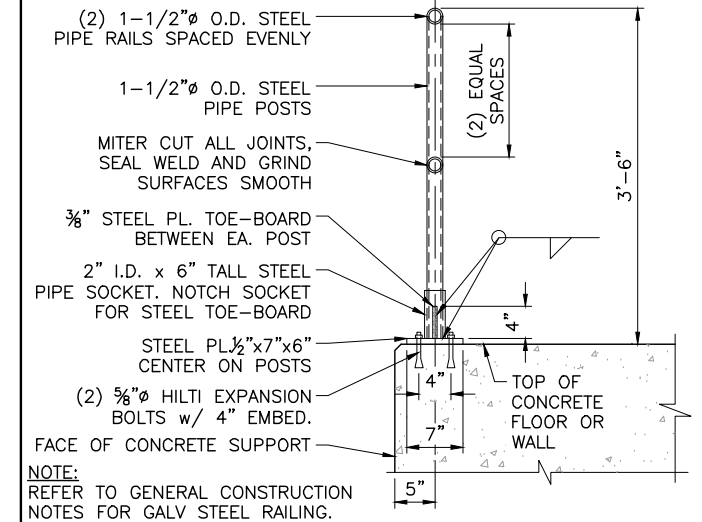
1. STEEL PIPE TO BE ASTM A53 GRADE B STEEL WITH  $F_y = 35$  KSI
2. STEEL PLATE & ANGLES TO BE ASTM A36 STEEL WITH  $F_y = 36$  KSI
3. ALL WELDING TO CONFORM TO CURRENT AWS D1.1 REQUIREMENTS.
4. COMPLETE RAIL ASSEMBLY, BRACKETS AND MISCELLANEOUS STEEL PIECES SHALL BE HOT-DIP GALVANIZED AFTER FABRICATION.
5. STRUCTURAL BOLTS, NUTS & WASHERS SHALL BE HOT-DIP GALVANIZED.
6. EXPANSION ANCHORS TO BE HILTI KWIK-BOLT II OR APPROVED EQUAL. INSTALL EXPANSION ANCHORS PER MANUFACTURER'S WRITTEN INSTRUCTIONS.
7. EXPANSION ANCHOR BOLTS, NUTS & WASHERS SHALL BE STAINLESS STEEL.
8. REFER TO OTHER DETAILS FOR CONCRETE REINFORCING REQUIREMENTS.
9. COORDINATE REBAR PLACEMENT IN CONCRETE TO MISS ANCHOR BOLTS.
10. FIELD SPLICES SHALL BE MADE UTILIZING GALVANIZED STEEL PIPE SLEEVE INSERTS AND HOT-DIP GALVANIZED STEEL BOLTS, NUTS & WASHERS.
11. GALVANIZED AREAS THAT ARE DAMAGED DURING CONSTRUCTION SHALL BE REPAIRED WITH AN APPROVED COLD-GALVANIZING COMPOUND.

**GENERAL NOTES FOR GALVANIZED STEEL PIPE RAILING**

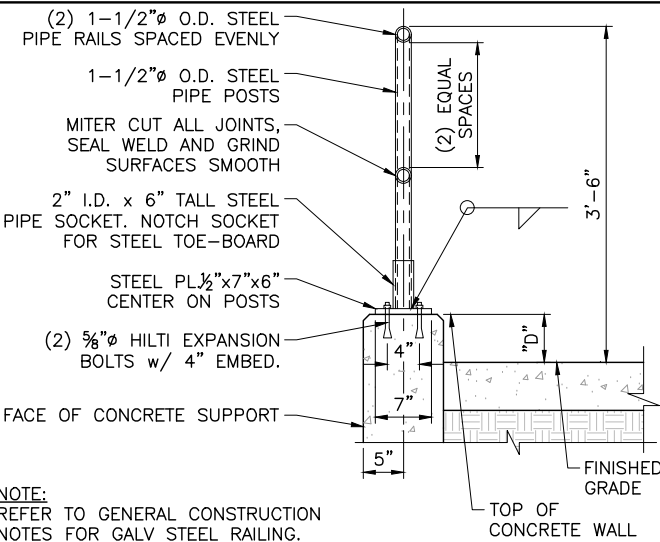
**B1** SCALE: NOT TO SCALE



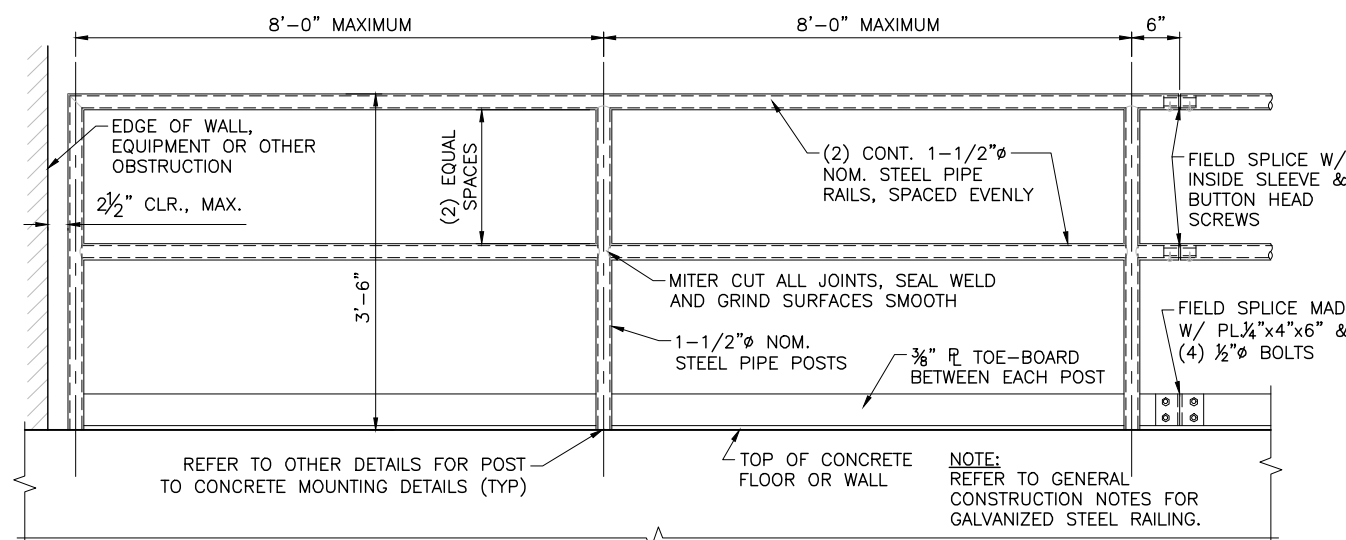
**B2** TYPICAL REMOVABLE GALVANIZED STEEL PIPE RAILING DETAIL  
SCALE: 1" = 1'-0"



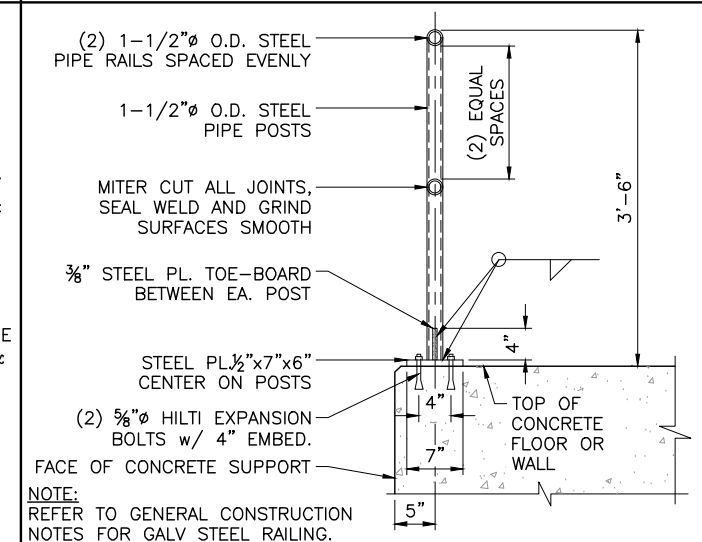
**B3** REMOVABLE HORIZONTAL SURFACE MOUNT STEEL RAILING DETAIL  
SCALE: 1" = 1'-0"



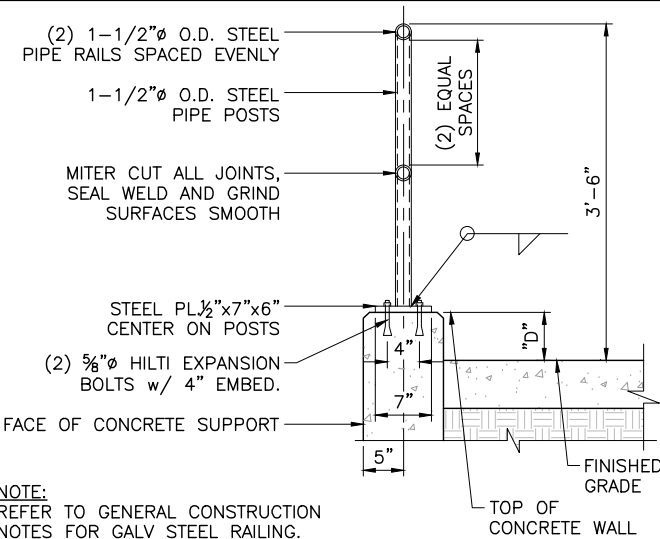
**C1** REMOVABLE TOP WALL MOUNT STEEL RAILING DETAIL  
SCALE: 1" = 1'-0"



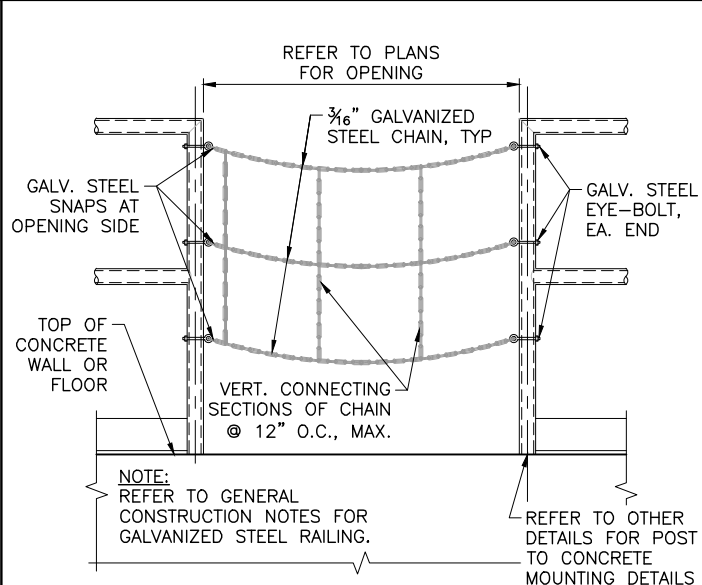
**C2** TYPICAL FIXED GALVANIZED STEEL PIPE RAILING DETAIL  
SCALE: 1" = 1'-0"



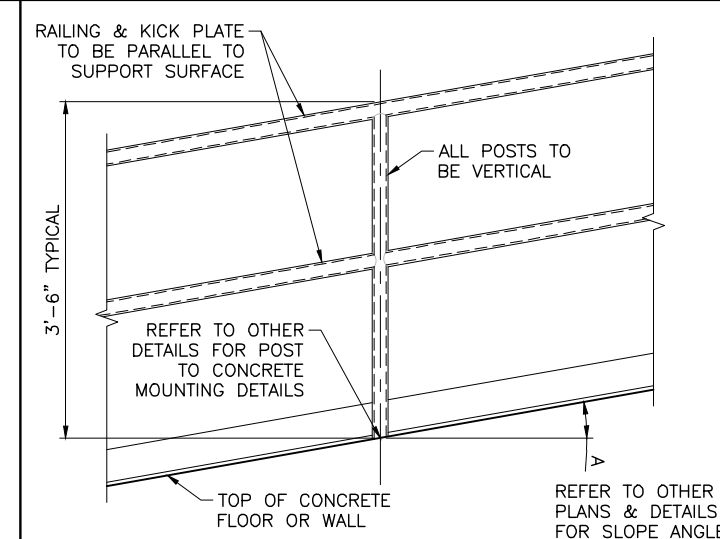
**C3** FIXED HORIZONTAL SURFACE MOUNT STEEL RAILING DETAIL  
SCALE: 1" = 1'-0"



**D1** FIXED TOP WALL MOUNT STEEL RAILING DETAIL  
SCALE: 1" = 1'-0"



**D2** TYPICAL SAFETY CHAIN  
SCALE: 1" = 1'-0"



**D3** TYP RAILING AT SLOPED SUPPORTS  
SCALE: 1" = 1'-0"



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BID SET



NO.	DESCRIPTION	BY	DATE

KANNAH CREEK INTAKE REHABILITATION  
CITY OF GRAND JUNCTION  
BID ALTERNATIVE 1  
GALVANIZED RAILING DETAILS

FILE: 81-18-011\_S1-501X  
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# 2017 KANNAH CREEK INTAKE REHABILITATION SEPTEMBER, 2017

- 1 ————— Cover Sheet
- 2 ————— Standard Abbreviations, Legend, and Symbols
- 3 ————— SHEET NOT USED
- 4 ————— Vicinity Map
- 5 ————— Demo Plan
- 6 ————— Concrete Plan
- 7 ————— Water Line Plan & Profile 0+00-2+50
- 8 ————— SHEET NOT USED
- 9 ————— SHEET NOT USED
- 10 ————— Service & Bypass Lines Plan
- 11 ————— Service & Bypass Lines Profiles
- E1-E5 ————— Electrical & Control Plans

UTILITIES AND AGENCIES								
AGENCY	NAME	POSITION	ROLE	MAILING ADDRESS	STREET ADDRESS	CITY, STATE	VOICE-WK	FAX
GRAND JUNCTION, CITY OF	JOHN EKLUND	PROJECT ENGINEER	PROJECT ENGINEER	250 N. 5th STREET	250 N. 5th STREET	GRAND JCT., CO 81501	(970) 244-1558	(970) 256-4022
GRAND JUNCTION, CITY OF	TRENT PRALL	ENGINEERING MANAGER	ENGINEERING MANAGER	250 N. 5th STREET	250 N. 5th STREET	GRAND JCT., CO 81501	(970) 256-4047	(970) 256-4022
GRAND JUNCTION, CITY OF	RICK BRIMKMAN	WATER SERVICES MANAGER	WATER	333 WEST AVENUE	333 WEST AVENUE	GRAND JCT., CO 81501	(970) 244-1429	
GRAND VALLEY POWER		UNIT MANAGER	GAS, ELECTRIC	845 22 RD	845 22 RD	GRAND JCT., CO 81505	(970) 242-0040	

N:\Landproj\Kannah Creek Intake\Kannah Creek Intake Improvements\_NEW.dwg, 01\_10/08/2018 1:31:25 PM

NOTE: NOTIFY AFFECTED UTILITY VENDOR 48 HOURS PRIOR TO EXCAVATIONS THAT WILL EXPOSE UTILITY LINES. THE COVER SHEET WILL HAVE A LISTING OF UTILITY VENDORS AND TELEPHONE NUMBERS.

REVISION	DESCRIPTION	DATE
REVISION △	_____	_____
REVISION △	_____	_____
REVISION △	_____	_____
REVISION △	_____	_____



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Engineering Division*



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<input type="radio"/>	BID SET
<input type="radio"/>	FINAL CONSTRUCTION DRAWINGS
<input type="radio"/>	ASBUILT
DESIGNED BY:	
JOHN EKLUND, PROJECT ENGINEER	2017
REVIEWED BY:	
TRENTON C. PRALL, ENGINEERING MANAGER	2017
AUTHORIZED FOR CONSTRUCTION	
TRENTON C. PRALL, ENGINEERING MANAGER	2017
ACCEPTED AS CONSTRUCTED	
JOHN EKLUND, PROJECT ENGINEER	2017

2017 KANNAH CREEK INTAKE REHABILITATION, SEPTEMBER, 2017, PLAN SET NO. \_\_\_\_\_

**ABBREVIATIONS**

AASHTO	AMERICAN ASSOCIATION OF STATE HIGHWAY & TRANSPORTATION OFFICIALS
ABC	AGGREGATE BASE COURSE
AC	ASBESTOS CEMENT
AP	ANGLE POINT
ASB	ANCHORED STRAW BALES
ASP	ALUMINIZED STEEL PIPE
ASTM	AMERICAN SOCIETY FOR TESTING MATERIALS
AWWA	AMERICAN WATER WORKS ASSOCIATION
BC	BACK OF CURB
BF	BUTTERFLY VALVE
BOW	BACK OF WALK
BCR	BEGIN CURB RETURN
BOT	BOTTOM
BSWMP	BETTER STORM WATER MANAGEMENT PRACTICES
CH	CHORD
CAP	CORRUGATED ALUMINUM PIPE
CDOT	COLORADO DEPARTMENT OF TRANSPORTATION
CI	CAST IRON
C,G,& SW	CURB, GUTTER & SIDEWALK
C	CENTER LINE
CL	CLEAR
CMP	CORRUGATED METAL PIPE
CO	CLEAN OUT
COMB	COMBINATION (AS IN STORM SEWER AND SANITARY SEWER)
CONC	CONCRETE
CSM	CITY SURVEY MONUMENT
CSP	CORRUGATED STEEL PIPE
CU	COPPER
DI	DUCTILE IRON
DWY	DRIVEWAY
E	ELECTRIC
ECR	END CURB RETURN
EG	EDGE OF GUTTER
EL	ELEVATION
EP	EDGE OF PAVEMENT
EX	EXISTING
FB	FULL BODY
FC	FACE OF CURB
FG	FINISHED GRADE
F	FLOW LINE
FL	FLANGE
FM	FORCE MAIN
FO	FIBER OPTICS
FS	FAR SIDE
FTG	FOOTING
G	GAS
GB	GRADE BREAK
GM	GAS METER
GV	GATE VALVE
HBP	HOT BITUMINOUS PAVEMENT
HDPE	HIGH DENSITY POLYETHYLENE
INV	INVERT
IRR	IRRIGATION
L	LENGTH OF ARC
LC	LONG CHORD
LF	LINEAR FEET
LL	LONG ARC
LS	SHORT ARC
LT	LEFT
MB	MAILBOX
MCSM	MESA COUNTY SURVEY MONUMENT
MH	MANHOLE
MJ	MECHANICAL JOINT
MW	MILL WRAP
N/A	NOT APPLICABLE
NIC	NOT IN CONTRACT
NOP	NO ONE PERSON
NRCP	NON-REINFORCED CONCRETE PIPE
NS	NEAR SIDE
NTS	NOT TO SCALE
OHP	OVERHEAD POWER
OHT	OVERHEAD TELEPHONE
PC	POINT OF CURVATURE
PCC	POINT OF COMPOUND CURVATURE
PE	POLYETHYLENE
PERF	PERFORATED
PI	POINT OF INTERSECTION
PIP	PLASTIC IRRIGATION PIPE
POC	POINT ON CURVE
POT	POINT ON TANGENT
PR	PROPOSED
PRC	POINT OF REVERSE CURVATURE
PT	POINT OF TANGENCY
PVC	POLYVINYL CHLORIDE
R	RADIUS
RCP	REINFORCED CONCRETE PIPE
REQ'D	REQUIRED
RG	RESTRAINED GLANDS
RL	RIGHT RADIUS
ROW	RIGHT OF WAY
RP	RADIUS POINT
RR	RAIL ROAD
RS	SHORT RADIUS
RT	RIGHT
S	SLOPE
SAN	SANITARY
SC	SHORT CHORD
SCD	STANDARD CONTRACT DOCUMENTS
SCH	SCHEDULE
SF	SILT FENCE
SL	SECTION LINE
SSRB	STANDARD SPECIFICATIONS FOR ROAD & BRIDGE CONSTRUCTION
SSUU	STANDARD SPECIFICATIONS FOR CONSTRUCTION OF UNDERGROUND UTILITIES
STA	STATION
STL	STEEL
STM	STORM
T	TELEPHONE
TAN	LENGTH OF TANGENT
TC	TOP OF CURB
TH	TEST HOLE
TV	TELEVISION
(TYP)	TYPICAL
UU	UNDERGROUND UTILITIES
VC	VERTICAL CURVE
VCP	VITRIFIED CLAY PIPE
VPC	VERTICAL POINT OF CURVATURE
VPCC	VERTICAL POINT OF COMPOUND CURVATURE
VPRC	VERTICAL POINT OF REVERSE CURVATURE
VPI	VERTICAL POINT OF INTERSECTION
VPT	VERTICAL POINT OF TANGENCY
W	WATER
Δ	DELTA ANGLE

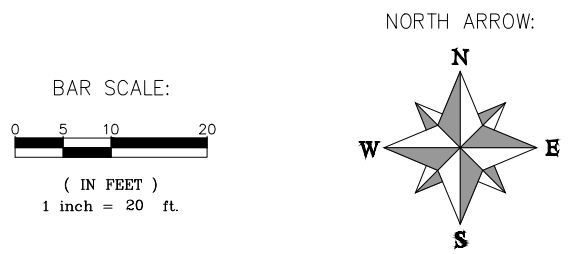
**LEGEND**

BSWMP	BSWMP
DRAINAGE BASIN BOUNDARY	— — — — —
BSWMP ANCHORED STRAW BALES	ASB ASB ASB ASB ASB ASB ASB ASB
BSWMP SILT FENCE	SF SF SF SF SF SF SF SF
BUILDING	
CONCRETE CURB AND GUTTER	2' CURB AND GUTTER
CONCRETE CURB, GUTTER, & SIDEWALK	7' C, G, & SW
CONCRETE DITCH	CONCRETE
CONCRETE SIDEWALK	4' SW
CULVERT	18" RCP
EARTH DITCH	EARTH . . . EARTH . . . EARTH . . .
EDGE OF GRAVEL	-----
EDGE OF PAVEMENT	-----
FENCE (BARBED WIRE)	— x — x — x — x — x — x —
FENCE (CHAIN LINK)	— x — x — x — x — x — x —
FENCE (IRON)	— x — x — x — x — x — x —
FENCE (PLASTIC)	— x — x — x — x — x — x —
FENCE (TEMPORARY CONSTRUCTION)	— x — x — x — x — x — x —
FENCE (WOOD)	— x — x — x — x — x — x —
FENCE (WOVEN WIRE)	— x — x — x — x — x — x —
GUARD RAIL	— — — — —
HATCHING: INDICATES ASPHALT REMOVAL	
HATCHING: INDICATES CONCRETE REMOVAL	
HATCHING: INDICATES STAGING AREA	
LINE (CENTER OF IMPROVEMENTS)	CENTERLINE
LINE (CITY LIMITS)	CITY LIMITS
LINE (CONTROL)	CONTROL LINE
LINE (EASEMENT)	-----
LINE (MONUMENT/SECTION)	MONUMENT/SECTION LINE
LINE (PROPERTY)	-----
LINE (RIGHT OF WAY)	-----
MATCH LINE	MATCH LINE SEE SHEET NO ?
PIPE (IRRIGATION)	4" IRR
PIPE (SIPHON)	4" SIPHON

PROPOSED CONCRETE CURB AND GUTTER	=====
PROPOSED CONCRETE CURB, GUTTER, & SIDEWALK	=====
PROPOSED CONCRETE SIDEWALK	=====
PROPOSED "WET" UTILITIES (CONSTRUCTION NOTE WILL INDICATE TYPE, SIZE, AND MATERIAL OF NEW MAIN)	8" PVC SANITARY SEWER
ALL PROPOSED FEATURES NOT SHOWN IN LEGEND WILL BE SHOWN THE SAME AS THEIR EXISTING COUNTERPART, BUT INDICATED BY BOLDER LINETYPE	
RAIL ROAD	
RETAINING WALL	1' RETAINING WALL
STRIPING (CONTINUOUS WHITE)	WHITE
STRIPING (DASHED WHITE)	WHITE
STRIPING (CONTINUOUS YELLOW)	YELLOW
STRIPING (DASHED YELLOW)	YELLOW
TOP OF SLOPE	4570
TOE OF SLOPE	4570
CONTOUR LINES (SHOWN BETWEEN TOP & TOE)	4580
TRAFFIC DETECTOR LOOP	
UTILITY LINE (ABANDON) (THIS CASE A WATER LINE)	W (ABANDON) 8" W
UTILITY LINE (CABLE TV)	TV TV
UTILITY LINE (ELECTRIC)	E E
UTILITY LINE (FIBER OPTIC)	FO OPT-FO
UTILITY LINE (GAS)	G 1 1/4" MW G
UTILITY LINE (HIGH VOLTAGE OVERHEAD POWER)	HVHP
UTILITY LINE (OVERHEAD POWER)	OHP
UTILITY LINE (OVERHEAD TELEPHONE)	OHT
UTILITY LINE (SANITARY SEWER)	8" SAN
UTILITY LINE (SANITARY SEWER FORCE MAIN)	8" FM
UTILITY LINE (SANITARY SEWER SERVICE)	SS
UTILITY LINE (STORM SEWER)	8" STM
UTILITY LINE (STORM SEWER, PERFORATED)	6" PERF
UTILITY LINE (STORM/SANITARY SEWER SEWER COMBINATION)	18" COMB
UTILITY LINE (TELEPHONE)	T T
UTILITY LINE (WATER)	W 8" W

**SYMBOLS**

BENCH MARK	
CATCH BASIN	
CLEAN OUT	
CURB STOP	
FIRE HYDRANT	
GUY WIRE ANCHOR	
HEADGATE	
IRRIGATION PUMP	
MAILBOX	
MANHOLE (ELECTRIC)	
MANHOLE (GAS)	
MANHOLE (SANITARY/STORM)	
MANHOLE (TELEPHONE)	
MANHOLE (TV)	
MANHOLE (WATER)	
METER (GAS)	
METER (WATER)	
PEDESTAL (TELEPHONE)	
PEDESTAL (TV)	
PROPERTY PIN	
PULL BOX	
REDUCER FITTING	
SIGN OR POST (SIGN TYPE NOTED)	
SPRINKLER HEAD	
STREET LIGHT	
SURVEY MONUMENT (CITY)	
SURVEY MONUMENT (TYPE NOTED)	
TEST HOLE	
TRAFFIC PAINT MARKING	
TRAFFIC SIGNAL POLE AND MAST ARM	
UTILITY POLE	
VALVE (GAS)	
VALVE (IRRIGATION)	
VALVE (WATER)	
VEGETATION (HEDGE OR BUSH)	
VEGETATION (TREE STUMP)	
VEGETATION (TREE) (CALIPER SIZE NOTED)	
WATER HYDRANT	
WEIR	
YARD LIGHT	



REVISION Δ	DESCRIPTION	DATE	DRAWN BY JCS	DATE 4-02
REVISION Δ			DESIGNED BY	DATE
REVISION Δ			CHECKED BY	DATE
REVISION Δ			APPROVED BY	DATE

SCALES: PLAN & PROFILE

HORIZONTAL: 1" = \_\_\_\_\_

VERTICAL: 1" = \_\_\_\_\_



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**CITY OF GRAND JUNCTION STANDARD ABBREVIATIONS, LEGEND, AND SYMBOLS**

SHEET NOT USED

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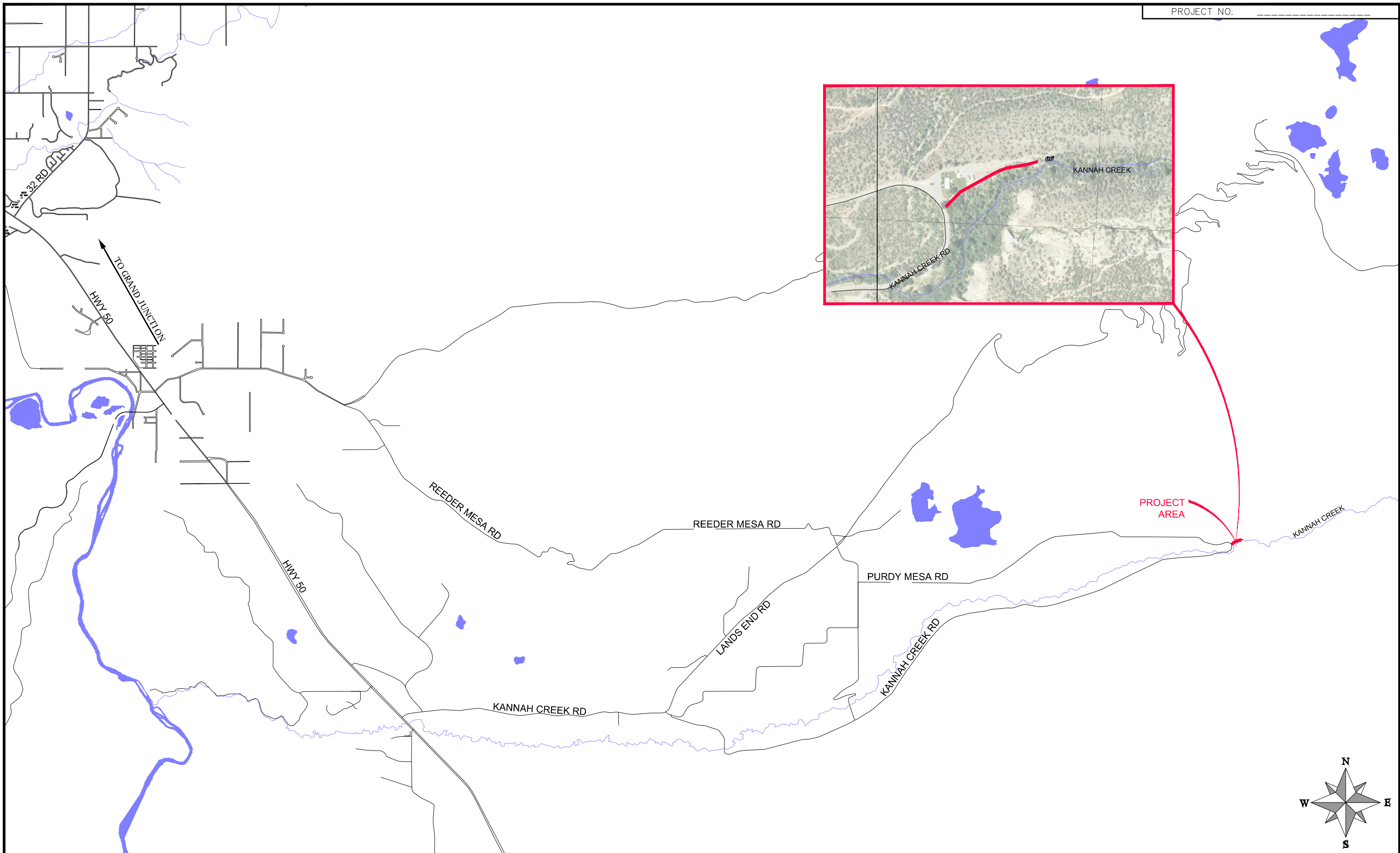
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REVISION	△	_____	CHECKED BY	JAE	DATE	2017	VERTICAL: 1" = _____
REVISION	△	_____	APPROVED BY	_____	DATE	_____	



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2017 KANNAH CREEK INTAKE REHABILITATION  
SUMMARY OF APPROXIMATE QUANTITIES





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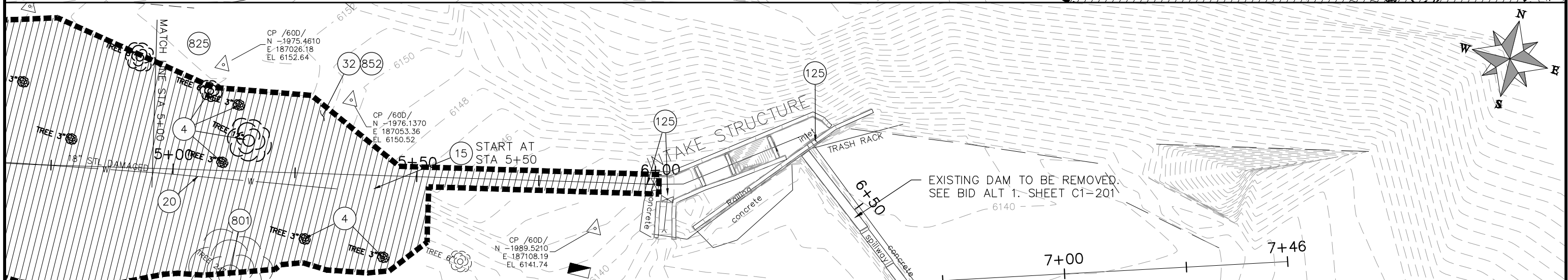
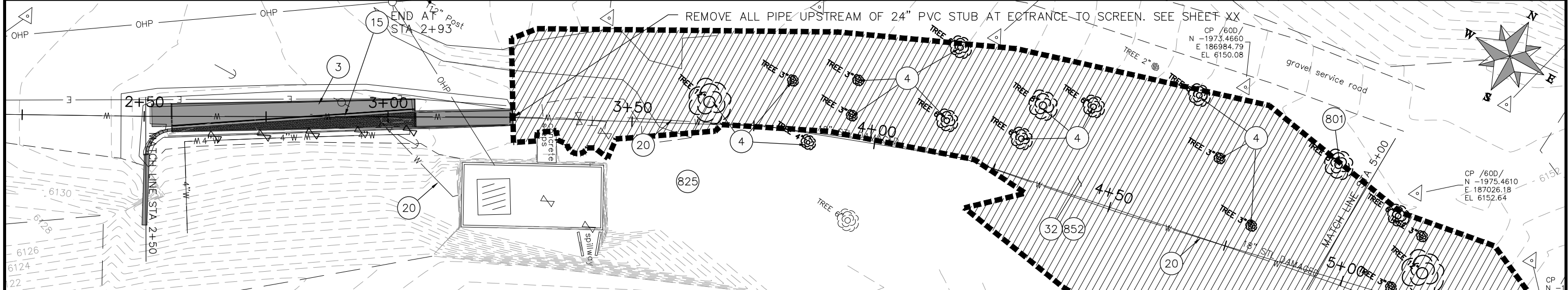
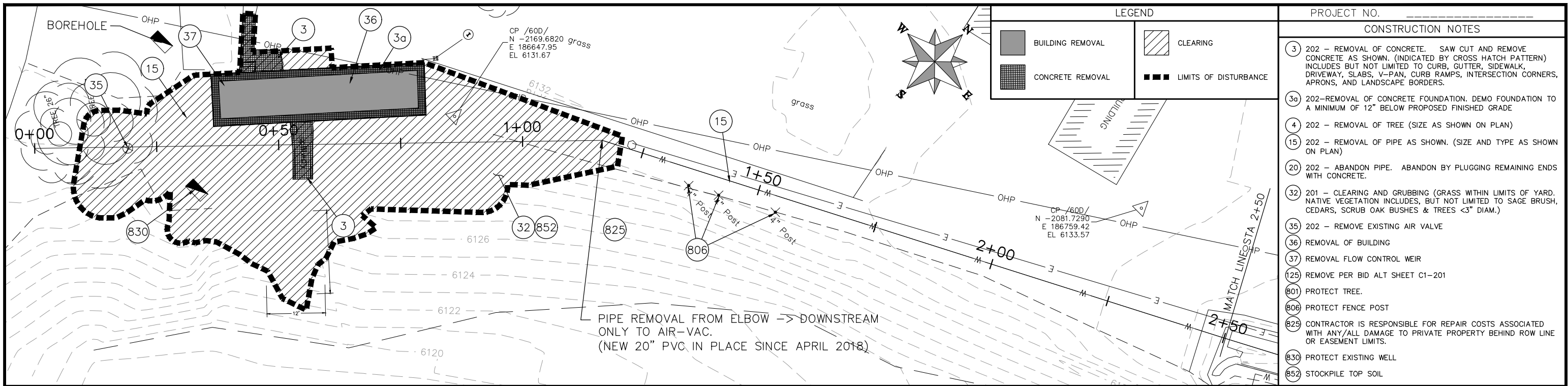
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△			CHECKED BY	JAE	DATE	2017
△			APPROVED BY		DATE	

SCALES: PLAN & PROFILE	
HORIZONTAL: 1" = 5000'	0 1250 2500 5000
VERTICAL: 1" =	



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**2017 KANNAH CREEK INTAKE REHABILITATION  
VICINITY MAP**



LEGEND	
	BUILDING REMOVAL
	CLEARING
	CONCRETE REMOVAL
	LIMITS OF DISTURBANCE

PROJECT NO. _____	
CONSTRUCTION NOTES	
3	202 - REMOVAL OF CONCRETE. SAW CUT AND REMOVE CONCRETE AS SHOWN. (INDICATED BY CROSS HATCH PATTERN) INCLUDES BUT NOT LIMITED TO CURB, GUTTER, SIDEWALK, DRIVEWAY, SLABS, V-PAN, CURB RAMPS, INTERSECTION CORNERS, APRONS, AND LANDSCAPE BORDERS.
3a	202-REMOVAL OF CONCRETE FOUNDATION. DEMO FOUNDATION TO A MINIMUM OF 12" BELOW PROPOSED FINISHED GRADE
4	202 - REMOVAL OF TREE (SIZE AS SHOWN ON PLAN)
15	202 - REMOVAL OF PIPE AS SHOWN. (SIZE AND TYPE AS SHOWN ON PLAN)
20	202 - ABANDON PIPE. ABANDON BY PLUGGING REMAINING ENDS WITH CONCRETE.
32	201 - CLEARING AND GRUBBING (GRASS WITHIN LIMITS OF YARD. NATIVE VEGETATION INCLUDES, BUT NOT LIMITED TO SAGE BRUSH, CEDARS, SCRUB OAK BUSHES & TREES <3" DIAM.)
35	202 - REMOVE EXISTING AIR VALVE
36	REMOVAL OF BUILDING
37	REMOVAL FLOW CONTROL WEIR
125	REMOVE PER BID ALT SHEET C1-201
801	PROTECT TREE.
806	PROTECT FENCE POST
825	CONTRACTOR IS RESPONSIBLE FOR REPAIR COSTS ASSOCIATED WITH ANY/ALL DAMAGE TO PRIVATE PROPERTY BEHIND ROW LINE OR EASEMENT LIMITS.
830	PROTECT EXISTING WELL
852	STOCKPILE TOP SOIL

REVISION	DESCRIPTION	DATE	DRAWN BY	HMC	DATE	2017
REVISION			DESIGNED BY	JAE	DATE	2017
REVISION			CHECKED BY	JAE	DATE	2017
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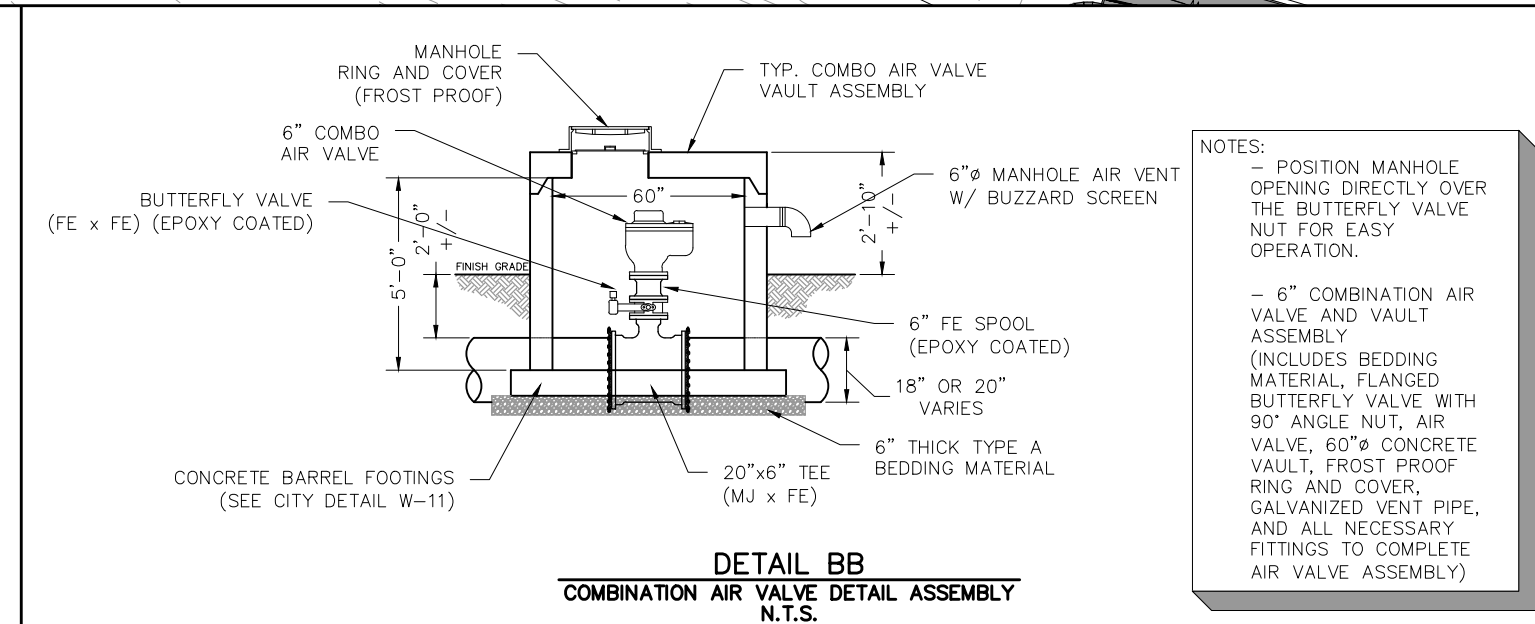
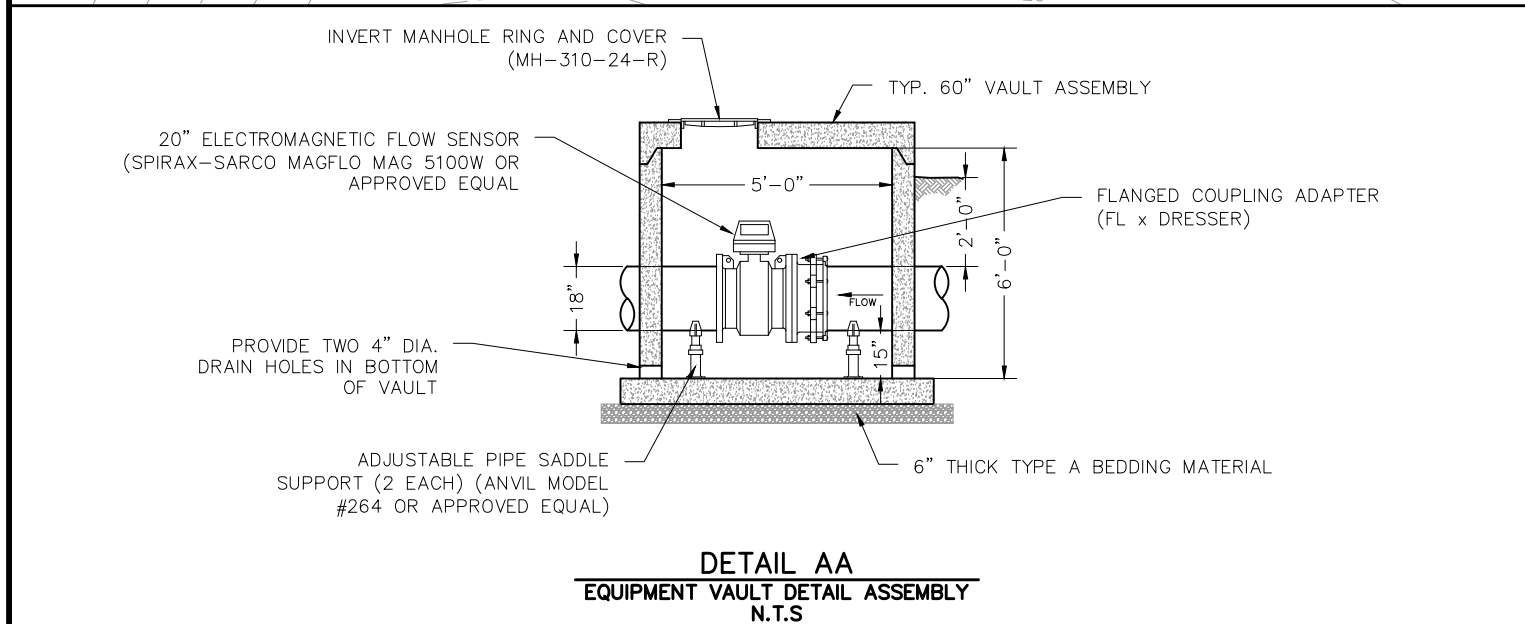
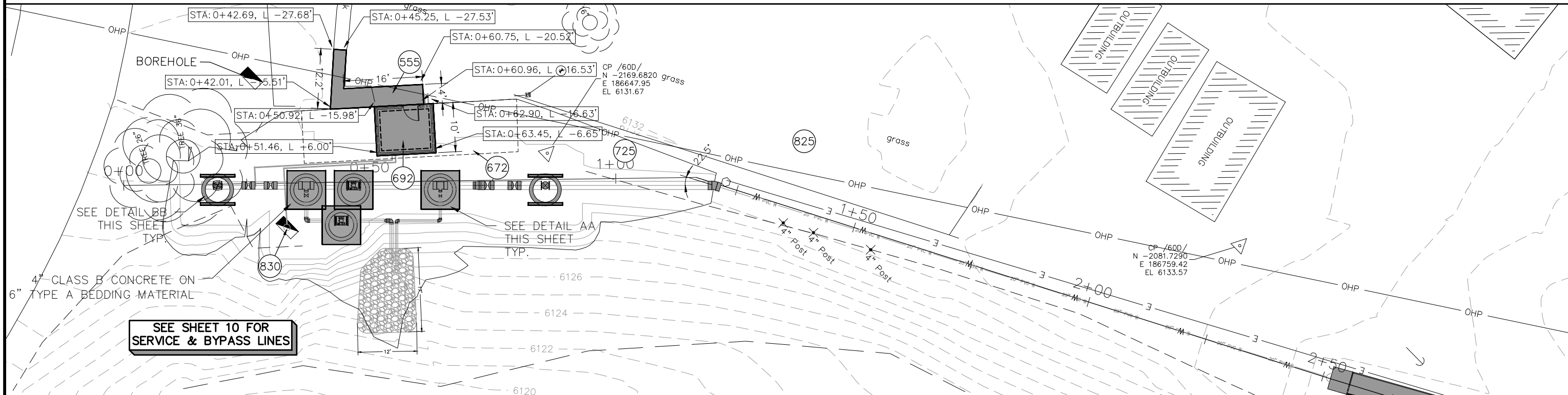
SCALES: PLAN & PROFILE	
HORIZONTAL: 1" = 20'	
VERTICAL: 1" = 10'	



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**2017 KANNAH CREEK INTAKE REHABILITATION  
DEMO PLAN  
STA 0+00 TO STA 7+50**

- 555 608.06 - CONCRETE SIDEWALK (4" THICK)(INCLUDES 6" AGGREGATE BASE COURSE)
- 672 304-AGGREGATE BASE COURSE (CLASS 3)(FILL CONCRETE FOUNDATION TO DEPTH 6" BELOW FINISHED GRADE, OR TO PROPOSED CONTROL BUILDING FOUNDATION. FILL IN MAX 12" LIFTS COMPACTED TO 95% STANDARD PROCTOR)
- 692 622-BUILDING FOUNDATION (4") (INCLUDES 6" AGGREGATE BASE COURSE)
- 725 207 - PLACE, GRADE, AND COMPACT 4" SUITABLE TOPSOIL AS SHOWN
- 825 CONTRACTOR IS RESPONSIBLE FOR REPAIR COSTS ASSOCIATED WITH ANY/ALL DAMAGE TO PRIVATE PROPERTY BEHIND ROW LINE OR EASEMENT LIMITS.
- 830 PROTECT EXISTING WELL



**NOTES:**

- POSITION MANHOLE OPENING DIRECTLY OVER THE BUTTERFLY VALVE NUT FOR EASY OPERATION.
- 6" COMBINATION AIR VALVE AND VAULT ASSEMBLY (INCLUDES BEDDING MATERIAL, FLANGED BUTTERFLY VALVE WITH 90° ANGLE NUT, AIR VALVE, 60"Ø CONCRETE VAULT, FROST PROOF RING AND COVER, GALVANIZED VENT PIPE, AND ALL NECESSARY FITTINGS TO COMPLETE AIR VALVE ASSEMBLY)

REVISION	DESCRIPTION	DATE	DRAWN BY	DATE	SCALE: PLAN & PROFILE
REVISION Δ			HMC	2017	HORIZONTAL: 1" = 20'
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REVISION Δ					0 2.5 5 10



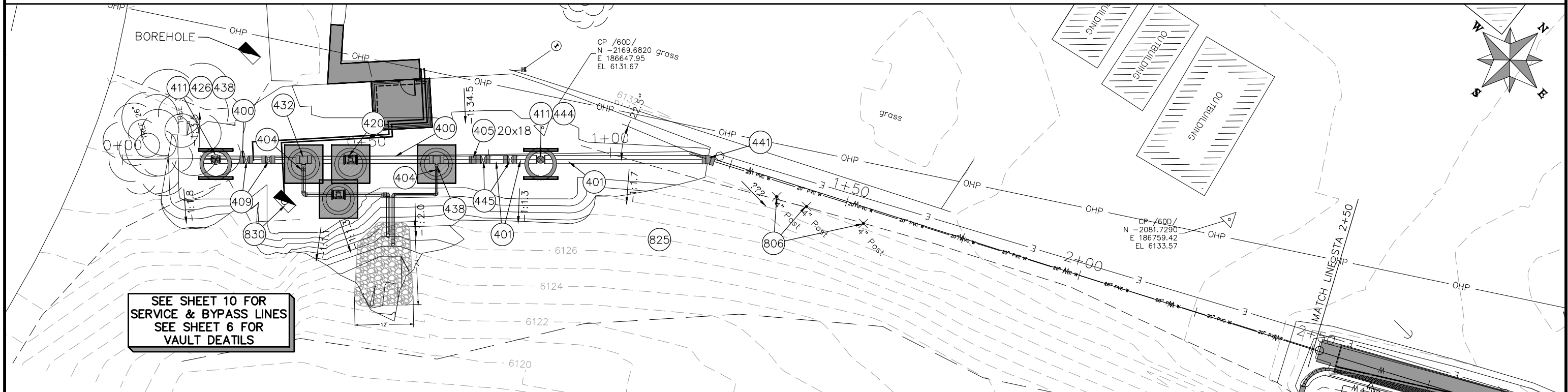
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**2017 KANNAH CREEK INTAKE REHABILITATION**  
**CONCRETE PLAN**  
STA 0+00 TO STA 2+50

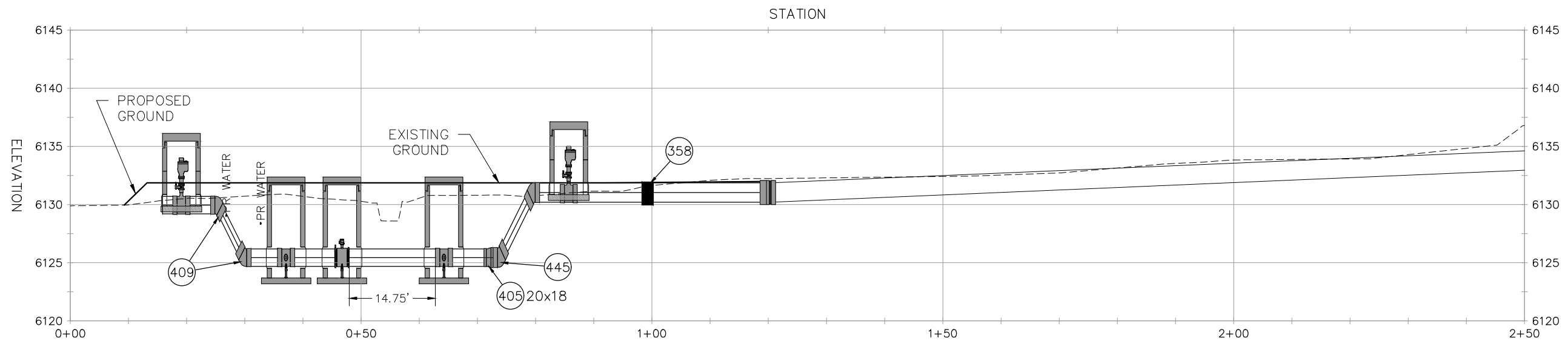
- 33 SPECIAL PROVISION CURED IN PLACE
- 358 103 - CLAY CUT-OFF WALL (INCIDENTAL TO WATER INSTALLATION PAY ITEM)
- 400 102.7/108.2 - 18" WATER MAIN PIPE (SDR-18 PVC). INCLUDES TYPE A BEDDING AND HAUNCHING MATERIAL AND BACKFILL OF TRENCH WITH NATIVE MATERIALS MEETING 103.16 EARTH BACKFILL MATERIAL.
- 401 102.7/108.2 - 20" WATER MAIN PIPE (SDR-18 PVC). INCLUDES TYPE A BEDDING AND HAUNCHING MATERIAL AND BACKFILL OF TRENCH WITH NATIVE MATERIALS MEETING 103.16 EARTH BACKFILL MATERIAL.
- 404 102.8e/108.3 - BUTTERFLY VALVE (SIZE AS SHOWN) (SEE SHEET 10)
- 405 102.8/108.3 - REDUCER (SIZE AS SHOWN).
- 409 102.8/108.3 - 18", 45° ELBOW
- 411 102.8g/102.8h/108.3 - 6" AIR VALVE AND VAULT

- 420 102.8i/108.4 - ELETROMAGNETIC FLOW METER (SIZE AS SHOWN ON PLAN) (SEE SHEET 10)
- 426 CONNECT TO EXISTING WATER PIPE/VALVE/FITTING. THE CONTRACT UNIT PRICE FOR WATER PIPE SHALL INCLUDE THE COST OF CONNECTION TO EXISTING PIPELINE
- 432 102.8/108.3 - 18" x 8" TEE
- 438 102.8/108.3 - 18" x 6" TEE
- 441 20", 22.5° ELBOW
- 444 102.8/108.3 - 20" x 6" TEE
- 445 102.8/108.3 20", 45° ELBOW
- 825 CONTRACTOR IS RESPONSIBLE FOR REPAIR COSTS ASSOCIATED WITH ANY/ALL DAMAGE TO PRIVATE PROPERTY BEHIND ROW LINE OR EASEMENT LIMITS.

830 PROTECT EXISTING WELL



SEE SHEET 10 FOR SERVICE & BYPASS LINES  
SEE SHEET 6 FOR VAULT DEATILS



REVISION	DESCRIPTION	DATE
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SCALES: PLAN & PROFILE	
HORIZONTAL: 1" = 20'	VERTICAL: 1" = 10'
0 5 10 20	0 2.5 5 10



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2017 KANNAH CREEK INTAKE REHABILITATION  
WATERLINE PLAN AND PROFILE  
STA 0+00 TO STA 2+50

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SCALES: PLAN & PROFILE	
HORIZONTAL: 1" = 20'	
VERTICAL: 1" = 10'	



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2017 KANNAH CREEK INTAKE REHABILITATION  
WATERLINE PLAN AND PROFILE  
STA 2+50 TO STA 5+00

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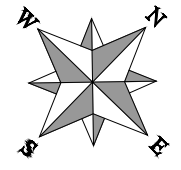
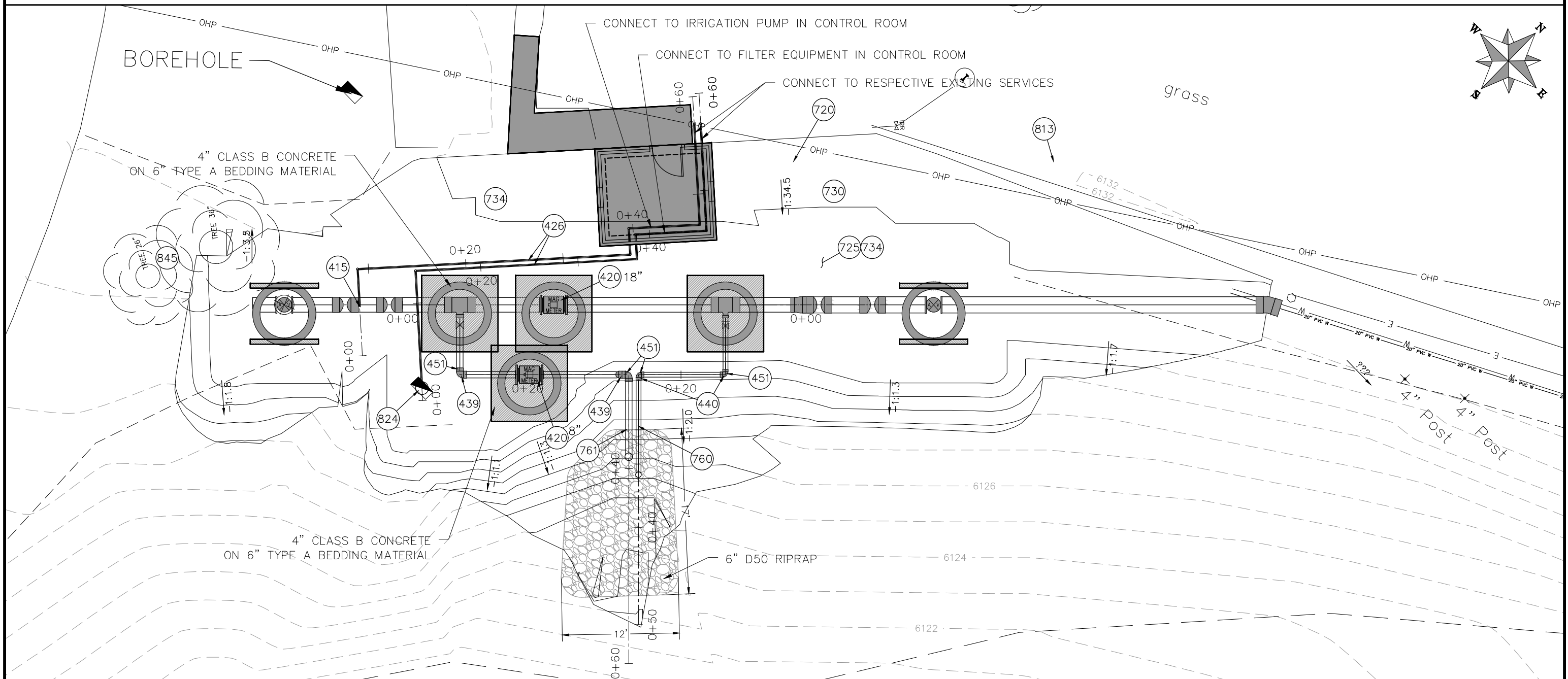


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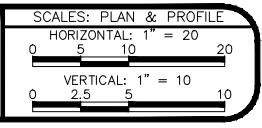
2017 KANNAH CREEK INTAKE REHABILITATION  
WATERLINE PLAN AND PROFILE  
STA 5+00 TO STA 7+50

- 415 102.8k/108.4 - TAPPING SADDLE (18"x2")
- 420 102.8l/108.4 - ELECTROMAGNETIC FLOW METER (SIZE AS SHOWN ON PLAN)
- 426 CONNECT TO EXISTING WATER PIPE/VALVE/FITTING. THE CONTRACT UNIT PRICE FOR WATER PIPE SHALL INCLUDE THE COST OF CONNECTION TO EXISTING PIPELINE
- 439 102.8/108.3 - 8", 90° ELBOW
- 440 102.8/108.3 - 6", 90° ELBOW
- 451 108.3 THRUSTBLOCK
- 720 207 - PLACE AND COMPACT FILL TO LEVEL EVEN WITH TOP OF FOUNDATION WALL
- 725 207 - PLACE, GRADE, AND COMPACT 4" SUITABLE TOPSOIL AS SHOWN

- 730 212 - RESEED AREA AS SHOWN
- 734 212 - SEED VARIATION 1
- 760 607 - 6" CHECK VALVE (TIDFLEX CHECKMATE OR ENGINEER APPROVED EQUIVALENT)
- 761 607 - 8" CHECK VALVE (TIDFLEX CHECKMATE OR ENGINEER APPROVED EQUIVALENT)
- 813 PROTECT LANDSCAPE APPURTENANCE (TYPE AS SHOWN ON PLAN).
- 824 PROTECT UTILITY PEDESTAL.
- 845 NOTE: NOTIFY AFFECTED UTILITY VENDOR 48 HOURS PRIOR TO EXCAVATIONS THAT WILL EXPOSE UTILITY LINES. THE COVER SHEET WILL HAVE A LISTING OF UTILITY VENDORS AND TELEPHONE NUMBERS.

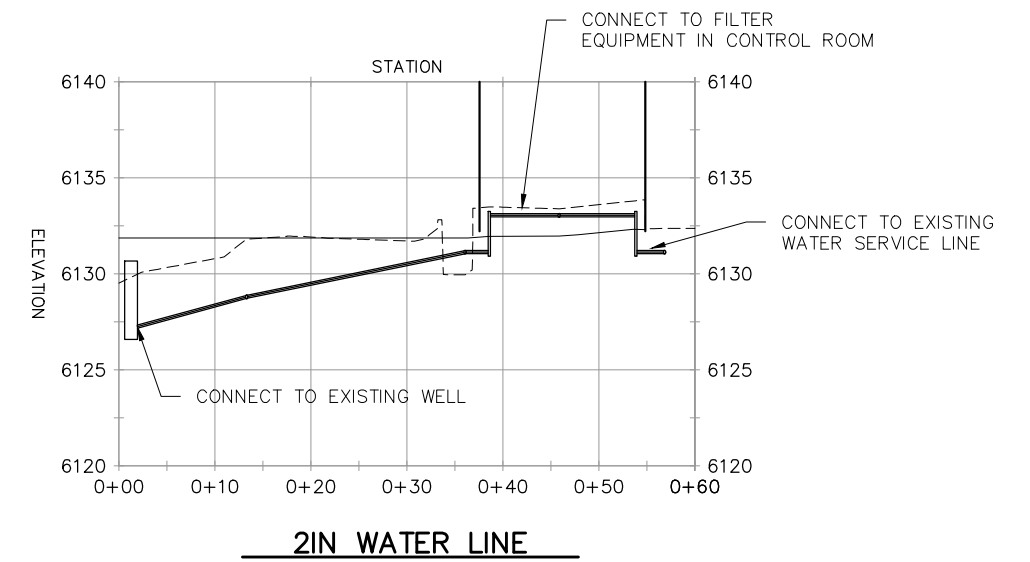
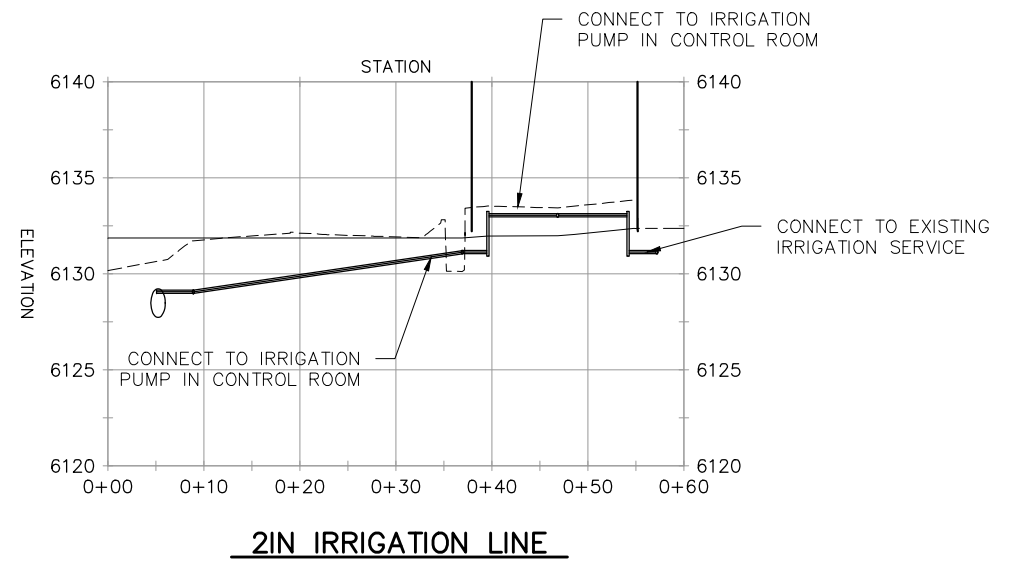
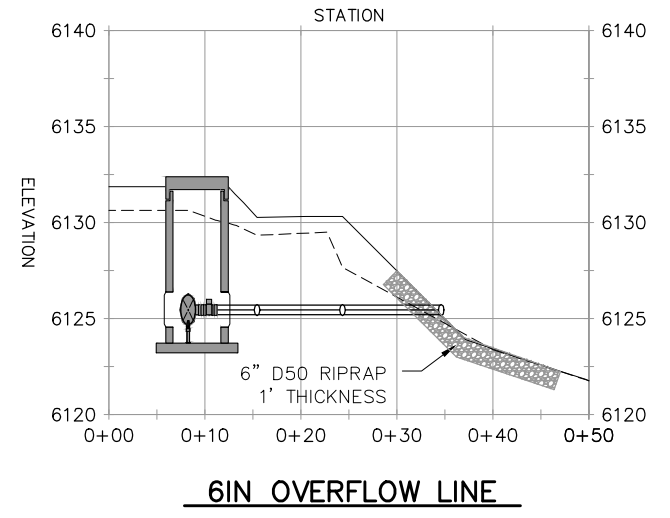
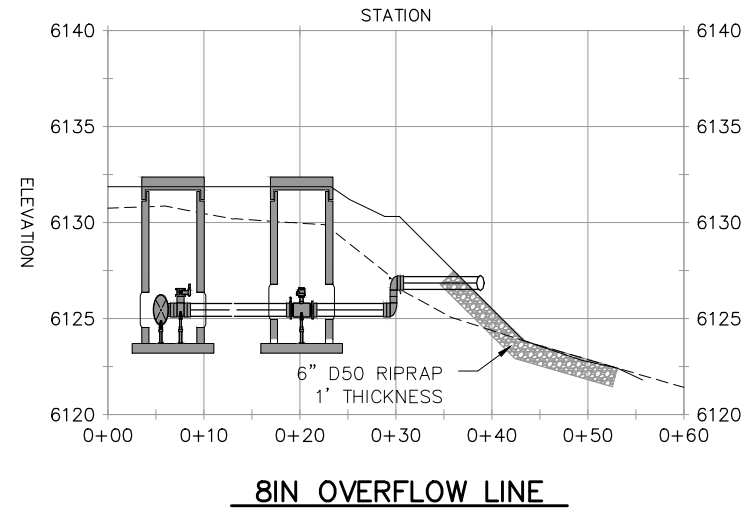


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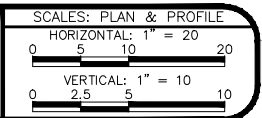


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**2017 KANNAH CREEK INTAKE REHABILITATION  
PLAN  
OVERFLOW AND ADDITIONAL LINES**



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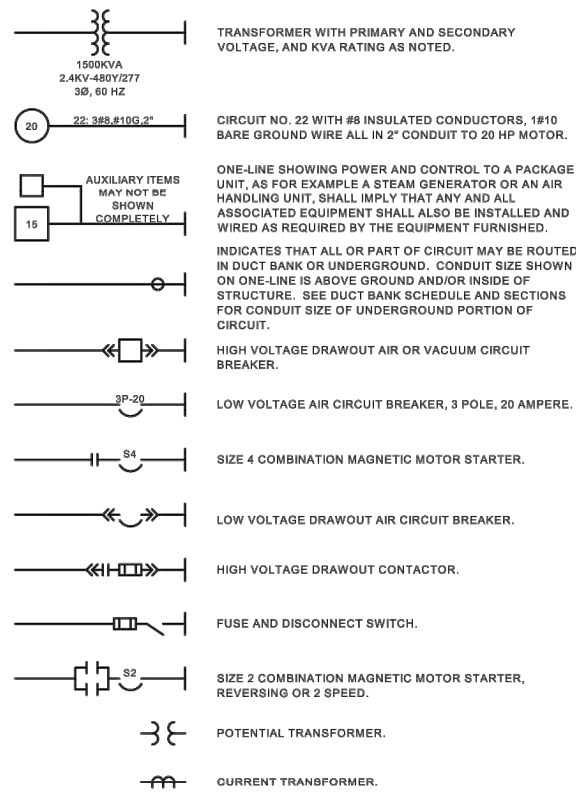


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2017 KANNAH CREEK INTAKE REHABILITATION  
OVERFLOW AND ADDITIONAL LINES



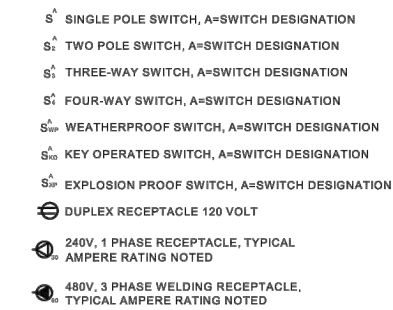
**ONE LINE DIAGRAM LEGEND**



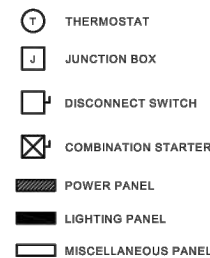
**SCHEMATIC SYMBOLS**



**SWITCH & OUTLET SYMBOLS**



**MISCELLANEOUS SYMBOLS**



**ABBREVIATIONS**

A	AMBER, AMPERE, ALARM	RECP	RECEPTACLE
AC	ALTERNATING CURRENT	RGS	RIGID GALVANIZED STEEL
AFD	ADJUSTABLE FREQUENCY DRIVE	RTD	RESISTANCE TYPE TEMP DETECTOR
AF	ABOVE FINISHED FLOOR	RTU	REMOTE TERMINAL UNIT
AM	AMMETER	RVSS	REDUCED VOLTAGE SOLID STATE STARTER
ATO	AUTOMATIC THROWOVER	S2	SIZE 2 STARTER
AWG	AMERICAN WIRE GAUGE	SCADA	SUPERVISORY CONTROL AND DATA ACQUISITION
C	CLOSE, COUNTER, CONTACTOR	SP	SINGLE POLE
CAP	CAPACITOR	SPDT	SINGLE POLE DOUBLE THROW
CB	CIRCUIT BREAKER	SPST	SINGLE POLE SINGLE THROW
CD	CONTROL DAMPER	SS	SELECTOR SWITCH
CKT	CIRCUIT	SV	SOLENOID VALVE
CL2	CHLORINE	SWB	SWITCHBOARD
CP	CONTROL PANEL	SWGR	SWITCHGEAR
CPT	CONTROL POWER TRANSFORMER	T	THERMOSTAT, TIMER, TOTALIZER
CS	CONTROL STATION	TACH	TACHOMETER
CT	CYCLE TIMER, CURRENT TRANSFORMER	TB	TERMINAL BLOCK
CTM	CYCLE TIMER MOTOR	TD	TIME DELAY RELAY
2/C	2 CONDUCTOR	TEMP	TEMPERATURE
4"C	4" CONDUIT	TQ	TORQUE
DC	DIRECT CURRENT	TS	TEMPERATURE SWITCH
DM	DAMPER MOTOR, DEMAND METER	UG	UNDERGROUND
DPDT	DOUBLE POLE DOUBLE THROW	UPS	UNINTERRUPTIBLE POWER SUPPLY
DPST	DOUBLE POLE SINGLE THROW	V	VOLTS
DPS	DIFFERENTIAL PRESSURE SWITCH	VA	VOLT AMPERE
DS	DISCONNECT SWITCH	VLS	VALVE LIMIT SWITCH
E	ELECTRIC OPERATOR FOR CONTROL DAMPER OR VALVE	VM	VOLTMETER
EMH	ELECTRICAL MANHOLE	W	WHITE, WATTS
ETM	ELAPSED TIME METER	WH	WATTHOUR METER
EX	EXISTING	WM	WATT METER
F	FORWARD	WP	WEATHERPROOF
FS	FLOW SWITCH	XFMR	TRANSFORMER
G	GREEN, GROUND	XP	EXPLOSION PROOF
GFI	GROUND FAULT INTERRUPTER	Y	YELLOW
GLS	GEARED LIMIT SWITCH	Z	AUXILIARY RELAY
#ØØ	#Ø GROUND WIRE	ZS	POSITION SWITCH
H	HIGH, HUMIDISTAT		
HH	HANDHOLE		
HMT	HIGH MOTOR TEMPERATURE		
HOA	HAND-OFF-AUTO		
HOR	HAND-OFF-REMOTE		
HP	HORSEPOWER		
HWCO	HIGH WATER CUTOFF		
HZ	HERTZ (CYCLE)		
I/O	INPUT/OUTPUT		
J	JUNCTION BOX		
KV	KILOVOLT		
KVA	KILOVOLT AMPERE		
KVAR	KILOVAR		
KW	KILOWATT		
KWH	KILOWATT HOUR		
L	LOW, LEVEL		
LA	LIGHTNING ARRESTOR		
LAN	LOCAL AREA NETWORK		
LP	LIGHTING PANEL		
LS	LIMIT SWITCH, LEVEL SWITCH		
LWCO	LOW WATER CUTOFF		
M	MAGNETIC MOTOR STARTER		
MA	MILLIAMPERE		
MCB	MAIN CIRCUIT BREAKER		
MCC	MOTOR CONTROL CENTER		
MCM	THOUSAND CIRCULAR MIL		
MD	MOISTURE DETECTOR		
MH	MANHOLE, MOUNTING HEIGHT		
MOV	MOTOR OPERATED VALVE		
MS	MANUAL MOTOR STARTER		
MSH	MOTOR SPACE HEATER		
N	NEUTRAL		
NC	NORMALLY CLOSED		
NO	NORMALLY OPEN, NUMBER		
O	OPEN		
OL	OVERLOAD		
PB	PUSH BUTTON, PULL BOX		
PF	POWER FACTOR METER		
PH	PHASE (CHEMICAL TERM)		
PLC	PROGRAMMABLE LOGIC CONTROLLER		
PP	POWER PANEL		
PS	PRESSURE SWITCH		
PT	POTENTIAL TRANSFORMER, PROGRAM TIMER		
2P	2 POLE		
R	RED, RAISE, RELAY, REVERSE		

**AREA DESIGNATIONS**

- THE SPECIAL AREA DESIGNATION BOXES, AS DEFINED BELOW, ARE LOCATED ON THE PLAN DRAWINGS TO DEFINE ELECTRICAL INSTALLATION REQUIREMENTS. DESIGNATION BOXES ARE LOCATED WITHIN ROOM OR BELOW ROOM NUMBER. ALL INDOOR AREAS NOT INDICATED OTHERWISE ARE AREA TYPE 1 AND MINIMUM NEMA TYPE 1 ENCLOSURES.
- AREA TYPE 1A CORROSIVE CHEMICAL FEED AND STORAGE ROOMS. CONDUIT SYSTEM SHALL BE EXPOSED PVC RIGID NON-METALLIC CONDUIT WITH PVC FITTINGS, BOXES, AND ACCESSORIES.
  - AREA TYPE 4 INDOOR WET LOCATIONS SUCH AS VAULTS, HOSEDOWN AREAS, BASEMENTS, ETC. MINIMUM NEMA TYPE 4 ENCLOSURE FOR EQUIPMENT AND GASKETED FITTINGS IN A CONDUIT SYSTEM.
  - AREA TYPE 7A CLASS 1, DIVISION 1 AREA AS DEFINED BY NEC. ALL EQUIPMENT AND CONDUIT SYSTEMS SHALL BE RATED FOR USE IN THIS AREA.
  - AREA TYPE 7B CLASS 1, DIVISION 2, GROUP C AND D (METHANE, GASOLINE) AS DEFINED BY NEC. EQUIPMENT AND CONDUIT SYSTEMS SHALL BE RATED FOR USE IN THIS AREA.
  - AREA TYPE 12 INDOOR, DRY, DIRTY AREA. REQUIRES MINIMUM NEMA TYPE 12 GASKETED ENCLOSURES FOR ALL EQUIPMENT AND GASKETED FITTINGS IN CONDUIT SYSTEMS.
  - AREA TYPE 4X OUTDOOR AND INDOOR WET LOCATIONS SUBJECT TO CORROSION. CONDUIT SYSTEM SHOULD BE PVC COATED RIGID GALVANIZED STEEL WITH PVC COATED FITTINGS, BOXES, AND STAINLESS STEEL HARDWARE.

**GENERAL REQUIREMENTS**

- THE CONTRACTOR SHALL BE RESPONSIBLE FOR ROUTING ALL CONDUITS NOT SHOWN ON THE PLANS. THIS SHALL INCLUDE ALL CONDUITS SHOWN ON THE ONE-LINES AND HOME-RUNS SHOWN ON THE PLAN DRAWINGS. CONDUITS SHALL BE ROUTED AS DEFINED IN THE SPECIFICATIONS.
- SPARE WIRES SHALL BE TAPED AND COILED.
- IF EQUIPMENT SUPPLIED BY MANUFACTURER HAS A LARGER LOAD THAN VALUE SHOWN, THE CABLE CONDUIT AND ELECTRICAL EQUIPMENT SHALL BE ENLARGED, AS REQUIRED, TO ACCOMODATE THE HIGHER VALUE.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR FURNISHING PROPERLY SIZED STARTER OVERLOADS FOR EQUIPMENT FURNISHED.
- LIGHTING AND RECEPTACLE CIRCUITS DESIGNATED ON THE FLOOR PLANS ARE NOT SHOWN ON THE ONE-LINES. CONDUCTORS FOR LIGHTING, RECEPTACLES, AND MISCELLANEOUS 120VAC CIRCUITS SHALL BE MINIMUM NO. 12 AWG. CONDUIT FOR LIGHTING, RECEPTACLES, AND MISCELLANEOUS 120VAC CIRCUITS SHALL BE MINIMUM 1/2".
- IN AREAS WHERE THERE ARE OVERHEAD BRIDGE CRANES, HOISTS, ETC., NO CONDUITS SHALL BE RUN OVERHEAD THAT WILL INTERFERE WITH THE OPERATION OF THE EQUIPMENT.

**GENERAL NOTES**

- SOLID LINES — INDICATE NEW WORK OR EQUIPMENT.
- DOTTED LINES . . . . INDICATE EXISTING WORK OR EQUIPMENT.
- DASHED LINES - - - INDICATE FUTURE WORK OR EQUIPMENT.
- THIS IS A GENERAL LEGEND SHEET. SOME SYMBOLS AND ABBREVIATIONS MAY NOT BE UTILIZED ON THIS SPECIFIC PROJECT.
- INFORMATION RELATED TO CIRCUIT IDENTIFICATION, WIRE & CONDUIT SIZES, AND ROUTING, IS ON THE FOLLOWING DRAWING TYPES.
  - A. ONE-LINE DIAGRAMS SHOW CIRCUIT IDENTIFICATION, WIRE QUANTITY AND SIZES, AND CONDUIT SIZE WITHIN STRUCTURES. ONE-LINE DIAGRAMS ALSO INDICATE ORIGIN AND DESTINATION OF CIRCUITS, AND IDENTIFY CIRCUITS ROUTED UNDERGROUND.
  - B. FOR CIRCUITS WITHOUT UNDERGROUND PORTIONS, BUILDING FLOOR PLANS SHOW LOCATION OF EQUIPMENT FOR DETERMINING CIRCUIT LENGTH WITHIN THE STRUCTURE. FOR CIRCUITS WITH UNDERGROUND PORTIONS, ANTICIPATED PENETRATION OF UNDERGROUND CONDUITS ARE SHOWN ON STRUCTURE PLANS FOR DETERMINING THE LENGTH OF IN-STRUCTURE PORTIONS OF CIRCUITS. BUILDING FLOOR PLANS MAY ALSO SHOW HOME RUNS FOR LIGHTING, RECEPTACLE, AND OTHER MISCELLANEOUS EQUIPMENT CIRCUITS.
  - C. SITE PLANS INDICATE THE GENERAL ROUTING OF UNDERGROUND CONDUITS AND DUCT BANKS. CIRCUITS ROUTED IN UNDERGROUND CONDUITS OR DUCT BANKS ARE INDICATED IN DUCT BANK SECTIONS REFERENCED ON THE SITE PLAN.
  - D. DUCT BANK SECTIONS AND SCHEDULES IDENTIFY CONDUIT SIZE, CONDUIT MATERIAL, ARRANGEMENT OF THE UNDERGROUND CONDUITS, AND CIRCUITS ROUTED IN EACH UNDERGROUND CONDUIT.
- CLOUDED MARKINGS INDICATE WORK IN EXISTING AREAS THAT IS NEW OR NEW WORK ON AN EXISTING PIECE OF EQUIPMENT.

REVISION	DESCRIPTION	DATE	DRAWN BY	DATE
REVISION			TFW	8-17
REVISION			TFW	8-17
REVISION				
REVISION				

SCALES: PLAN & PROFILE

HORIZONTAL: 1" = \_\_\_\_\_

VERTICAL: 1" = \_\_\_\_\_



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ENGINEERING DIVISION

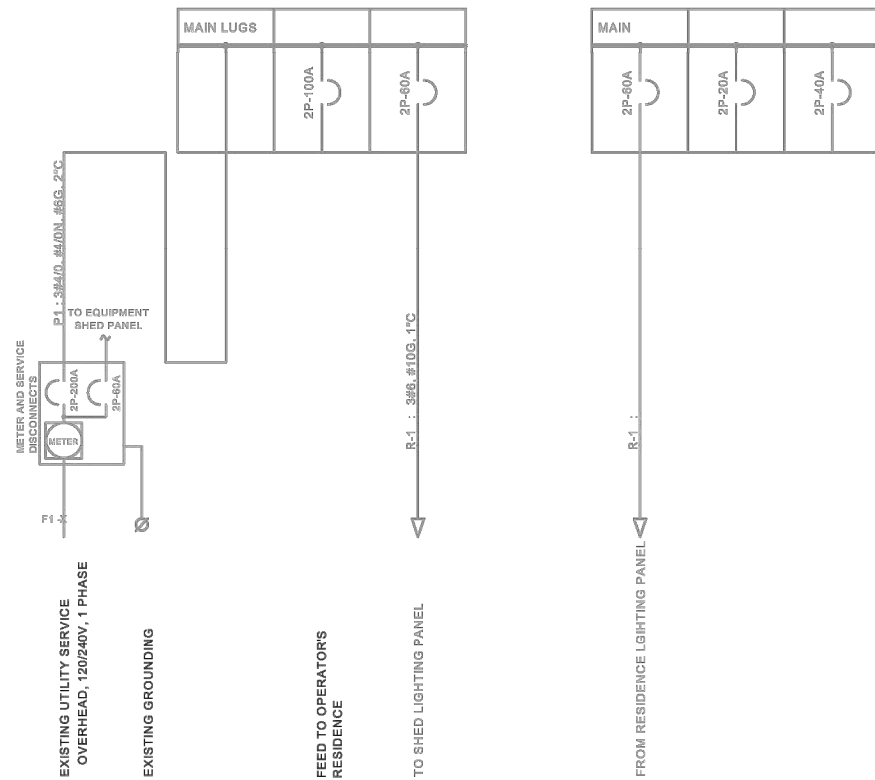
CITY OF GRAND JUNCTION  
2017 KANNAH CREEK INTAKE REHABILITATION  
ELECTRICAL LEGEND

NAME:	LP-1	BUS:	100A	COPPER		MAINS:	2P-60A			
SERVICE	120/240 VAC	RATING:	100A	100A		LOCATION:	WATER SHED			
MOUNTING	SURFACE, NEMA 3R									
V.A.							V.A.			
A	B	LOAD	PHASE	BREAKER	CIRCUIT NUMBER	BREAKER	PHASE	LOAD	A	B
920		WELL PUMP (1HP)	2	20	1 2	40	2	IRRIGATION PUMP (5HP)	2875	
	920	-	-	20	3 4	-	-	-		2875
180		RECEPTACLE	1	15	5 6	15	1	RECEPTACLE	180	
	0				7 8	15	1	LIGHTS		150
0					9 10	20	2	SPARE	0	
	0				11 12	-	-	-		0
0					13 14				0	
	0				15 16					0
0					17 18				0	
	0				19 20					0
1100	920	TOTALS PER PHASE PER SIDE							3055	3025
4155	3945	TOTALS PER PHASE								
	8100	PANEL TOTAL								

EXISTING WATER SHED LIGHTING PANEL, LP-1, PANEL SCHEDULE

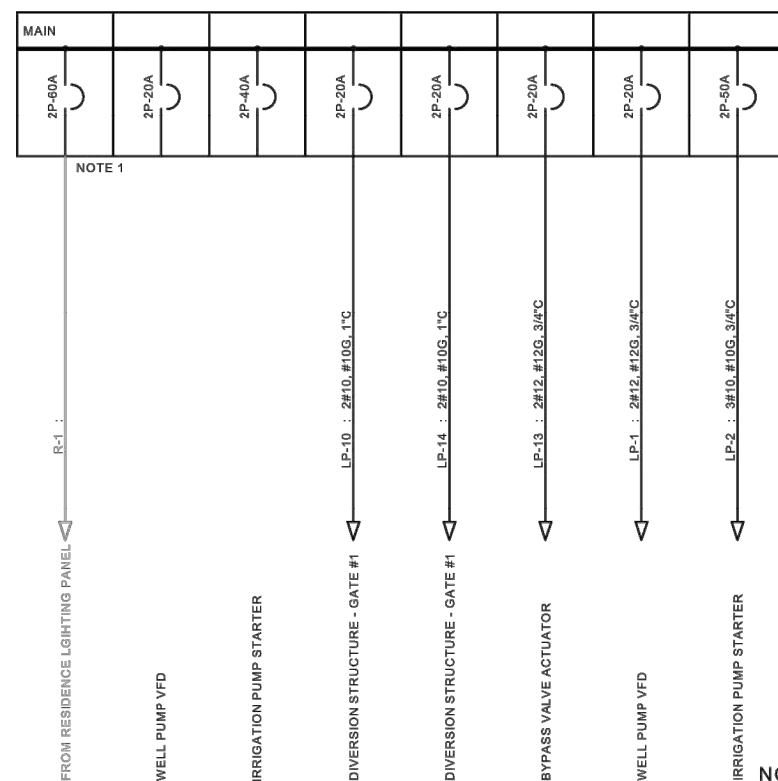
NAME:	LP-SHED	BUS:	100A	COPPER		MAINS:	2P-60A			
SERVICE	120/240 VAC	RATING:	10KAIC	100A		LOCATION:	WATER SHED			
MOUNTING	SURFACE, NEMA 3R									
V.A.							V.A.			
A	B	LOAD	PHASE	BREAKER	CIRCUIT NUMBER	BREAKER	PHASE	LOAD	A	B
920		WELL PUMP (1HP)	2	20	1 2	50	2	IRRIGATION PUMP (5HP)	2875	
	920	-	-	20	3 4	-	-	-		2875
360		RECEPTACLE	1	15	5 6	15	1	RECEPTACLE	180	
	150	RTU PANEL	1	15	7 8	15	1	LIGHTS		150
25		PIPELINE FLOW METER	1	15	9 10	20	2	DIVERSION GATE #1	500	
	25	BYPASS FLOW METER	1	15	11 12	-	-	-		500
350		BYPASS VALVE ACTUATOR	2	20	13 14	20	2	DIVERSION GATE #2	500	
	350	-	-	-	15 16	-	-	-		500
40		TURBIDIMETER	1	15	17 18				0	
	750	HEATER	2	20	19 20					0
750		-	-	-	21 22				0	
	200	UV FILTER (RECEPT)	1	15	23 24					
100		WATER SOFTENER (RECEPT)	1	15	25 26				0	
	0				27 28					
0					29 30				0	
2545	2395	TOTALS PER PHASE PER SIDE							4055	4025
6600	6420	TOTALS PER PHASE								
	13020	PANEL TOTAL								

NEW WATER SHED LIGHTING PANEL, LP-SHED, PANEL SCHEDULE



EXISTING SITE POWER ONE-LINE DIAGRAM

EXISTING WATER SHED POWER ONE-LINE DIAGRAM



NEW WATER SHED POWER, LP-SHED ONE-LINE DIAGRAM

FAULT CURRENTS	
LOCATION	VALUE
F1-UTILITY	7,400A

- NOTES:
- THE EXISTING CIRCUIT TO THE EXISTING SHED SHALL BE RELOCATED TO CONNECT TOT HE NEW LIGHTING PANEL, LP-SHED.
  - AN ETHERNET RADIO SHALL BE INSTALLED TO CONNECT THE SHED TO THE RESIDENCE'S INTERNET SERVICE.

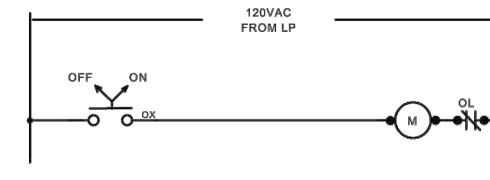
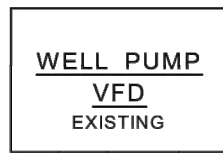
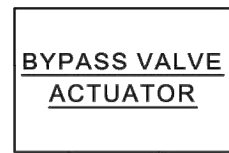
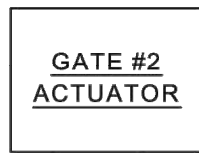
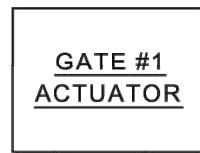
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REVISION			JFW	8-17
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REVISION				

SCALES: PLAN & PROFILE	
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PUBLIC WORKS ENGINEERING DIVISION

CITY OF GRAND JUNCTION  
2017 KANNAH CREEK INTAKE REHABILITATION  
ELECTRICAL ONE-LINE DIAGRAMS



**IRRIGATION PUMP STARTER SCHEMATIC**  
(NEW STARTER FOR THIS EXISTING PUMP SHALL BE PROVIDED)

240V; LP-SHED

RTU PANEL

240V; LP-SHED

RTU PANEL

240V; LP-SHED

RTU PANEL

240V; LP-SHED

POTABLE WATER SYSTEM  
PRESSURE TRANSMITTER  
EXISTING - RECONNECT

IRRIGATION PUMP

240V; LP-SHED

IRRIGATION PUMP

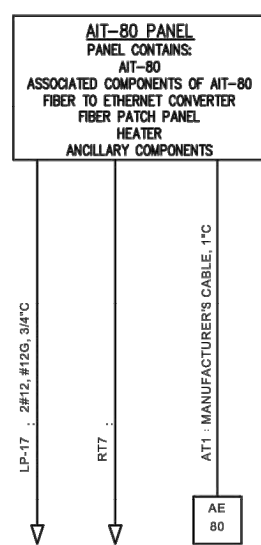
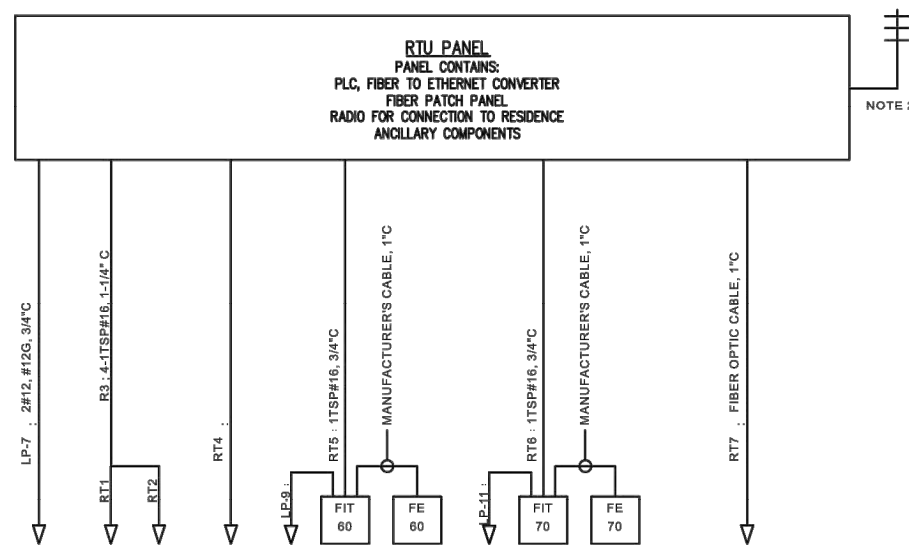
**DIVERSION STRUCTURE GATE #1 ONE-LINE DIAGRAM**

**DIVERSION STRUCTURE GATE #2 ONE-LINE DIAGRAM**

**BYPASS VALVE ACTUATOR ONE-LINE DIAGRAM**

**WELL PUMP VFD(EXISTING) ONE-LINE DIAGRAM**

**IRRIGATION PUMP STARTER ONE-LINE DIAGRAM**



120V, LP-SHED  
DIVERSION GATE #1  
DIVERSION GATE #2  
BYPASS VALVE ACTUATOR  
120VAC: LP-SHED  
PIPELINE FLOW  
FLOW TUBE  
120VAC: LP-SHED  
BYPASS FLOW  
FLOW TUBE  
AIT-80 PANEL

120V, LP-SHED  
RTU PANEL  
SENSOR

**RTU PANEL ONE-LINE DIAGRAM**

**AIT-80 PANEL ONE-LINE DIAGRAM**

**NOTES:**

1. THE EXISTING CIRCUIT TO THE EXISTING SHED SHALL BE RELOCATED TO CONNECT TOT HE NEW LIGHTING PANEL, LP-SHED.
2. AN ETHERNET RADIO SHALL BE INSTALLED TO CONNECT THE SHED TO THE RESIDENCE'S INTERNET SERVICE.

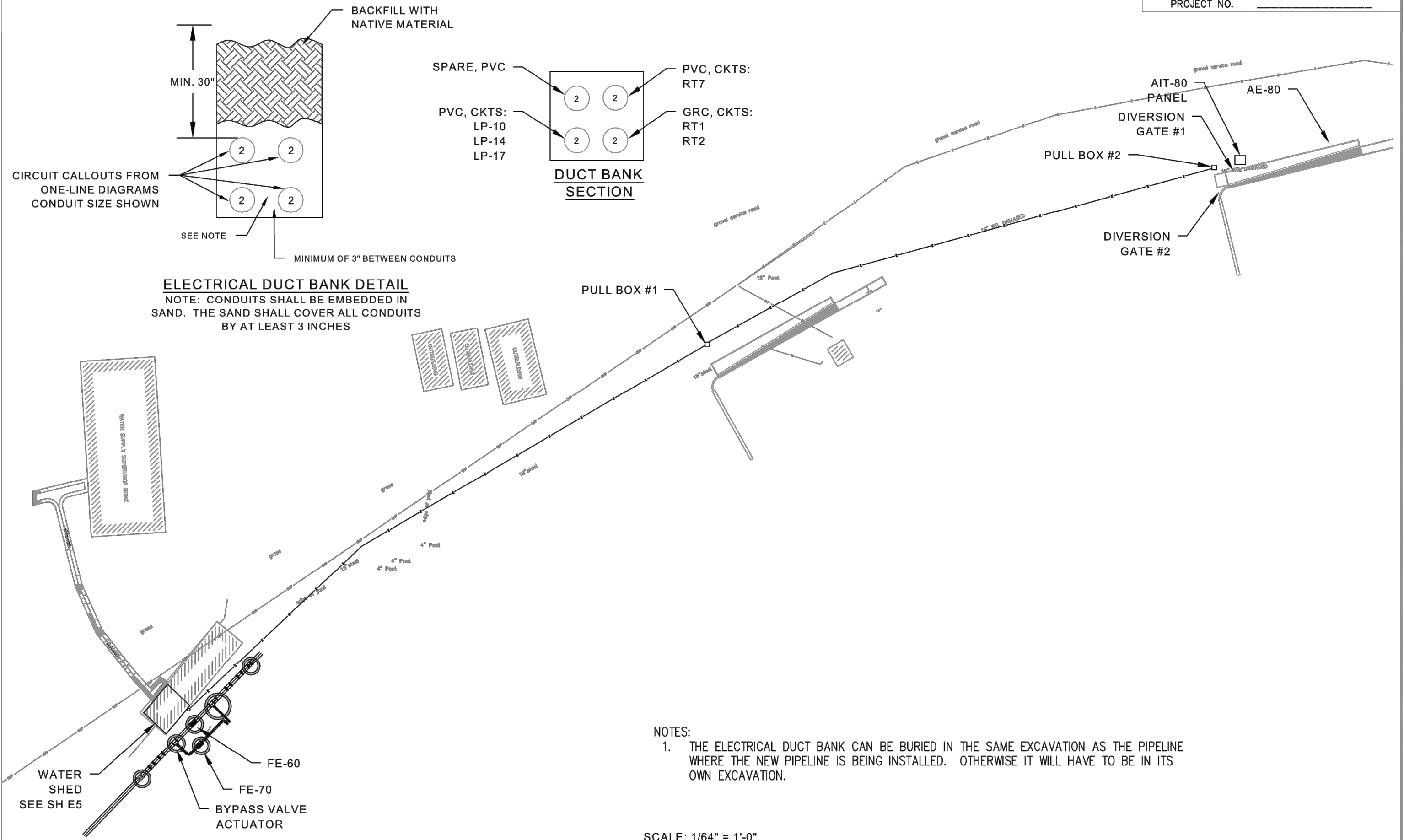
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SCALES: PLAN & PROFILE
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**PUBLIC WORKS ENGINEERING DIVISION**

**CITY OF GRAND JUNCTION  
2017 KANNAH CREEK INTAKE REHABILITATION  
ELECTRICAL ONE-LINE DIAGRAMS**



- NOTES:  
 1. THE ELECTRICAL DUCT BANK CAN BE BURIED IN THE SAME EXCAVATION AS THE PIPELINE WHERE THE NEW PIPELINE IS BEING INSTALLED. OTHERWISE IT WILL HAVE TO BE IN ITS OWN EXCAVATION.

SCALE: 1/64" = 1'-0"

REVISION	DESCRIPTION	DATE	DRAWN BY	DATE
REVISION			TFW	8-17
REVISION			TFW	8-17
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REVISION				

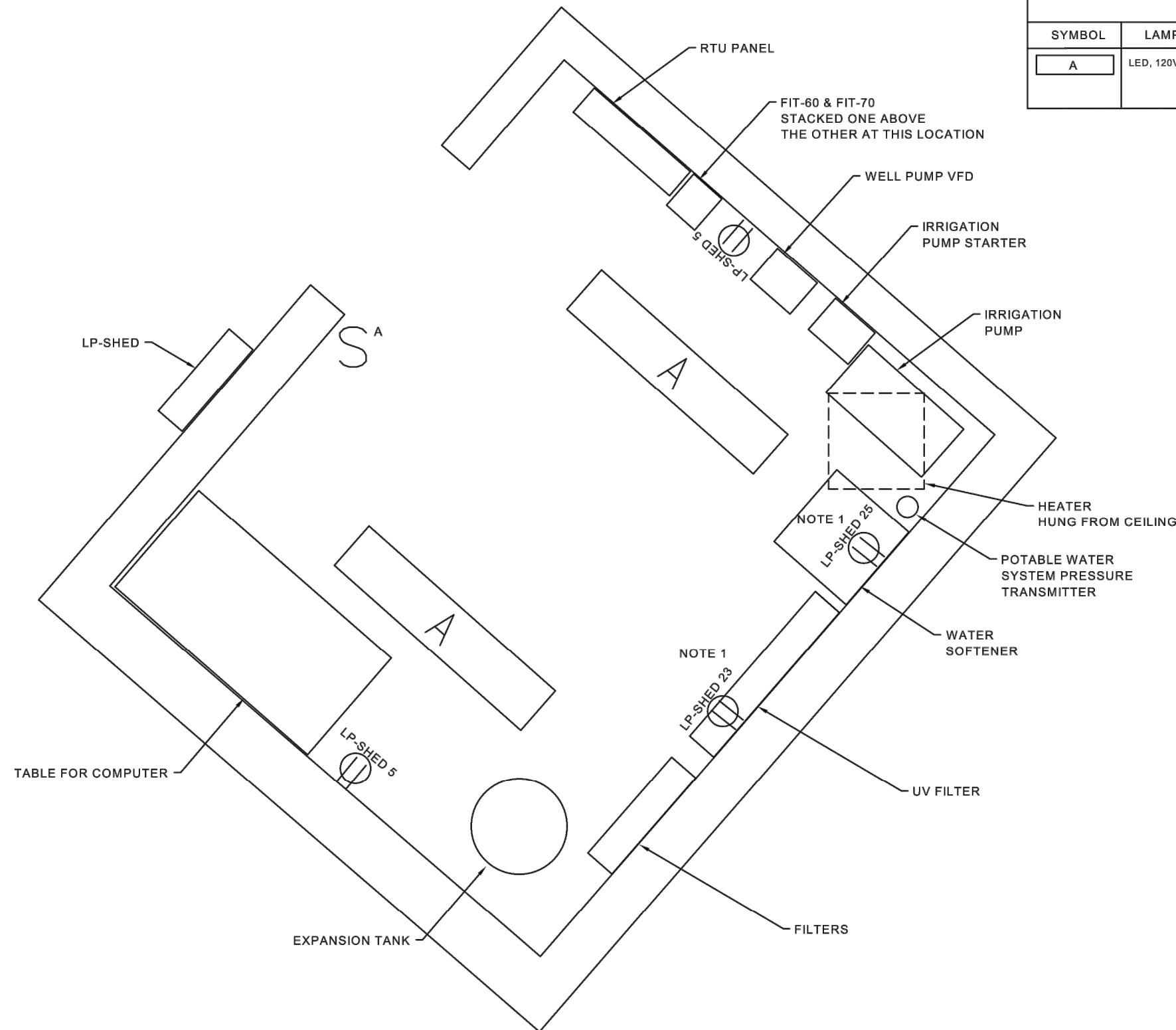
SCALES: PLAN & PROFILE
HORIZONTAL: 1" = _____
VERTICAL: 1" = _____



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 2017 KANNAH CREEK INTAKE REHABILITATION  
 ELECTRICAL SITE PLAN

LIGHTING FIXTURE SCHEDULE				
SYMBOL	LAMP	MTG HEIGHT	DESCRIPTION	MANUFACTURER
A	LED, 120V	MOUNT ON CEILING	4 FOOT FIXTURE-HEAVY DUTY AND MOUNTING HARDWARE SUITABLE FOR WET LOCATIONS	DIALIGHT: LPK44-2C3DIF



- NOTES:
1. MOUNT THE RECEPTACLE NEAR THE EQUIPMENT IT IS DEDICATED FOR.

## WATER SHED - PLAN VIEW

NTS

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REVISION			TFW	8-17	VERTICAL: 1" =
REVISION					
REVISION					

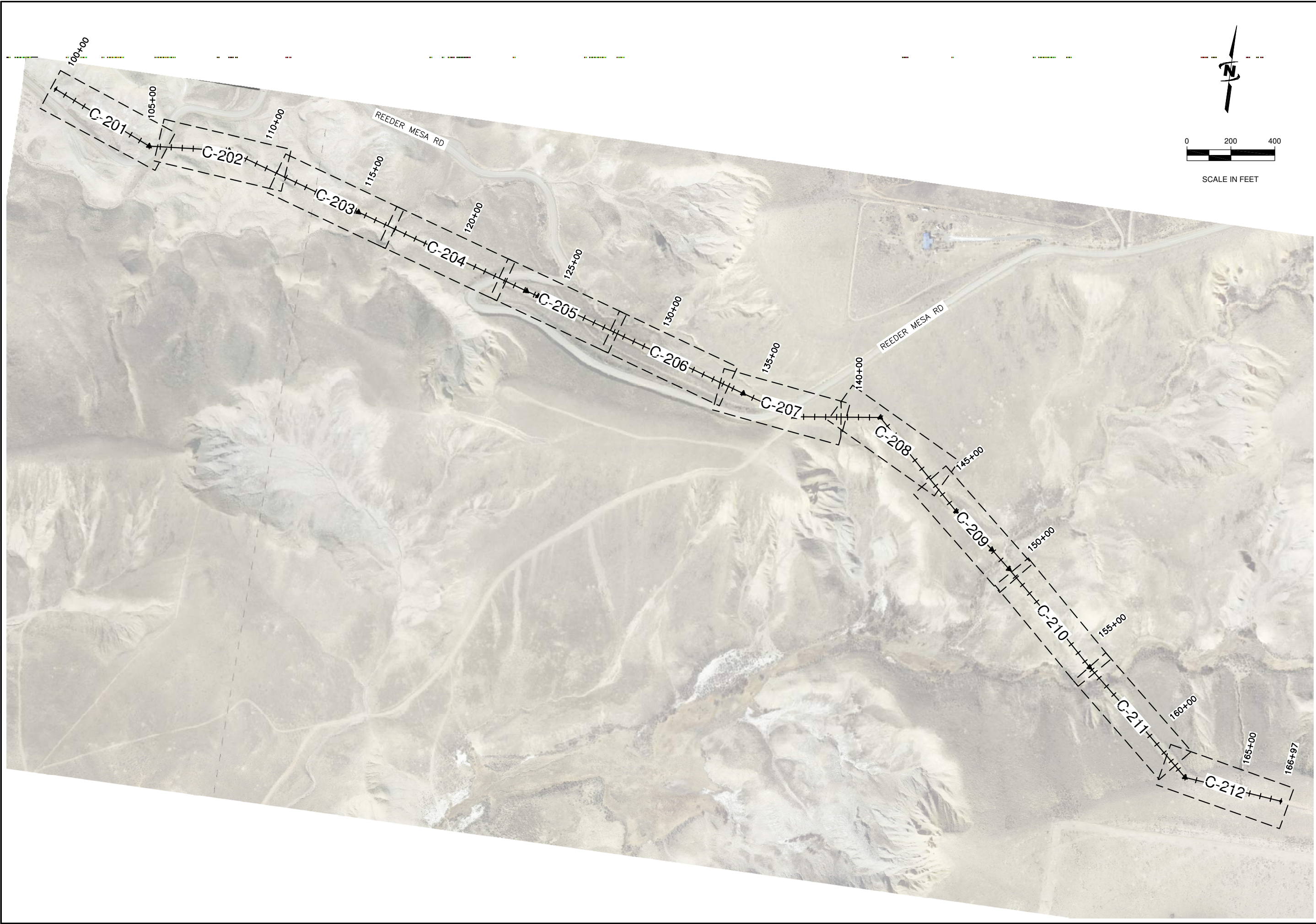


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2017 KANNAH CREEK INTAKE REHABILITATION  
ELECTRICAL ONE-LINE DIAGRAMS



Plot Date: 9/20/2018 7:43 AM Plotted By: Juba Myers  
 Date Created: 8/1/2018 10:06 AM Project: JUB GRAND JUNCTION 81-18-013 CITY OF GRAND JUNCTION PURDY MESA FLOWLINE CAD SHEET 81-18-013 C-001 INDEX.DWG



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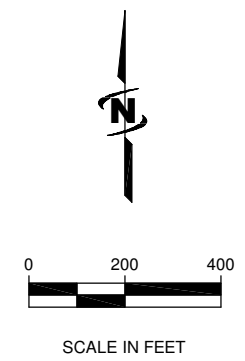
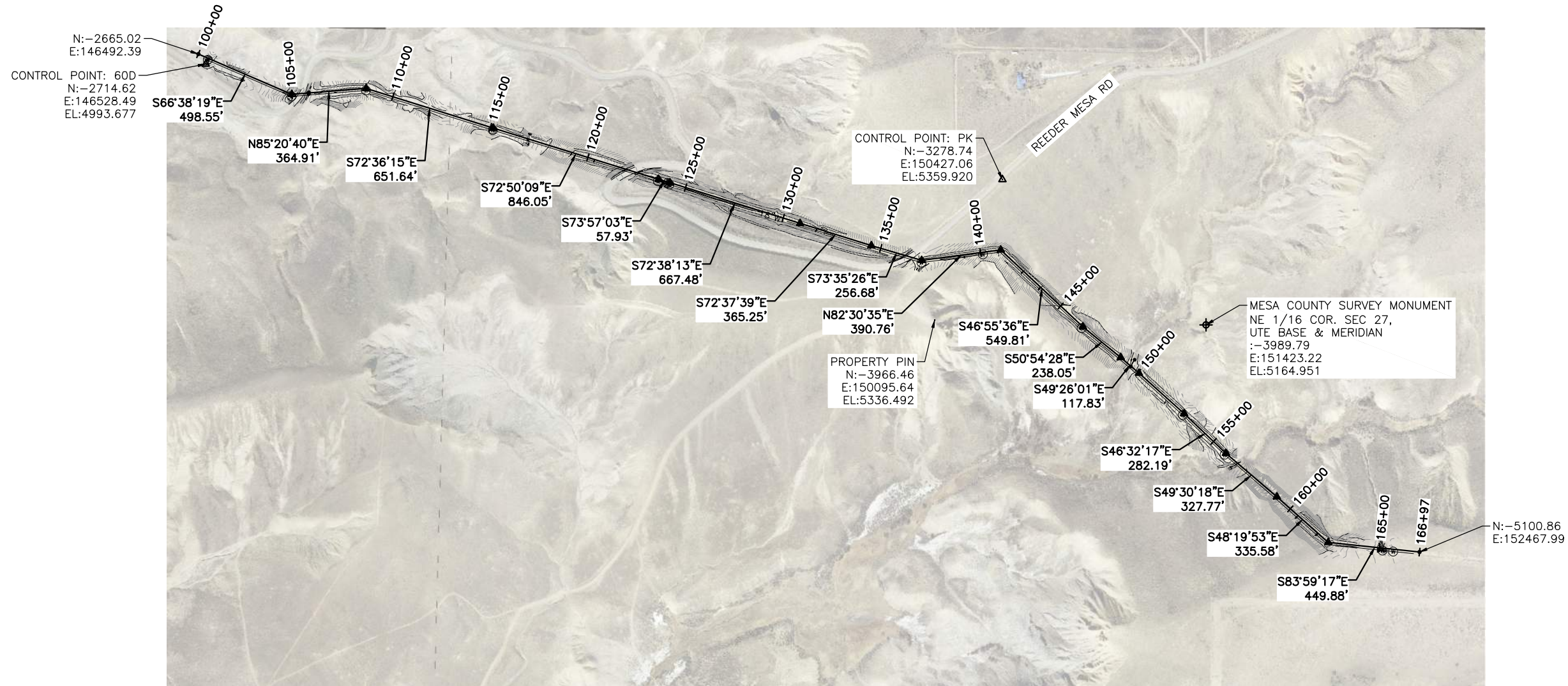
**PURDY MESA FLOWLINE REPLACEMENT  
 CITY OF GRAND JUNCTION**

BID ALTERNATIVE 2  
 SHEET KEY

FILE: 81-18-013 C-001 INDEX  
 JUB PROJ #: 81-18-013  
 DRAWN BY: JMM  
 DESIGN BY: ---  
 CHECKED BY: ---  
 AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY  
 LAST UPDATED: 8/17/2018  
 SHEET NUMBER:  
**C2-001**



Plot Date: 2/20/2018 7:45 AM Plotted By: Juba Myers  
 Date Created: 6/12/18 JUBENTLES PUBLIC PROJECTS/JUB GRAND JUNCTION/81-18-013 CITY OF GRAND JUNCTION PURDY MESA FLOWLINE CAD SHEET 18-013 V-101 SCONTROL.DWG



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**NOT FOR CONSTRUCTION**

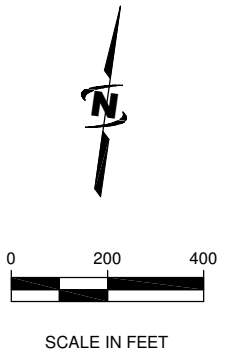
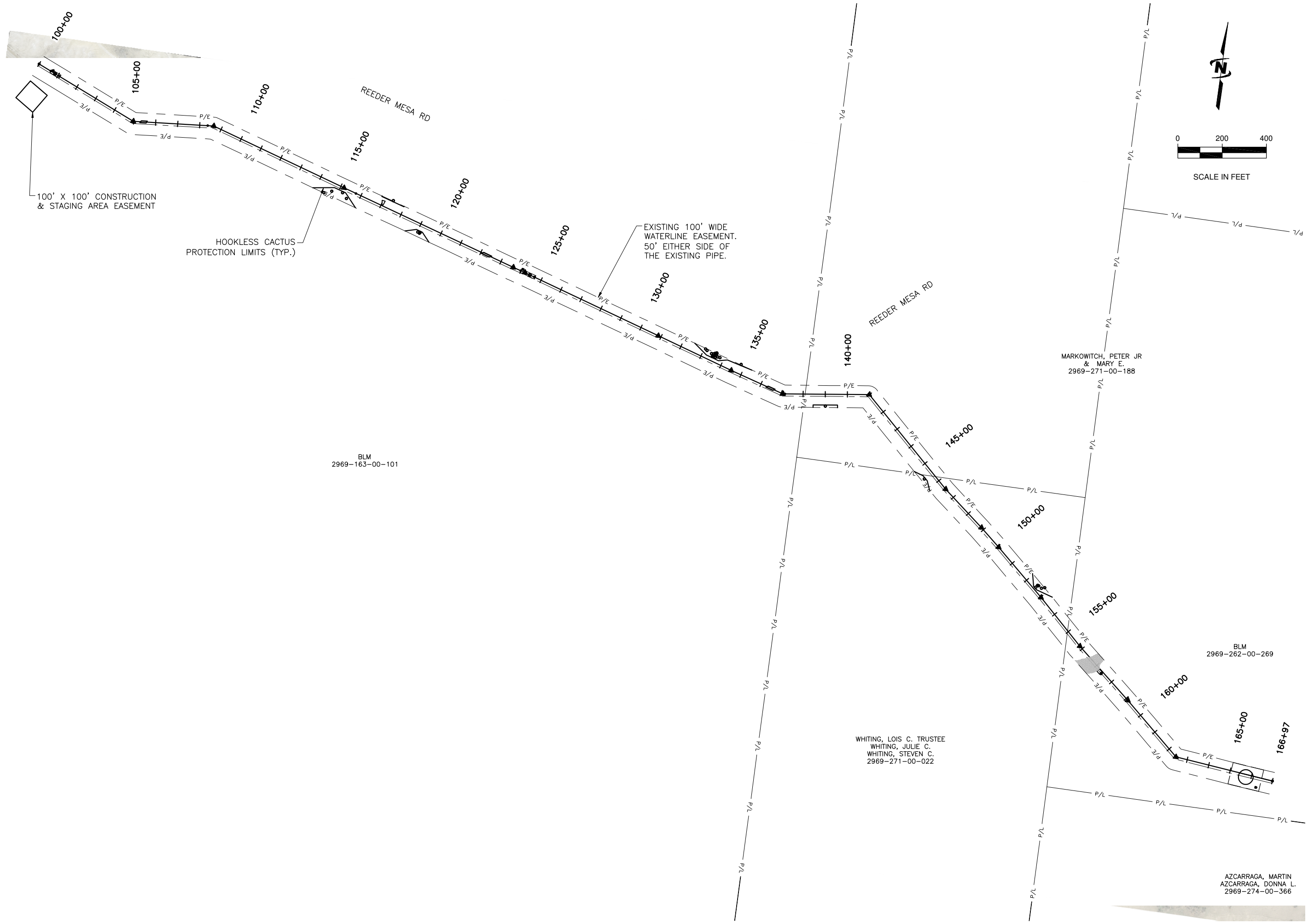
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**PURDY MESA FLOWLINE REPLACEMENT**  
**CITY OF GRAND JUNCTION**  
 BID ALTERNATIVE 2  
 SURVEY CONTROL

FILE: 81-18-013 V-101 SCONTROL
JUB PROJ #: 81-18-013
DRAWN BY: JMM
DESIGN BY: ---
CHECKED BY: ---
ONE INCH AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY
LAST UPDATED: 6/1/2018
SHEET NUMBER: <b>V2-101</b>

Plot Date: 2/20/2018 7:47 AM Plotted By: Juba Myers  
 Date Created: 2/12/2018 10:06:15 AM Project: JUB GRAND JUNCTION PURDY MESA FLOWLINE CAD: SHEET 18-013 C2-101 STAGING AREAS.DWG



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**PURDY MESA FLOWLINE REPLACEMENT  
 CITY OF GRAND JUNCTION**

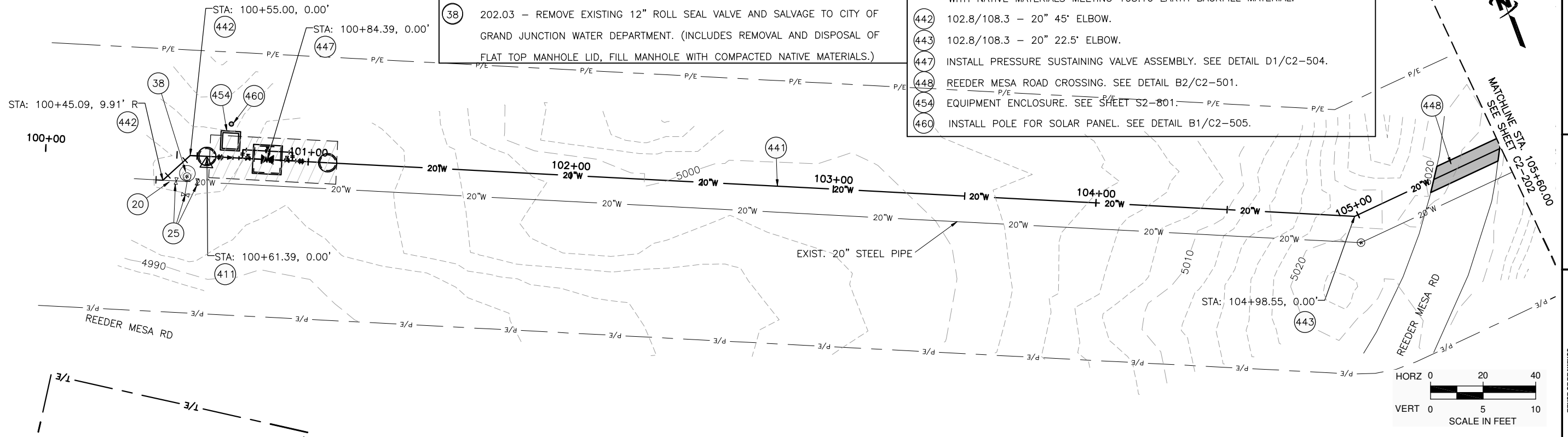
BID ALTERNATIVE 2  
 STAGING AREAS

FILE: 81-18-013 C2-101 STAGING AREAS  
 JUB PROJ #: 81-18-013  
 DRAWN BY: JMM  
 DESIGN BY: ---  
 CHECKED BY: ---  
 AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY  
 LAST UPDATED: 8/17/2018  
 SHEET NUMBER:  
**C2-101**

AZCARRAGA, MARTIN  
 AZCARRAGA, DONNA L.  
 2969-274-00-366



BLM  
2969-163-00-101



- (20) 202 - ABANDON PIPE. ABANDON BY PLUGGING REMAINING ENDS WITH CONCRETE.
- (25) 202 - ABANDON EXISTING WATER VALVE. CLOSE VALVE, REMOVE TOP HALF OF EXISTING VALVE BOX, FILL CAVITY TO FINISHED SUBGRADE WITH FLOW FILL MATERIAL.
- (38) 202.03 - REMOVE EXISTING 12" ROLL SEAL VALVE AND SALVAGE TO CITY OF GRAND JUNCTION WATER DEPARTMENT. (INCLUDES REMOVAL AND DISPOSAL OF FLAT TOP MANHOLE LID, FILL MANHOLE WITH COMPACTED NATIVE MATERIALS.)

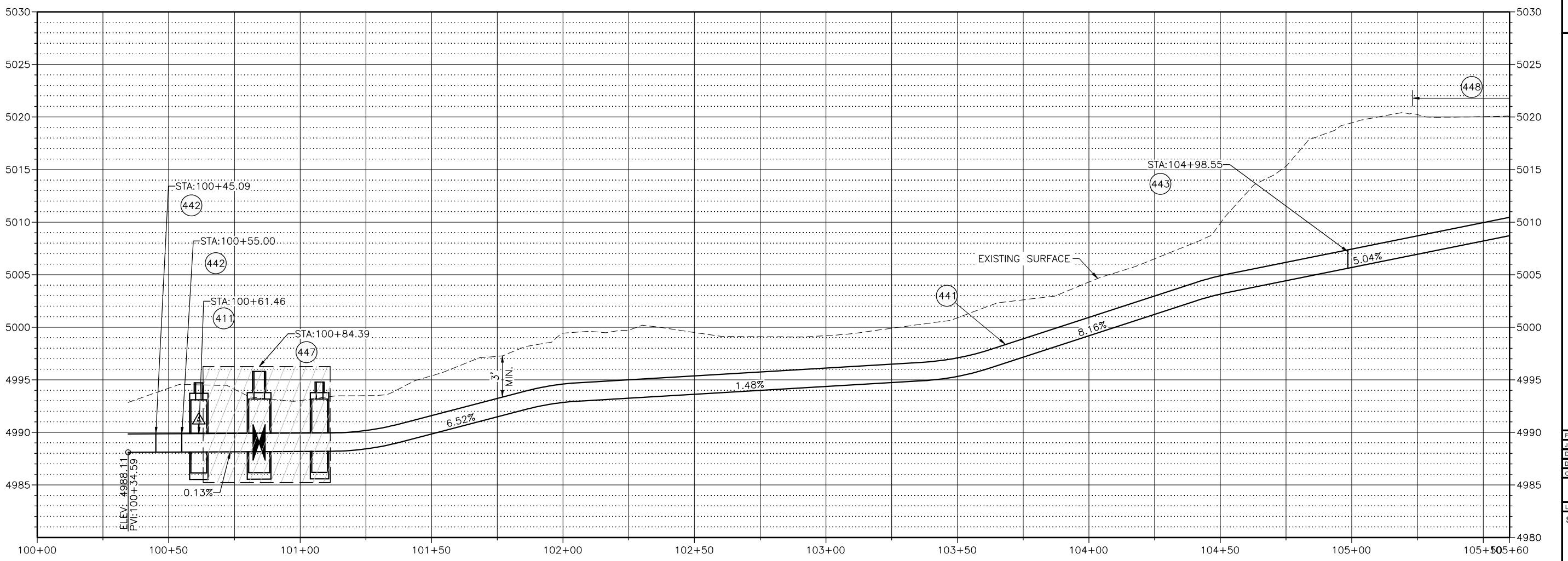
- (411) 102.8g/1028h/108.3 - 6" AIR VALVE AND VAULT. SEE DETAIL D3/C2-502.
- (441) 102.7/108.2 20" WATER MAIN PIPE (DR-25 EAGLE LOC WITH INSERTION STOP). INCLUDES TYPE A BEDDING AND HAUNCHING MATERIAL AND BACKFILL OF TRENCH WITH NATIVE MATERIALS MEETING 103.16 EARTH BACKFILL MATERIAL.
- (442) 102.8/108.3 - 20" 45' ELBOW.
- (443) 102.8/108.3 - 20" 22.5' ELBOW.
- (447) INSTALL PRESSURE SUSTAINING VALVE ASSEMBLY. SEE DETAIL D1/C2-504.
- (448) REEDER MESA ROAD CROSSING. SEE DETAIL B2/C2-501.
- (454) EQUIPMENT ENCLOSURE. SEE SHEET S2-801.
- (460) INSTALL POLE FOR SOLAR PANEL. SEE DETAIL B1/C2-505.

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NO.	DESCRIPTION	BY	DATE

**PURDY MESA FLOWLINE REPLACEMENT  
CITY OF GRAND JUNCTION**  
BID ALTERNATIVE 2  
PLAN AND PROFILE



FILE: 81-18-013 C-20X  
JUB PROJ #: 81-18-013  
DRAWN BY: JMM  
DESIGN BY: CSF  
CHECKED BY: SBG  
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY  
LAST UPDATED: 8/17/2018  
SHEET NUMBER:  
**C2-201**

Plot Date: 8/20/2018 7:45 AM Plotted By: Juba Myers Date Created: 8/17/2018 10:06 AM Project: JUB GRAND JUNCTION CITY OF GRAND JUNCTION PURDY MESA FLOWLINE REPLACEMENT 81-18-013 C-20X.DWG



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NO.	DESCRIPTION	BY	DATE

**PURDY MESA FLOWLINE REPLACEMENT  
CITY OF GRAND JUNCTION**

BID ALTERNATIVE 2  
PLAN AND PROFILE

FILE: 81-18-013 C-202  
JUB PROJ #: 81-18-013  
DRAWN BY: JMM  
DESIGN BY: SCF  
CHECKED BY: SBG

AT FULL SIZE, IF NOT ONE  
INCH SCALE ACCORDINGLY

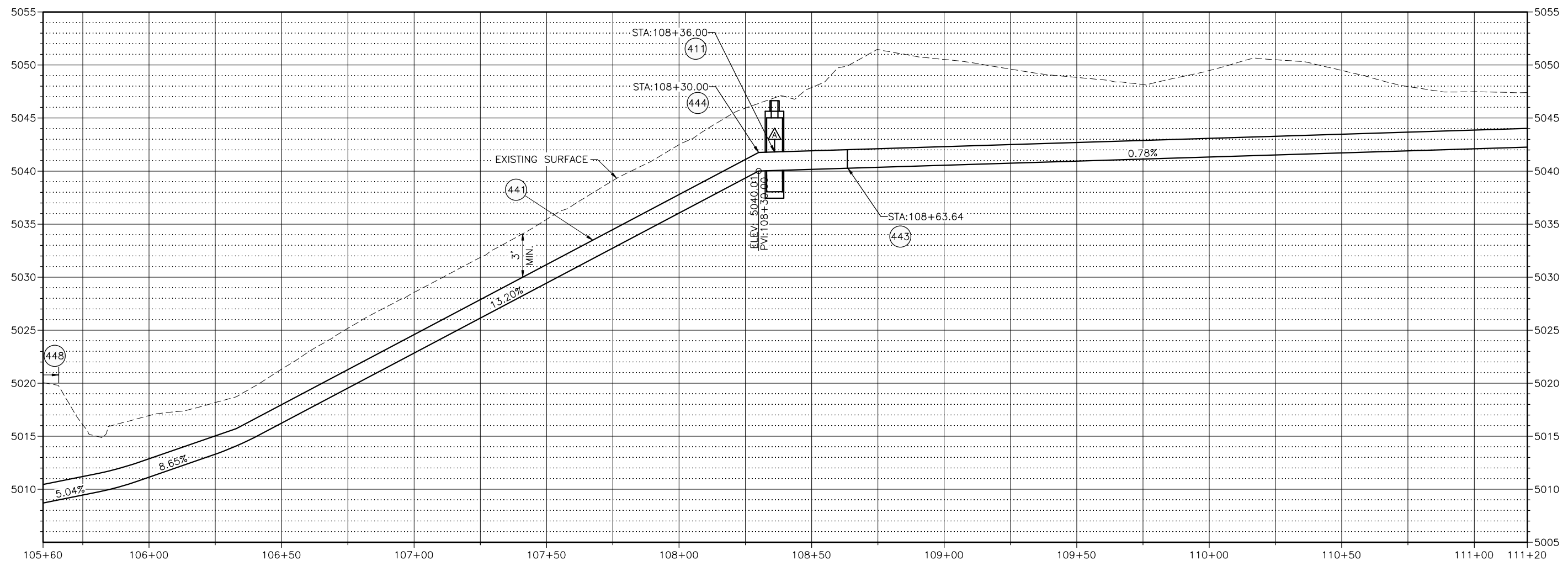
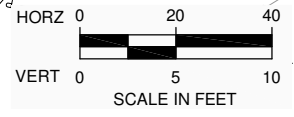
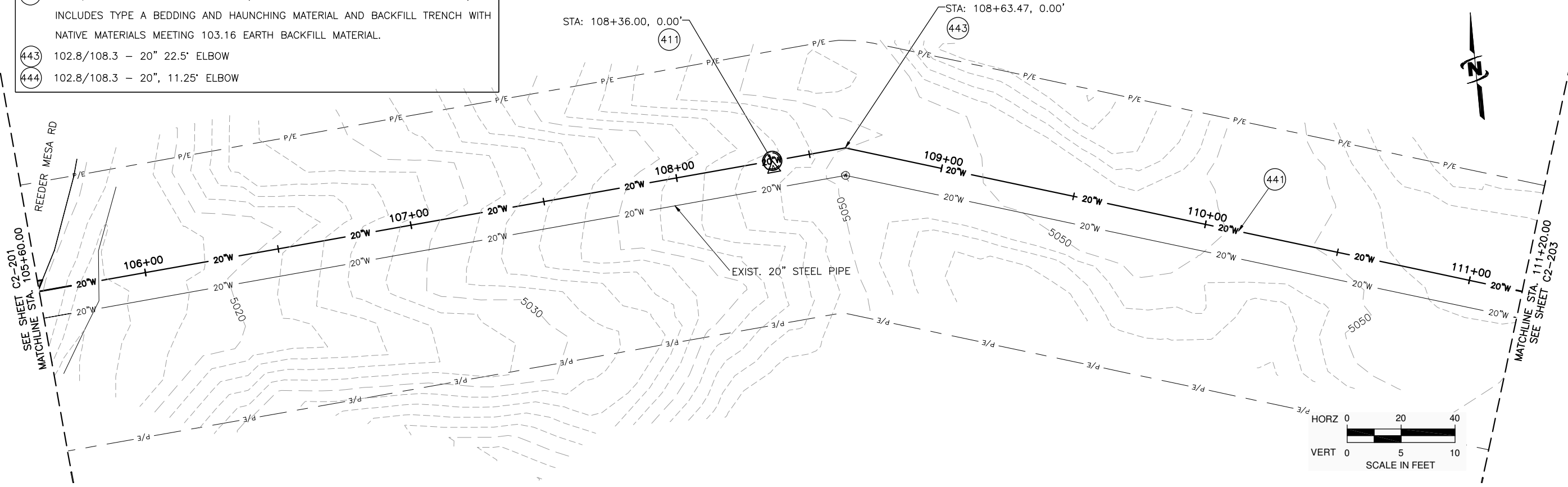
LAST UPDATED: 8/17/2018

SHEET NUMBER:

**C2-202**

- 411 102.8g/1028h/108.3 - 6" AIR VALVE AND VAULT. SEE DETAIL D3/C2-502
- 441 102.7/108.2 20" WATER MAIN PIPE (DR-25 EAGLE LOC WITH INSERTION STOP). INCLUDES TYPE A BEDDING AND HAUNCHING MATERIAL AND BACKFILL TRENCH WITH NATIVE MATERIALS MEETING 103.16 EARTH BACKFILL MATERIAL.
- 443 102.8/108.3 - 20" 22.5° ELBOW
- 444 102.8/108.3 - 20", 11.25° ELBOW

BLM  
2969-163-00-101



Plot Date: 8/20/2018 7:45 AM. Plotted By: Juba Myers  
 Date Created: 8/17/2018 10:06 AM. Project: JUB GRAND JUNCTION. Purdy Mesa Flowline Replacement. 81-18-013 C-202.DWG



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NO.	REVISION	DESCRIPTION	BY	DATE

PURDY MESA FLOWLINE REPLACEMENT  
CITY OF GRAND JUNCTION

BID ALTERNATIVE 2  
PLAN AND PROFILE

FILE: 81-18-013 C-20X  
JUB PROJ #: 81-18-013  
DRAWN BY: JMM  
DESIGN BY: CSF  
CHECKED BY: SBG

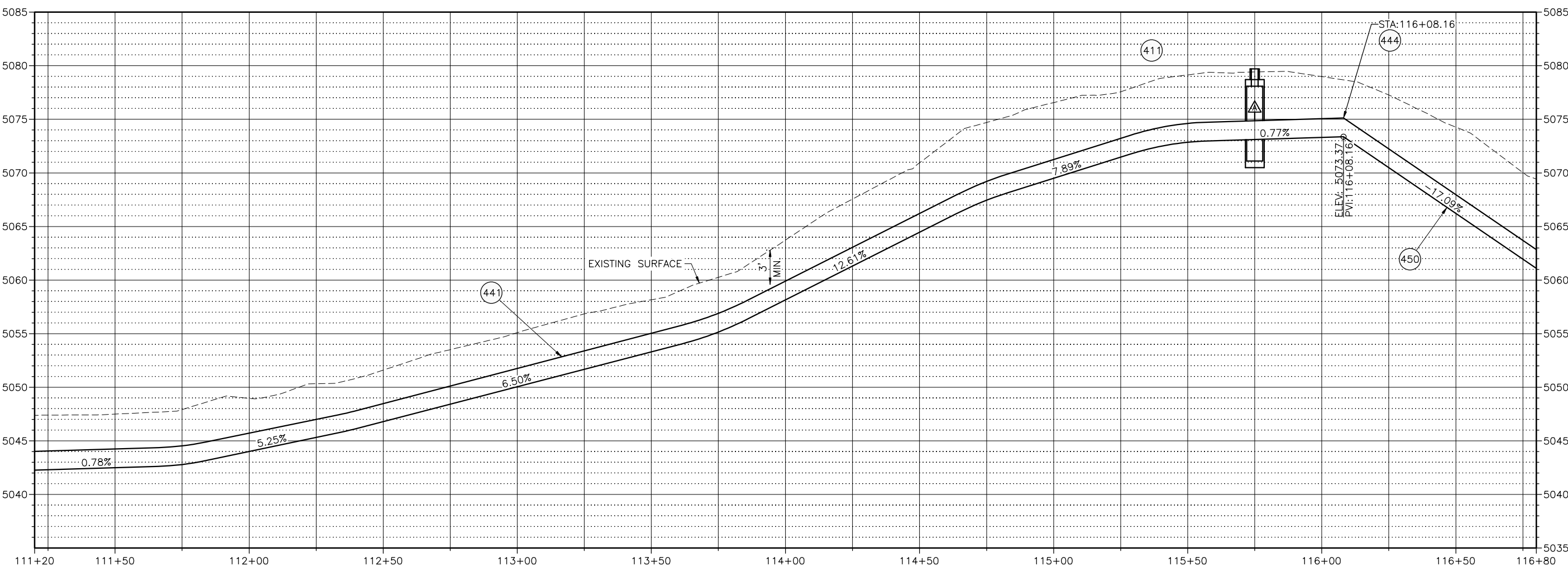
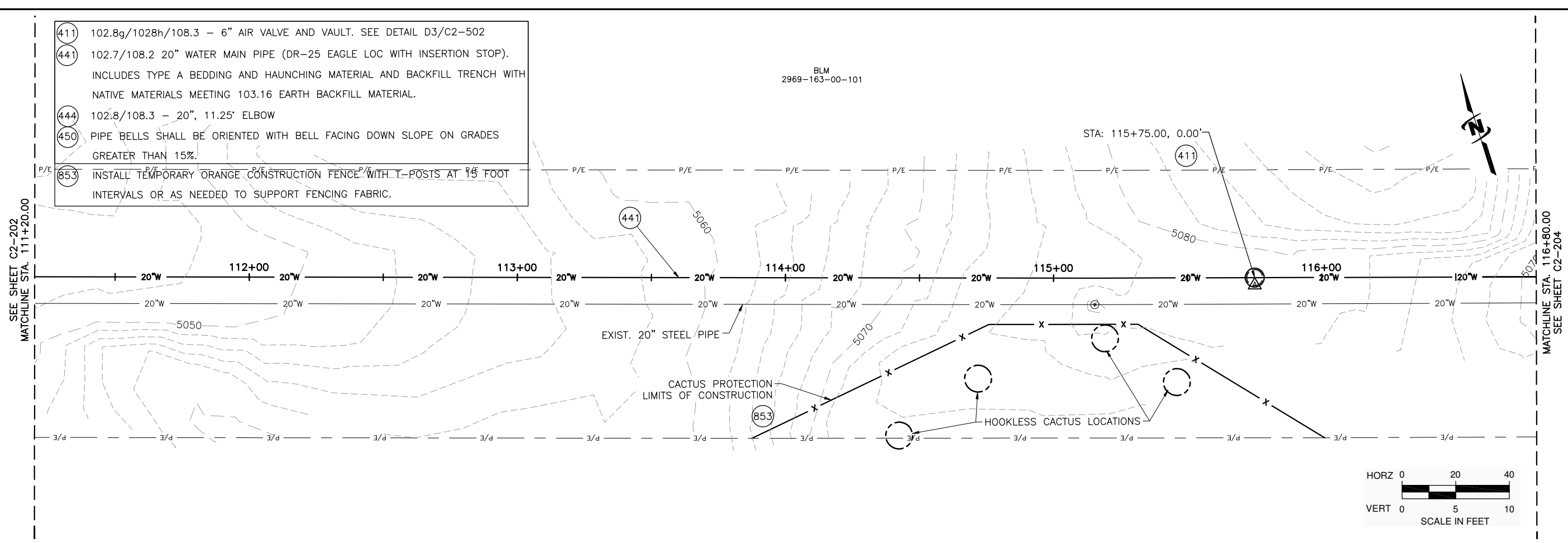
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

LAST UPDATED: 8/17/2018

SHEET NUMBER:  
**C2-203**

- 411 102.8g/1028h/108.3 - 6" AIR VALVE AND VAULT. SEE DETAIL D3/C2-502
- 441 102.7/108.2 20" WATER MAIN PIPE (DR-25 EAGLE LOC WITH INSERTION STOP). INCLUDES TYPE A BEDDING AND HAUNCHING MATERIAL AND BACKFILL TRENCH WITH NATIVE MATERIALS MEETING 103.16 EARTH BACKFILL MATERIAL.
- 444 102.8/108.3 - 20", 11.25' ELBOW
- 450 PIPE BELLS SHALL BE ORIENTED WITH BELL FACING DOWN SLOPE ON GRADES GREATER THAN 15%.
- 853 INSTALL TEMPORARY ORANGE CONSTRUCTION FENCE WITH T-POSTS AT 15 FOOT INTERVALS OR AS NEEDED TO SUPPORT FENCING FABRIC.

BLM  
2969-163-00-101



Plot Date: 8/20/2018 7:50 AM Plotted By: Juba Myers  
Date Created: 8/17/2018 10:06 AM File Path: C:\PROJECTS\JUB\GRAND JUNCTION\81-18-013 CITY OF GRAND JUNCTION\PURDY MESA FLOWLINE\CAD\81-18-013 C-20X.DWG

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**PURDY MESA FLOWLINE REPLACEMENT  
 CITY OF GRAND JUNCTION**

BID ALTERNATIVE 2  
 PLAN AND PROFILE

FILE: 81-18-013 C-204  
 JUB PROJ #: 81-18-013  
 DRAWN BY: JMM  
 DESIGN BY: CSF  
 CHECKED BY: SBF

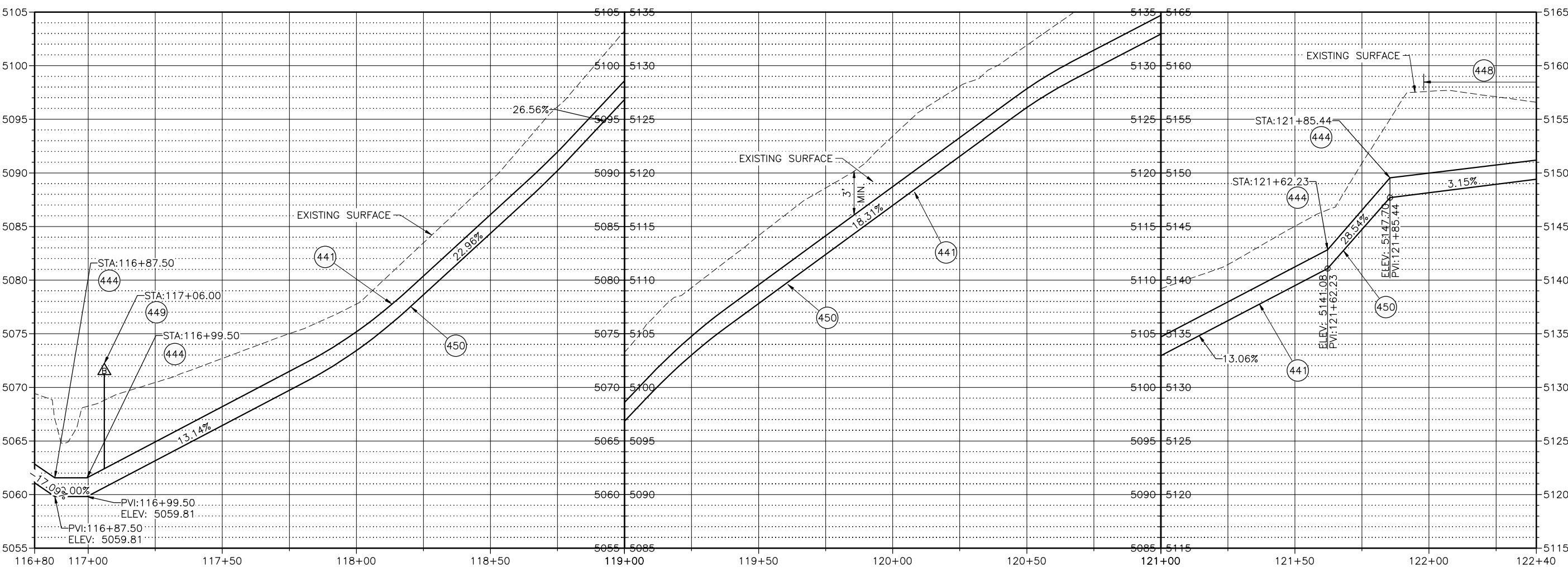
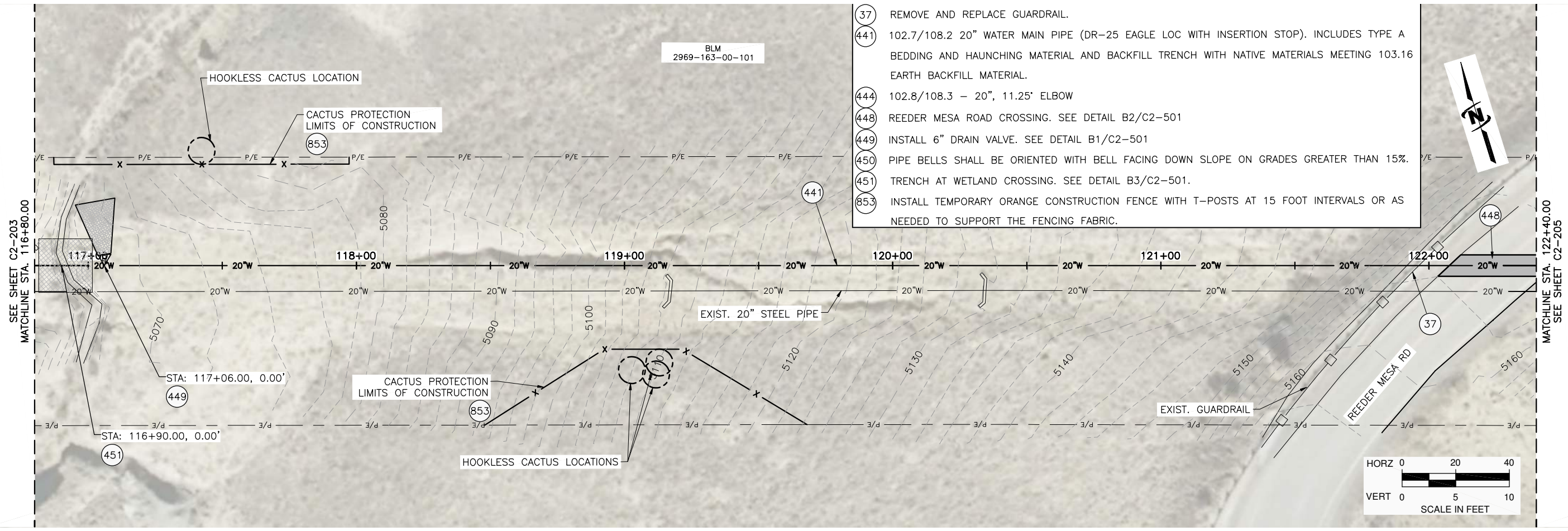
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

LAST UPDATED: 9/18/2018

SHEET NUMBER:  
**C2-204**

- (37) REMOVE AND REPLACE GUARDRAIL.
- (441) 102.7/108.2 20" WATER MAIN PIPE (DR-25 EAGLE LOC WITH INSERTION STOP). INCLUDES TYPE A BEDDING AND HAUNCHING MATERIAL AND BACKFILL TRENCH WITH NATIVE MATERIALS MEETING 103.16 EARTH BACKFILL MATERIAL.
- (444) 102.8/108.3 - 20", 11.25' ELBOW
- (448) REEDER MESA ROAD CROSSING. SEE DETAIL B2/C2-501
- (449) INSTALL 6" DRAIN VALVE. SEE DETAIL B1/C2-501
- (450) PIPE BELLS SHALL BE ORIENTED WITH BELL FACING DOWN SLOPE ON GRADES GREATER THAN 15%.
- (451) TRENCH AT WETLAND CROSSING. SEE DETAIL B3/C2-501.
- (853) INSTALL TEMPORARY ORANGE CONSTRUCTION FENCE WITH T-POSTS AT 15 FOOT INTERVALS OR AS NEEDED TO SUPPORT THE FENCING FABRIC.

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 2969-163-00-101



Plot Date: 9/18/2018 4:12 PM, Plotted By: Juba Myers, Date Created: 9/18/2018, I:\081818\PROJECTS\JUB\GRAND JUNCTION\81-18-013\CITY OF GRAND JUNCTION\_PURDY MESA FLOWLINE\CAD\SHEET\81-18-013 C-204.DWG





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**PURDY MESA FLOWLINE REPLACEMENT  
CITY OF GRAND JUNCTION**

BID ALTERNATIVE 2  
PLAN AND PROFILE

FILE: 81-18-013 C-20X  
JUB PROJ. #: 81-18-013  
DRAWN BY: JMM  
DESIGN BY: CSF  
CHECKED BY: SBG

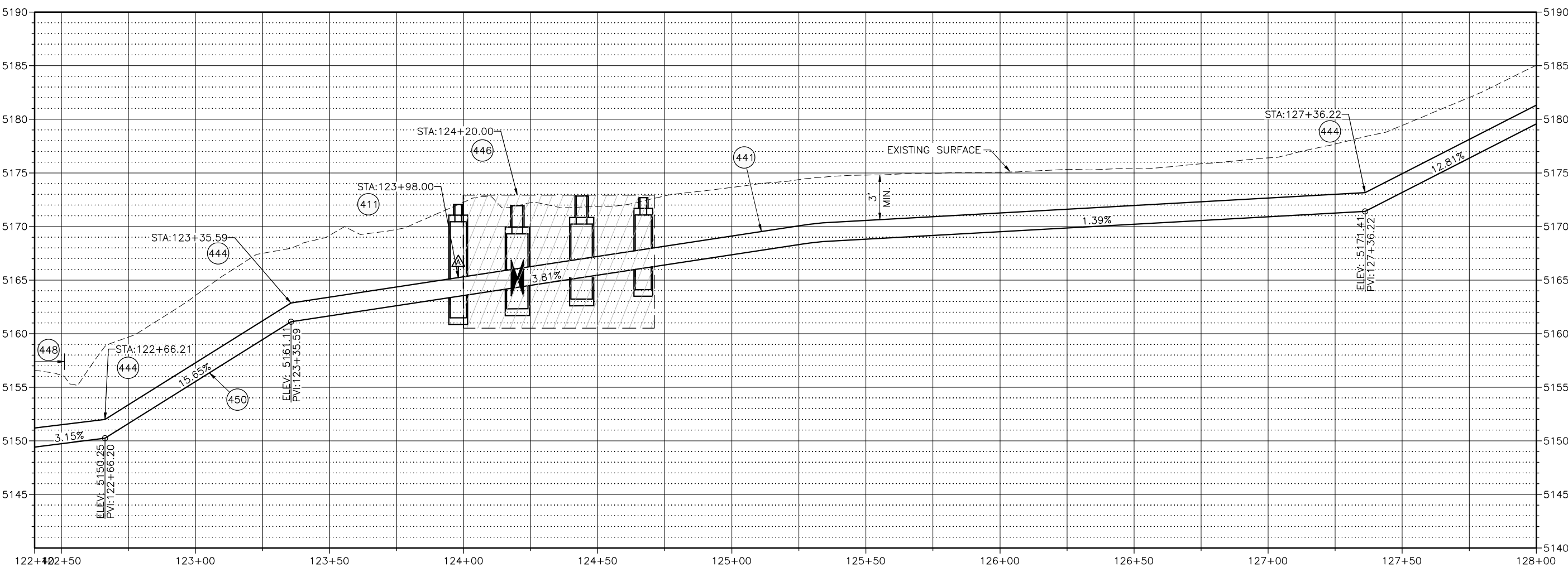
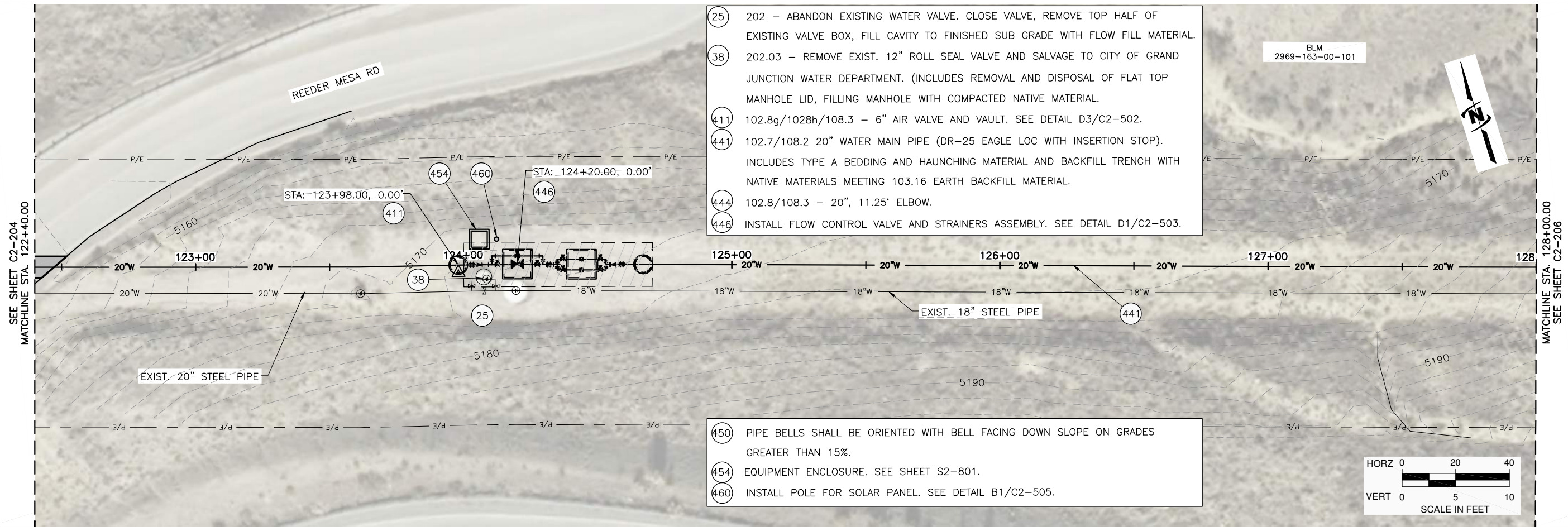
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY  
LAST UPDATED: 8/17/2018

SHEET NUMBER:

**C2-205**

- 25 202 - ABANDON EXISTING WATER VALVE. CLOSE VALVE, REMOVE TOP HALF OF EXISTING VALVE BOX, FILL CAVITY TO FINISHED SUB GRADE WITH FLOW FILL MATERIAL.
- 38 202.03 - REMOVE EXIST. 12" ROLL SEAL VALVE AND SALVAGE TO CITY OF GRAND JUNCTION WATER DEPARTMENT. (INCLUDES REMOVAL AND DISPOSAL OF FLAT TOP MANHOLE LID, FILLING MANHOLE WITH COMPACTED NATIVE MATERIAL.
- 411 102.8g/1028h/108.3 - 6" AIR VALVE AND VAULT. SEE DETAIL D3/C2-502.
- 441 102.7/108.2 20" WATER MAIN PIPE (DR-25 EAGLE LOC WITH INSERTION STOP). INCLUDES TYPE A BEDDING AND HAUNCHING MATERIAL AND BACKFILL TRENCH WITH NATIVE MATERIALS MEETING 103.16 EARTH BACKFILL MATERIAL.
- 444 102.8/108.3 - 20", 11.25' ELBOW.
- 446 INSTALL FLOW CONTROL VALVE AND STRAINERS ASSEMBLY. SEE DETAIL D1/C2-503.

- 450 PIPE BELLS SHALL BE ORIENTED WITH BELL FACING DOWN SLOPE ON GRADES GREATER THAN 15%.
- 454 EQUIPMENT ENCLOSURE. SEE SHEET S2-801.
- 460 INSTALL POLE FOR SOLAR PANEL. SEE DETAIL B1/C2-505.



Plot Date: 8/20/2018 7:51 AM, Plotted By: Juba Myers, Date Created: 8/17/2018 10:05 AM, Project: PURDY MESA FLOWLINE REPLACEMENT, City of Grand Junction, File: 81-18-013 C-20X.DWG





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NO.	REVISION	DESCRIPTION	BY	DATE

**PURDY MESA FLOWLINE REPLACEMENT  
CITY OF GRAND JUNCTION**

BID ALTERNATIVE 2  
PLAN AND PROFILE

FILE: 81-18-013 C-20X  
JUB PROJ #: 81-18-013  
DRAWN BY: JMM  
DESIGN BY: CSF  
CHECKED BY: SBG  
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY  
LAST UPDATED: 8/17/2018  
SHEET NUMBER:  
**C2-206**

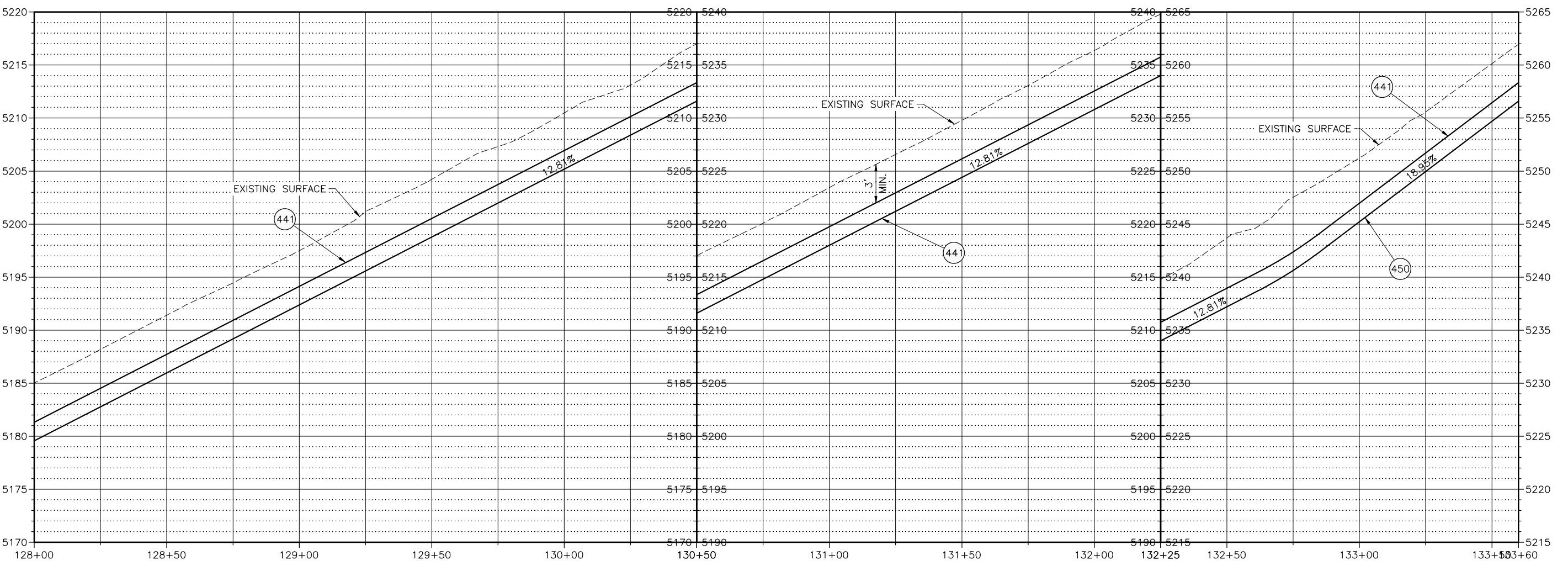
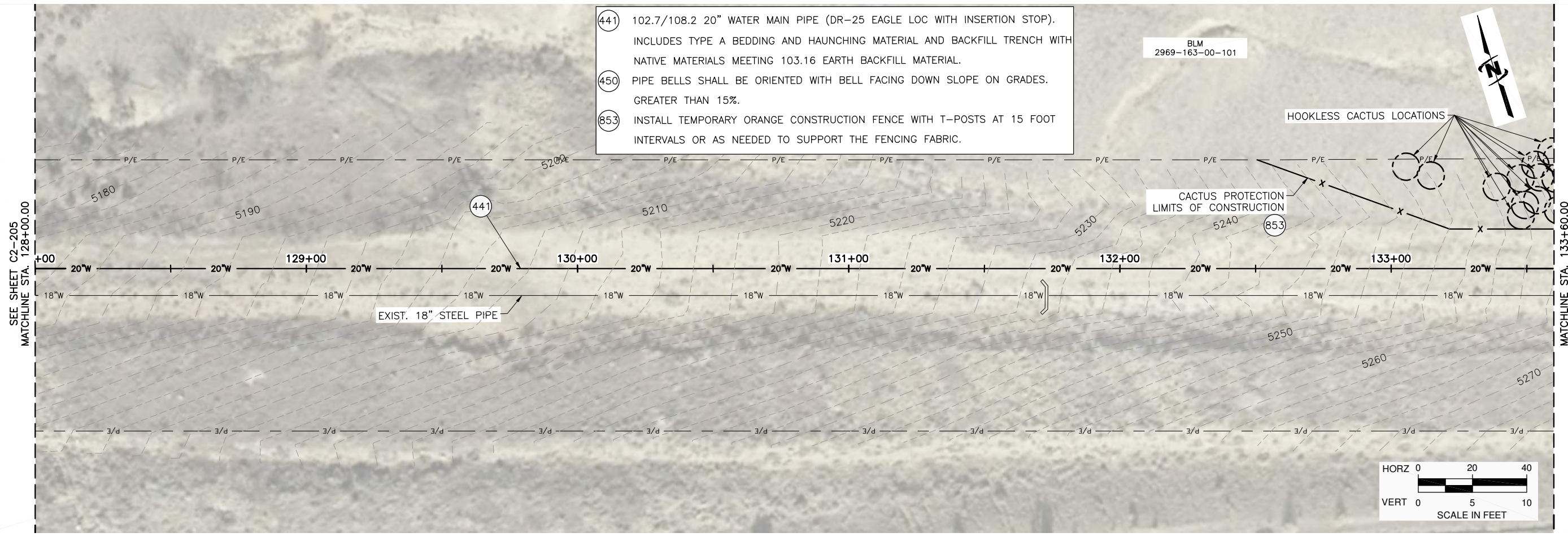
- 441 102.7/108.2 20" WATER MAIN PIPE (DR-25 EAGLE LOC WITH INSERTION STOP). INCLUDES TYPE A BEDDING AND HAUNCHING MATERIAL AND BACKFILL TRENCH WITH NATIVE MATERIALS MEETING 103.16 EARTH BACKFILL MATERIAL.
- 450 PIPE BELLS SHALL BE ORIENTED WITH BELL FACING DOWN SLOPE ON GRADES. GREATER THAN 15%.
- 853 INSTALL TEMPORARY ORANGE CONSTRUCTION FENCE WITH T-POSTS AT 15 FOOT INTERVALS OR AS NEEDED TO SUPPORT THE FENCING FABRIC.

BLM  
2969-163-00-101



HOOKLESS CACTUS LOCATIONS

CACTUS PROTECTION LIMITS OF CONSTRUCTION



Plot Date: 8/20/2018 7:51 AM, Plotted By: Juba Myers  
 Date Created: 8/17/2018 10:06 AM, Project: JUB GRAND JUNCTION, PURDY MESA FLOWLINE REPLACEMENT, 81-18-013 C-20X.DWG

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NO.	DESCRIPTION	BY	DATE

**PURDY MESA FLOWLINE REPLACEMENT  
 CITY OF GRAND JUNCTION**

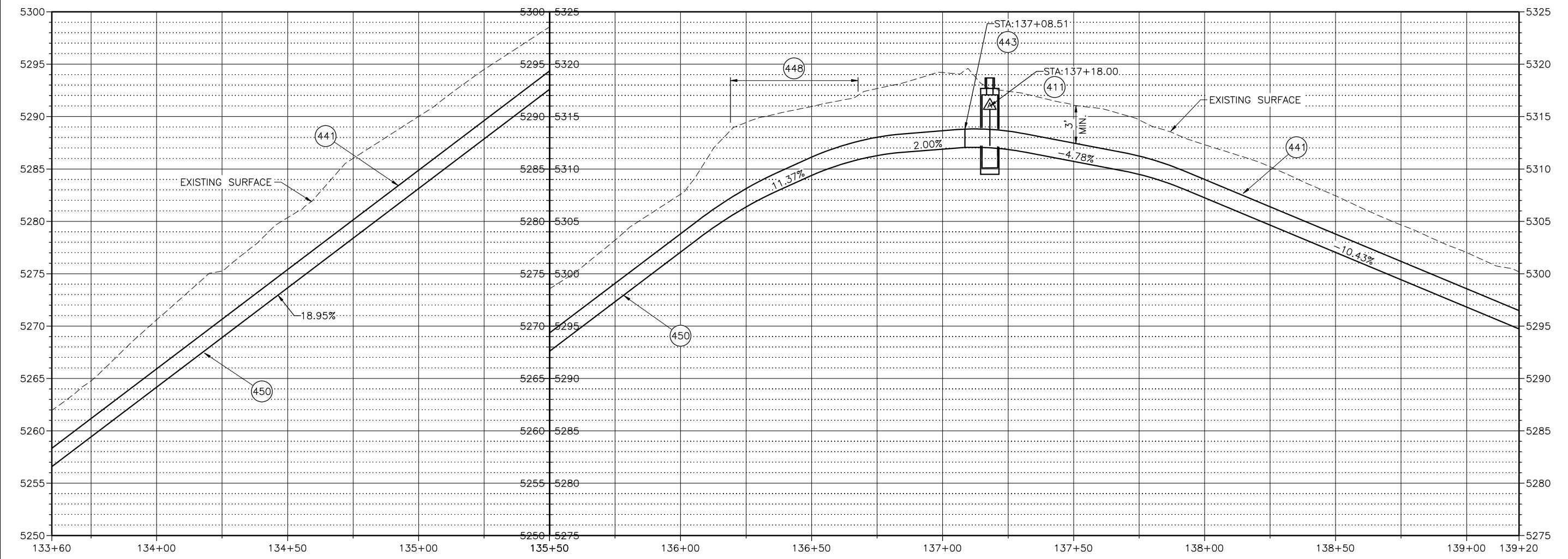
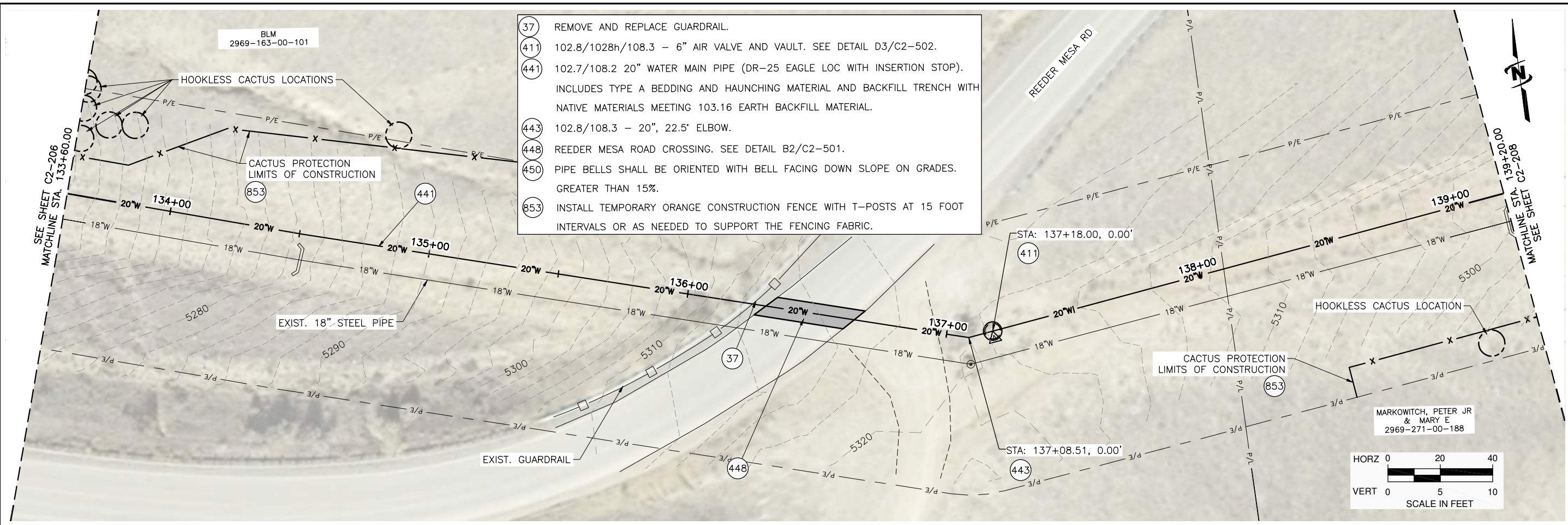
BID ALTERNATIVE 2  
 PLAN AND PROFILE

FILE: 81-18-013 C-20X
JUB PROJ #: 81-18-013
DRAWN BY: JMM
DESIGNED BY: CSF
CHECKED BY: SBG

AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY  
 LAST UPDATED: 8/17/2018

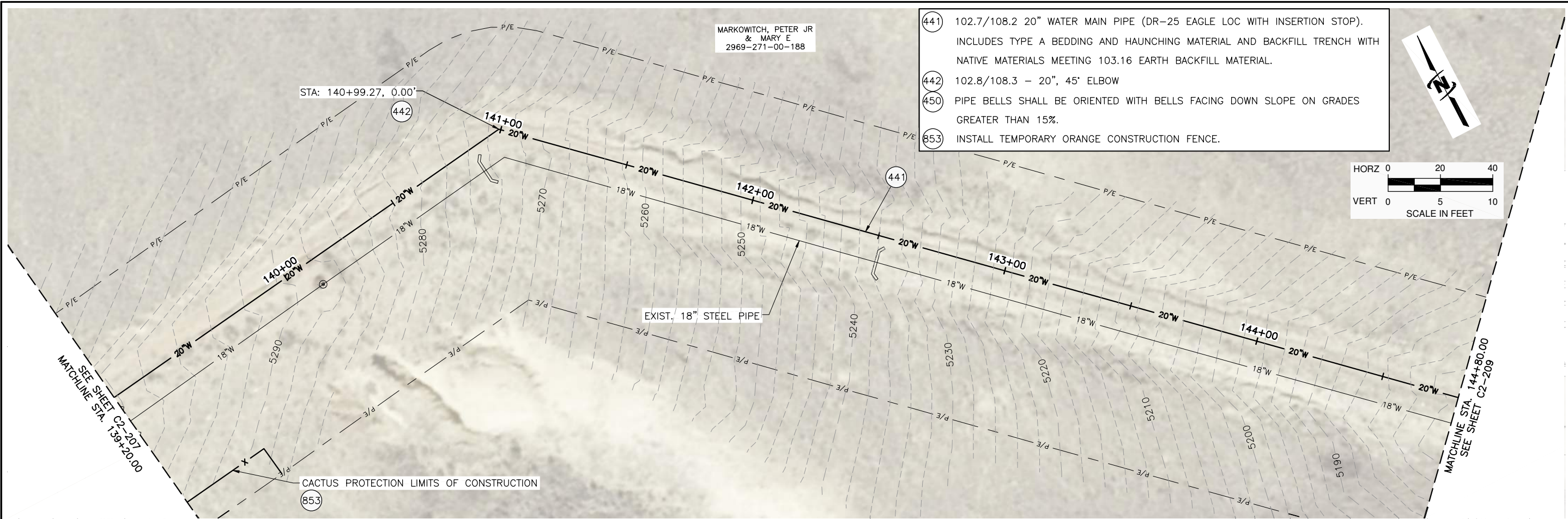
SHEET NUMBER:  
**C2-207**

- (37) REMOVE AND REPLACE GUARDRAIL.
- (411) 102.8/1028h/108.3 - 6" AIR VALVE AND VAULT. SEE DETAIL D3/C2-502.
- (441) 102.7/108.2 20" WATER MAIN PIPE (DR-25 EAGLE LOC WITH INSERTION STOP). INCLUDES TYPE A BEDDING AND HAUNCHING MATERIAL AND BACKFILL TRENCH WITH NATIVE MATERIALS MEETING 103.16 EARTH BACKFILL MATERIAL.
- (443) 102.8/108.3 - 20", 22.5' ELBOW.
- (448) REEDER MESA ROAD CROSSING. SEE DETAIL B2/C2-501.
- (450) PIPE BELLS SHALL BE ORIENTED WITH BELL FACING DOWN SLOPE ON GRADES. GREATER THAN 15%.
- (853) INSTALL TEMPORARY ORANGE CONSTRUCTION FENCE WITH T-POSTS AT 15 FOOT INTERVALS OR AS NEEDED TO SUPPORT THE FENCING FABRIC.

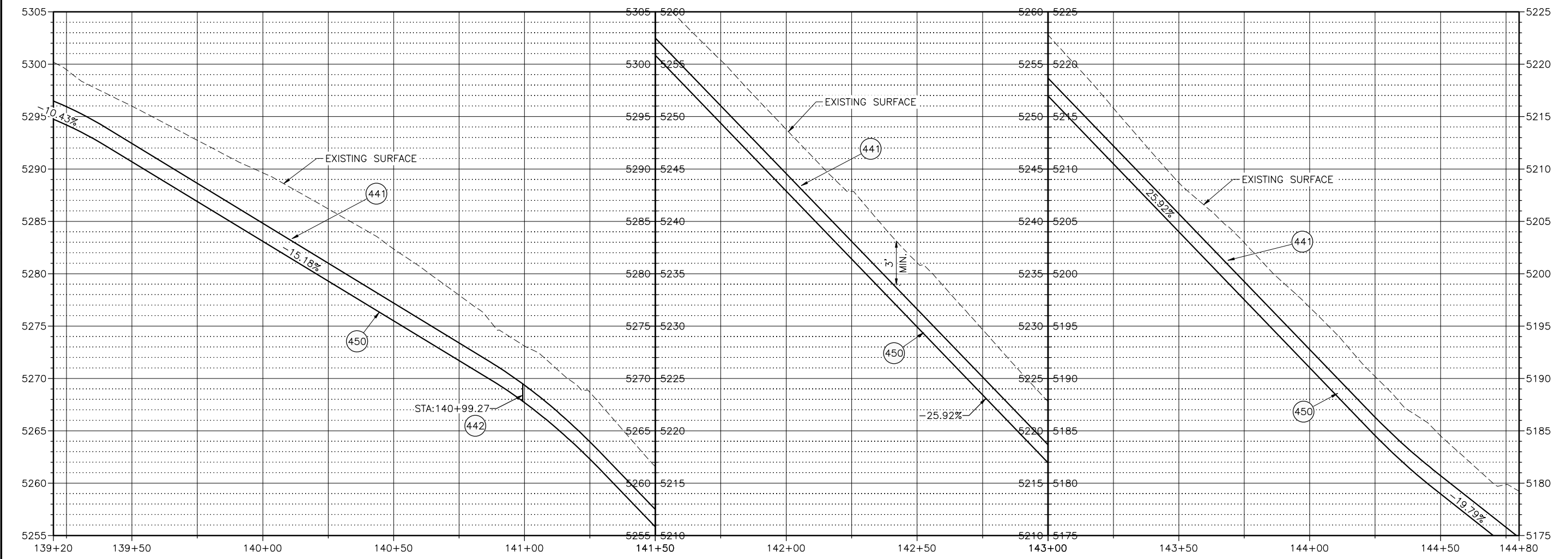
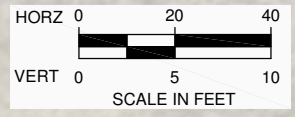


Plot Date: 8/20/2018 7:52 AM Plotted By: Juba Myers  
 Date Created: 8/17/2018 10:06 AM File Path: C:\PROJECTS\JUB\GRAND JUNCTION\81-18-013 CITY OF GRAND JUNCTION PURDY MESA FLOWLINE\CAD\DRAWING C-20X.DWG





- 441 102.7/108.2 20" WATER MAIN PIPE (DR-25 EAGLE LOC WITH INSERTION STOP). INCLUDES TYPE A BEDDING AND HAUNCHING MATERIAL AND BACKFILL TRENCH WITH NATIVE MATERIALS MEETING 103.16 EARTH BACKFILL MATERIAL.
- 442 102.8/108.3 - 20", 45° ELBOW
- 450 PIPE BELLS SHALL BE ORIENTED WITH BELLS FACING DOWN SLOPE ON GRADES GREATER THAN 15%.
- 853 INSTALL TEMPORARY ORANGE CONSTRUCTION FENCE.



Plot Date: 8/20/2018 7:52 AM, Plotted By: Juba Myers, Date Created: 8/17/2018 10:06 AM, Project: JUB GRAND JUNCTION, PURDY MESA FLOW LINE, CAD SHEET: 8-18-013 C-208.DWG

  
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NO.	DESCRIPTION	BY	DATE

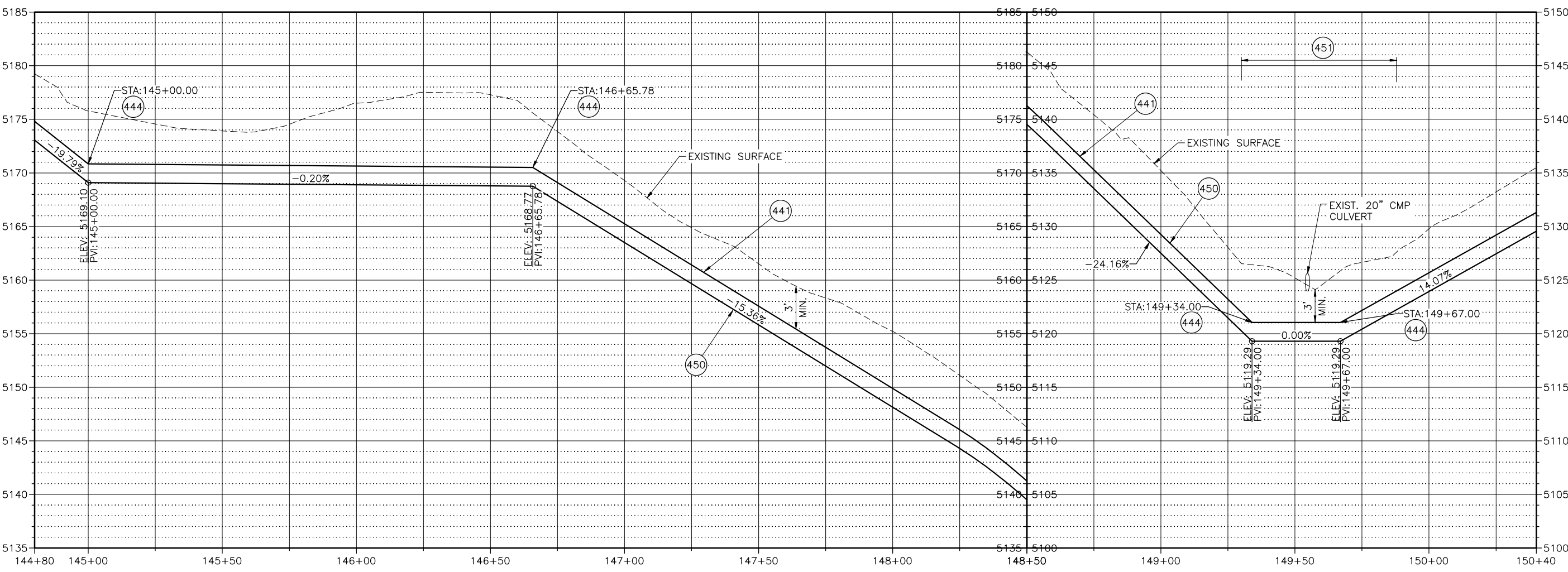
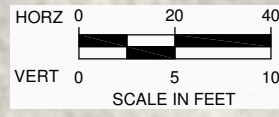
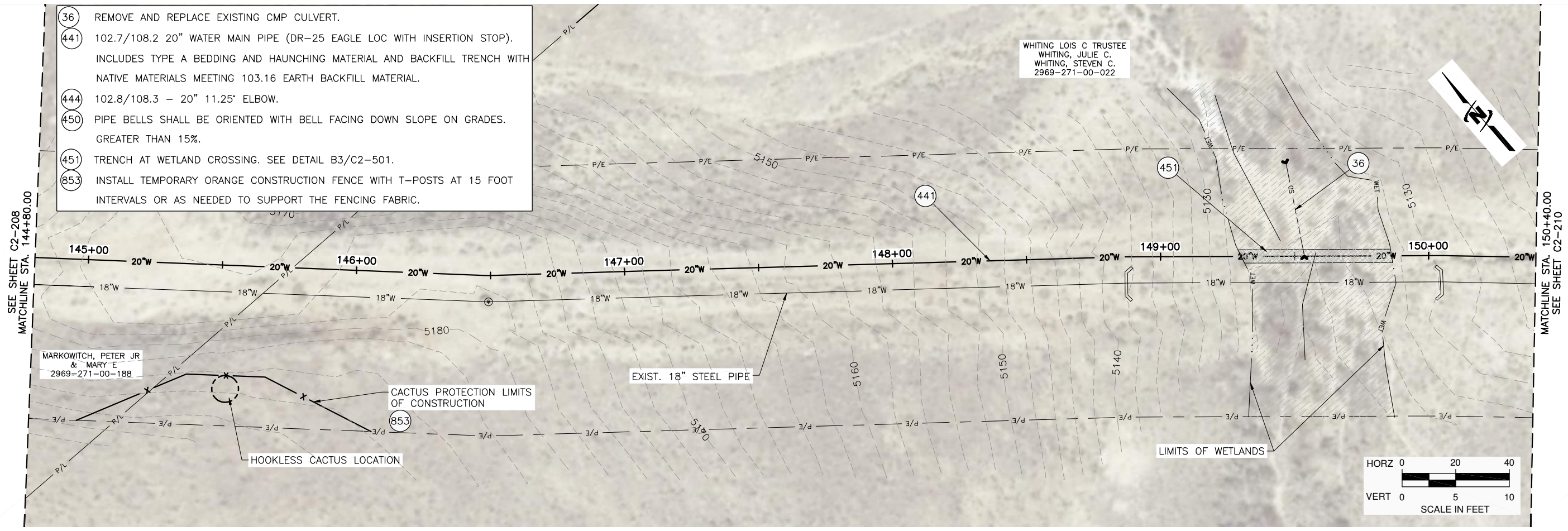
**PURDY MESA FLOWLINE REPLACEMENT**  
**CITY OF GRAND JUNCTION**  
 BID ALTERNATIVE 2  
 PLAN AND PROFILE

FILE: 81-18-013 C-208  
 JUB PROJ #: 81-18-013  
 DRAWN BY: JMM  
 DESIGN BY: CSF  
 CHECKED BY: SBG  
 AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY  
 LAST UPDATED: 8/17/2018  
 SHEET NUMBER:  
**C2-208**



- 36 REMOVE AND REPLACE EXISTING CMP CULVERT.
- 441 102.7/108.2 20" WATER MAIN PIPE (DR-25 EAGLE LOC WITH INSERTION STOP). INCLUDES TYPE A BEDDING AND HAUNCHING MATERIAL AND BACKFILL TRENCH WITH NATIVE MATERIALS MEETING 103.16 EARTH BACKFILL MATERIAL.
- 444 102.8/108.3 - 20" 11.25' ELBOW.
- 450 PIPE BELLS SHALL BE ORIENTED WITH BELL FACING DOWN SLOPE ON GRADES. GREATER THAN 15%.
- 451 TRENCH AT WETLAND CROSSING. SEE DETAIL B3/C2-501.
- 853 INSTALL TEMPORARY ORANGE CONSTRUCTION FENCE WITH T-POSTS AT 15 FOOT INTERVALS OR AS NEEDED TO SUPPORT THE FENCING FABRIC.

WHITING LOIS C TRUSTEE  
WHITING, JULIE C.  
WHITING, STEVEN C.  
2969-271-00-022



Plot Date: 8/20/2018 7:55 AM. Plotted By: Juhai Myers  
 Date Created: 8/17/2018 10:06 AM. Project: JUB GRAND JUNCTION. PURDY MESA FLOWLINE. CAD SHEET: 81-18-013 C-209.DWG

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**PURDY MESA FLOWLINE REPLACEMENT  
CITY OF GRAND JUNCTION**

BID ALTERNATIVE 2  
PLAN AND PROFILE

FILE: 81-18-013 C-209  
JUB PROJ #: 81-18-013  
DRAWN BY: JMM  
DESIGN BY: CSF  
CHECKED BY: SBG

AT FULL SIZE, IF NOT ONE  
INCH SCALE ACCORDINGLY

LAST UPDATED: 8/17/2018

SHEET NUMBER:  
**C2-209**

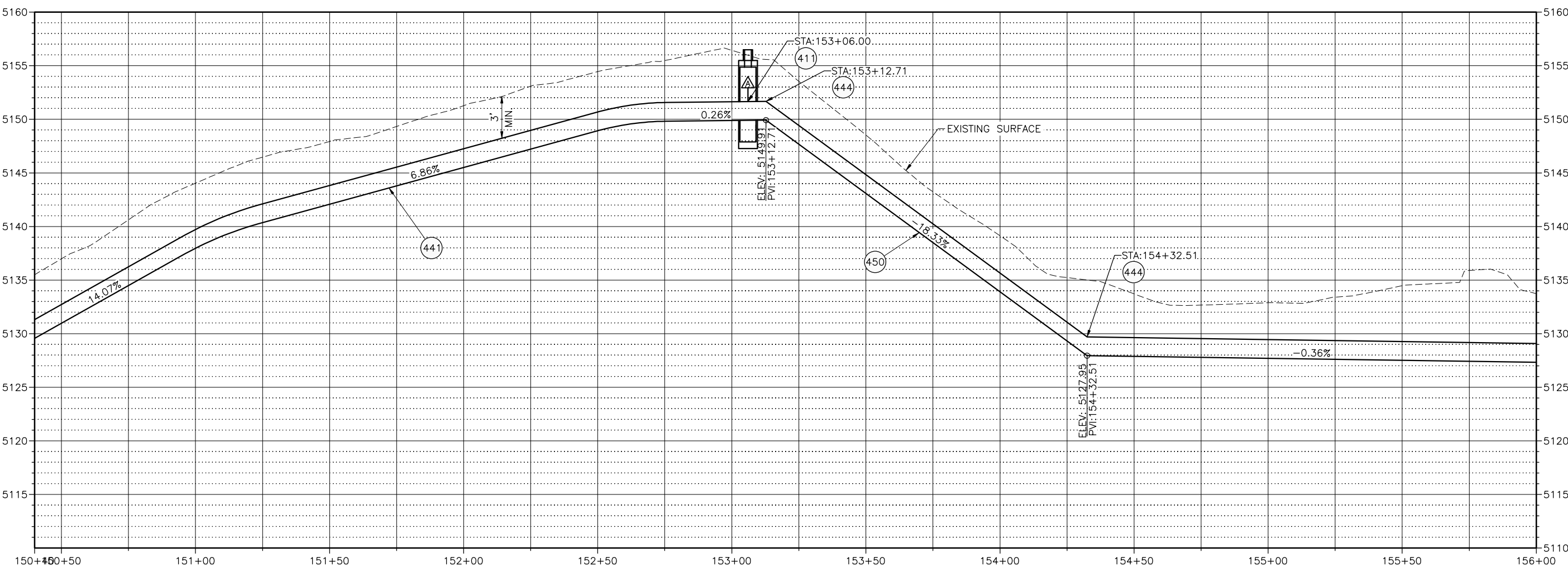
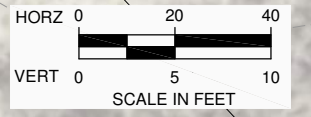
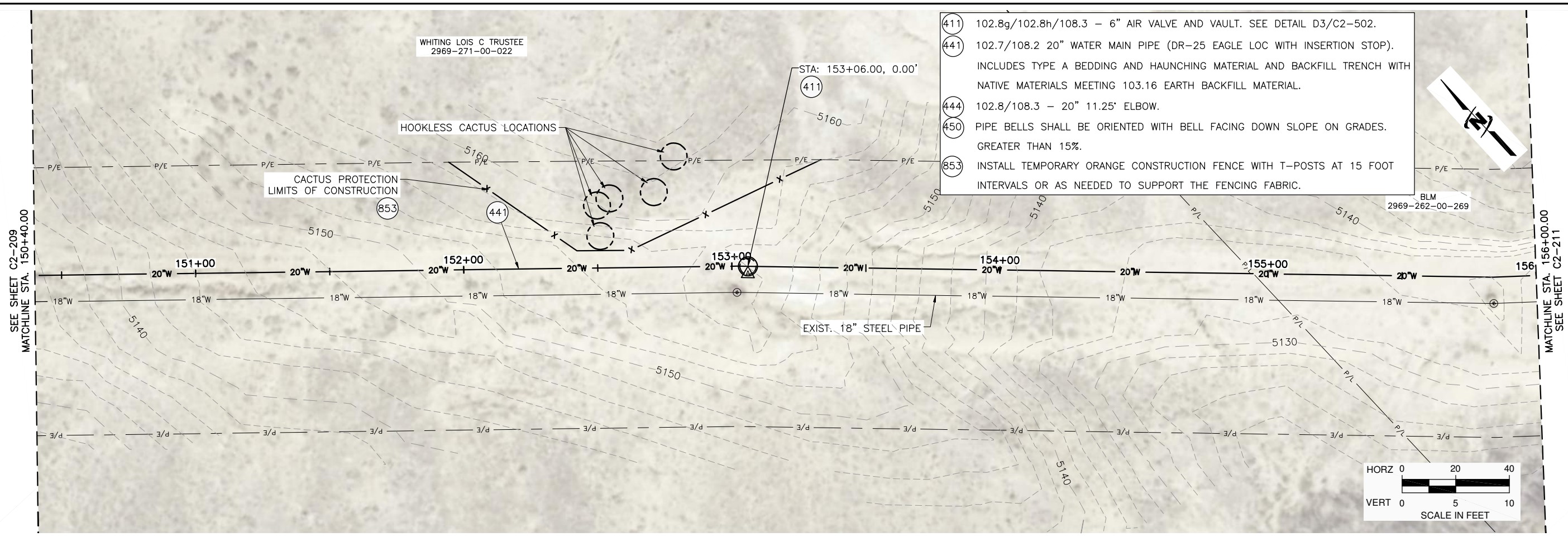


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NO.	DESCRIPTION	BY	DATE

- (411) 102.8g/102.8h/108.3 - 6" AIR VALVE AND VAULT. SEE DETAIL D3/C2-502.
- (441) 102.7/108.2 20" WATER MAIN PIPE (DR-25 EAGLE LOC WITH INSERTION STOP). INCLUDES TYPE A BEDDING AND HAUNCHING MATERIAL AND BACKFILL TRENCH WITH NATIVE MATERIALS MEETING 103.16 EARTH BACKFILL MATERIAL.
- (444) 102.8/108.3 - 20" 11.25' ELBOW.
- (450) PIPE BELLS SHALL BE ORIENTED WITH BELL FACING DOWN SLOPE ON GRADES. GREATER THAN 15%.
- (853) INSTALL TEMPORARY ORANGE CONSTRUCTION FENCE WITH T-POSTS AT 15 FOOT INTERVALS OR AS NEEDED TO SUPPORT THE FENCING FABRIC.



**PURDY MESA FLOWLINE REPLACEMENT  
 CITY OF GRAND JUNCTION**

BID ALTERNATIVE 2  
 PLAN AND PROFILE

Plot Date: 8/20/2018 7:55 AM Plotted By: Juba Myers  
 Date Created: 8/17/2018 10:06 AM Project: PURDY MESA FLOWLINE REPLACEMENT - BID SET - C-20X.DWG



BID SET

NO.	DESCRIPTION	BY	DATE

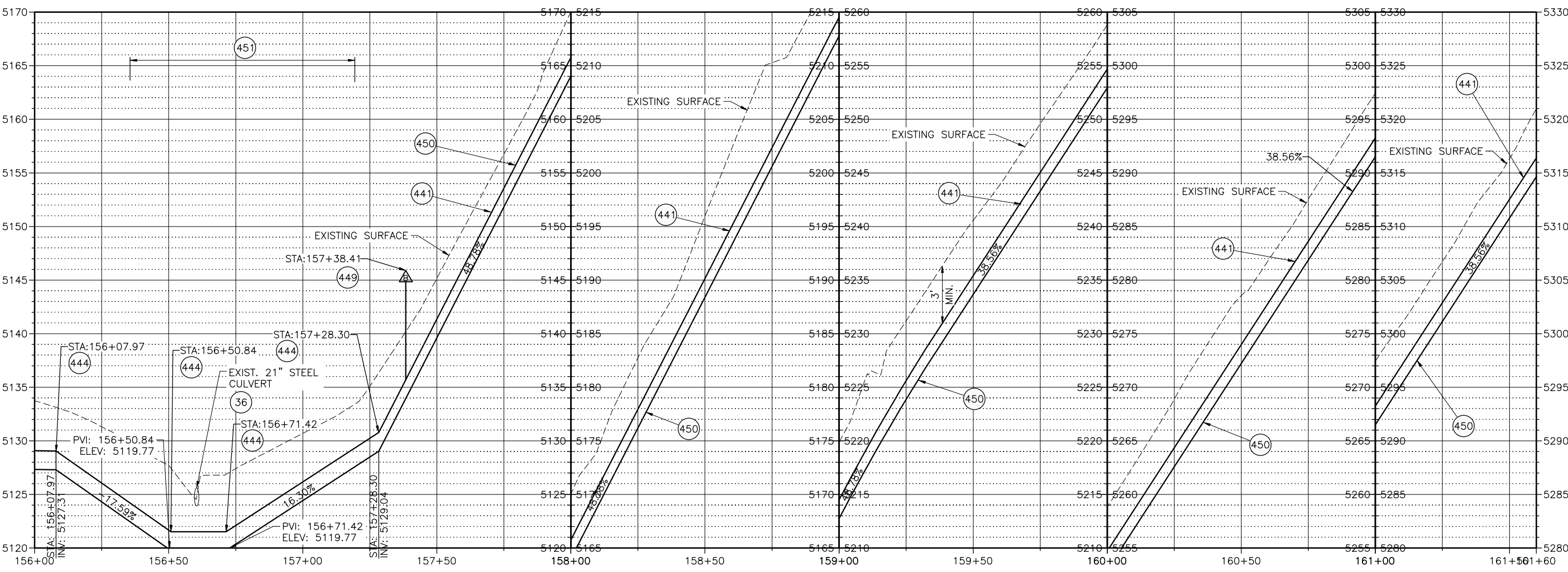
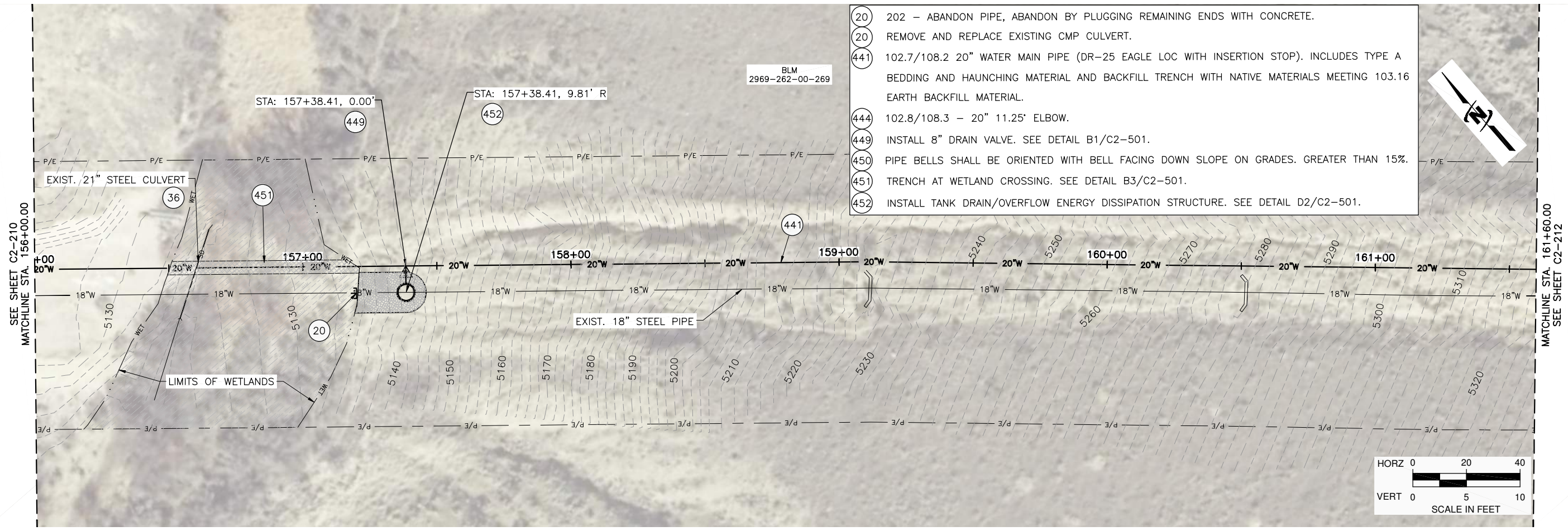
PURDY MESA FLOWLINE REPLACEMENT  
 CITY OF GRAND JUNCTION

BID ALTERNATIVE 2  
 PLAN AND PROFILE

FILE: 81-18-013 C-20X
JUB PROJ #: 81-18-013
DRAWN BY: JMM
DESIGN BY: CSF
CHECKED BY: SBG
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY
LAST UPDATED: 8/17/2018
SHEET NUMBER: <b>C2-211</b>

- (20) 202 - ABANDON PIPE, ABANDON BY PLUGGING REMAINING ENDS WITH CONCRETE.
- (20) REMOVE AND REPLACE EXISTING CMP CULVERT.
- (441) 102.7/108.2 20" WATER MAIN PIPE (DR-25 EAGLE LOC WITH INSERTION STOP). INCLUDES TYPE A BEDDING AND HAUNCHING MATERIAL AND BACKFILL TRENCH WITH NATIVE MATERIALS MEETING 103.16 EARTH BACKFILL MATERIAL.
- (444) 102.8/108.3 - 20" 11.25' ELBOW.
- (449) INSTALL 8" DRAIN VALVE. SEE DETAIL B1/C2-501.
- (450) PIPE BELLS SHALL BE ORIENTED WITH BELL FACING DOWN SLOPE ON GRADES. GREATER THAN 15%.
- (451) TRENCH AT WETLAND CROSSING. SEE DETAIL B3/C2-501.
- (452) INSTALL TANK DRAIN/OVERFLOW ENERGY DISSIPATION STRUCTURE. SEE DETAIL D2/C2-501.

BLM  
 2969-262-00-269



Plot Date: 8/20/2018 7:54 AM Plotted By: Juba Myers  
 Date Created: 8/17/2018 10:06 AM Project: PURDY MESA FLOWLINE REPLACEMENT - BID SET - ALTERNATIVE 2 - CITY OF GRAND JUNCTION - 81-18-013 - JUB - PURDY MESA FLOWLINE REPLACEMENT - 81-18-013 - C-20X.DWG



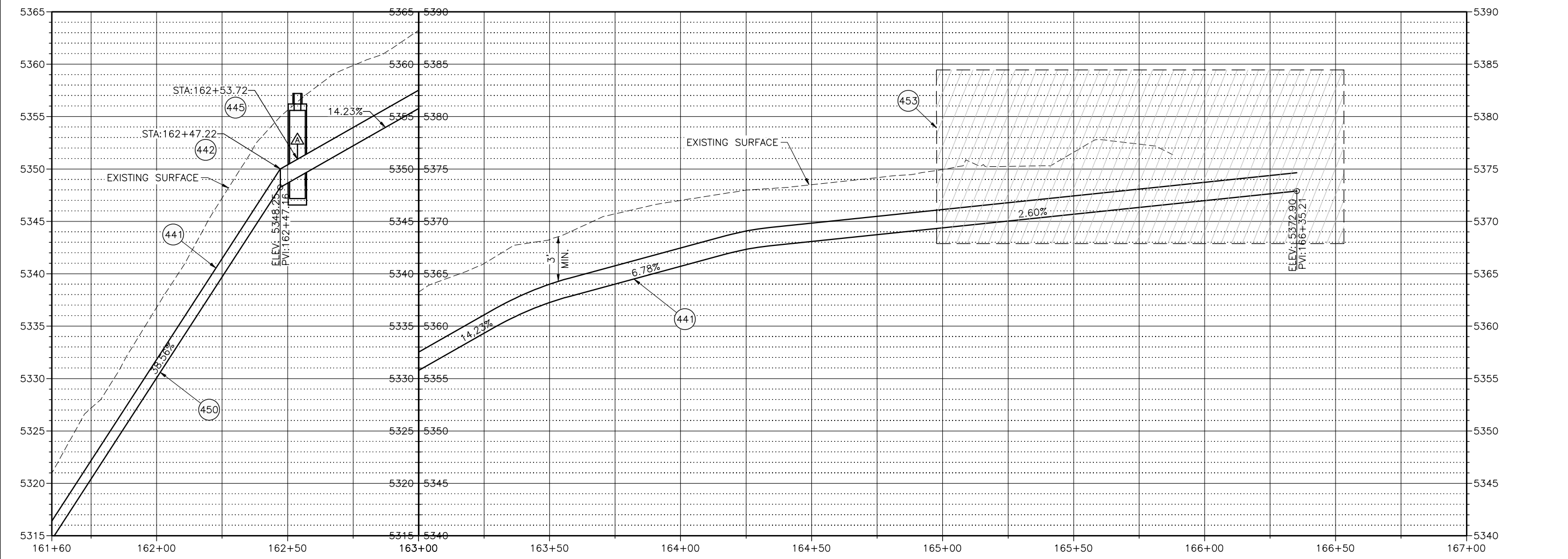
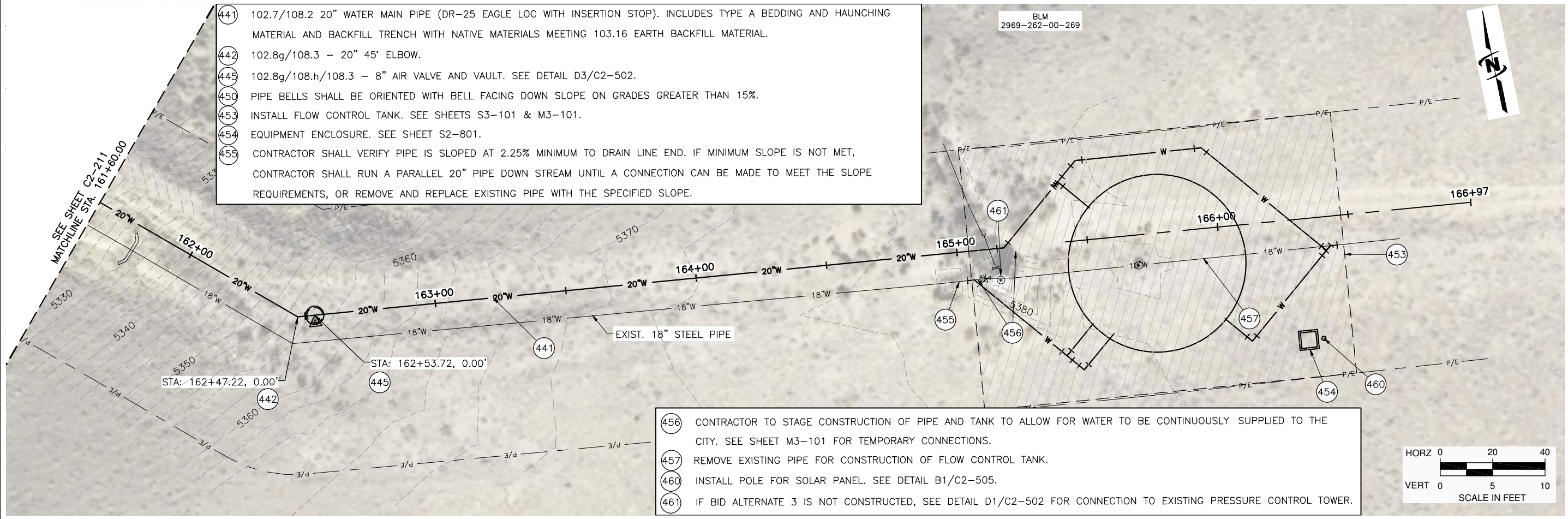
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NO.	REVISION	DESCRIPTION	BY	DATE

**PURDY MESA FLOWLINE REPLACEMENT  
CITY OF GRAND JUNCTION**

BID ALTERNATIVE 2  
PLAN AND PROFILE



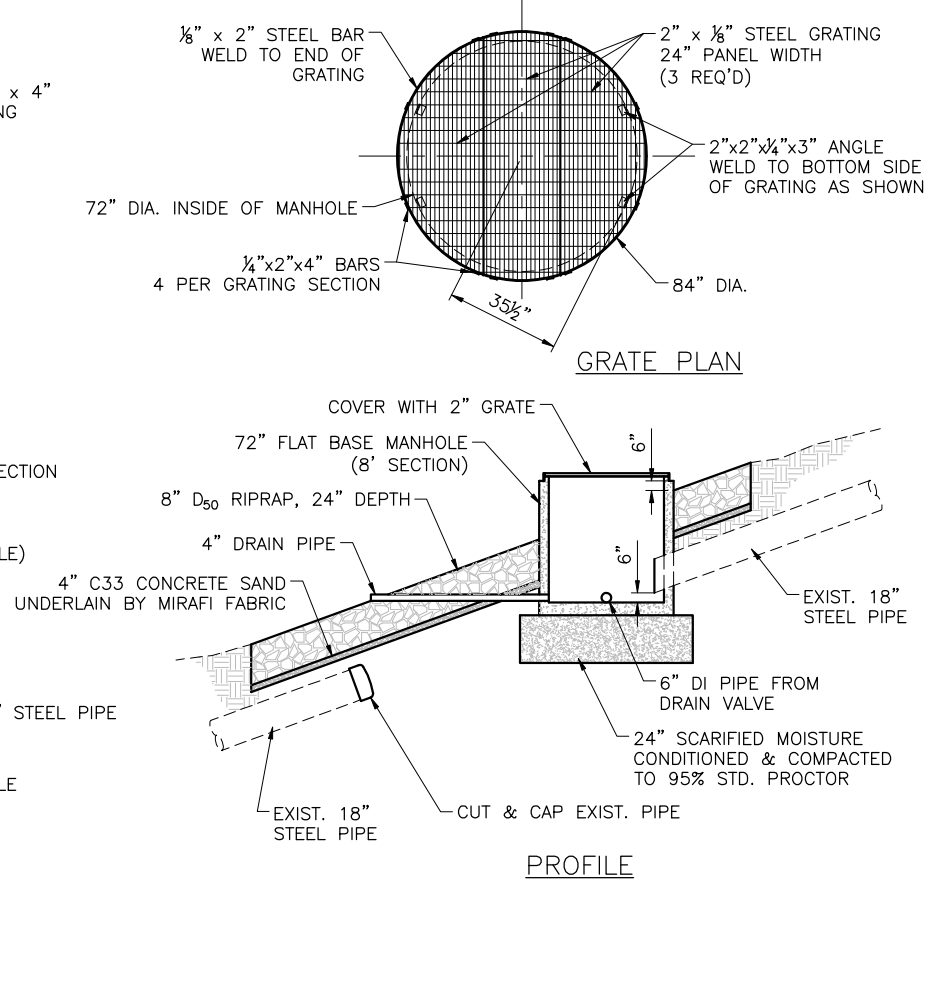
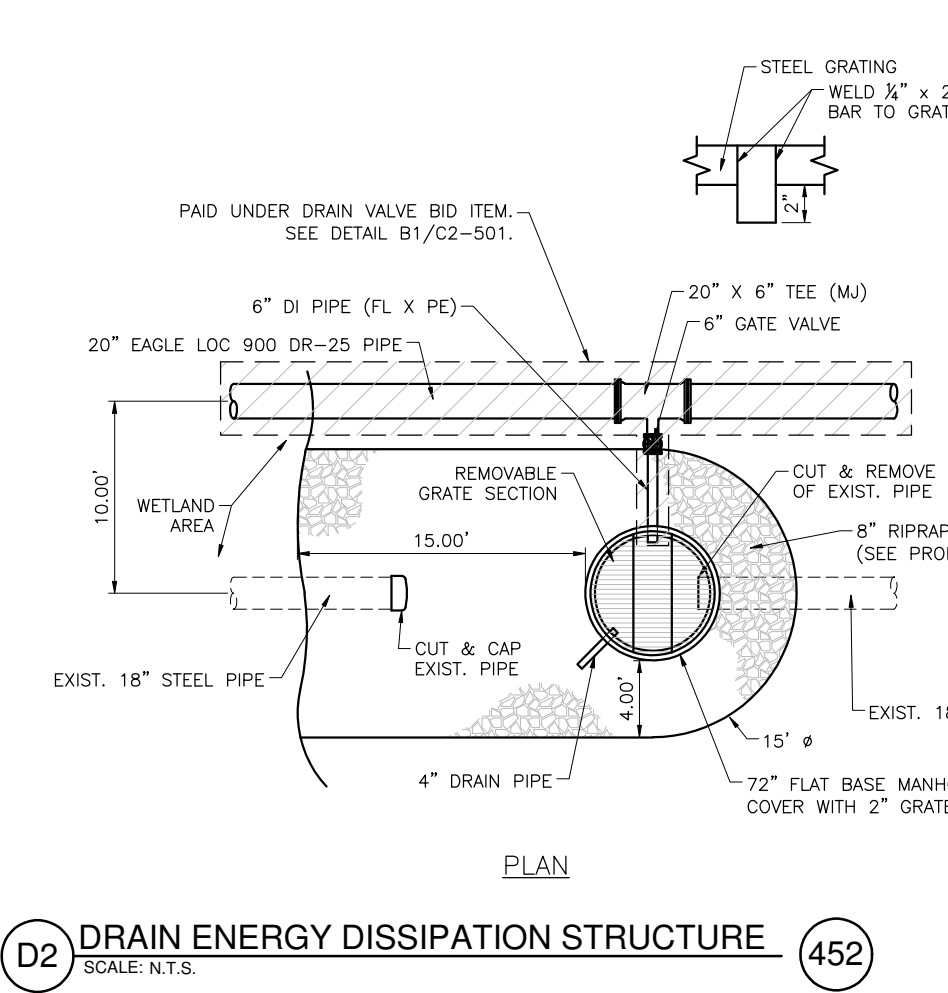
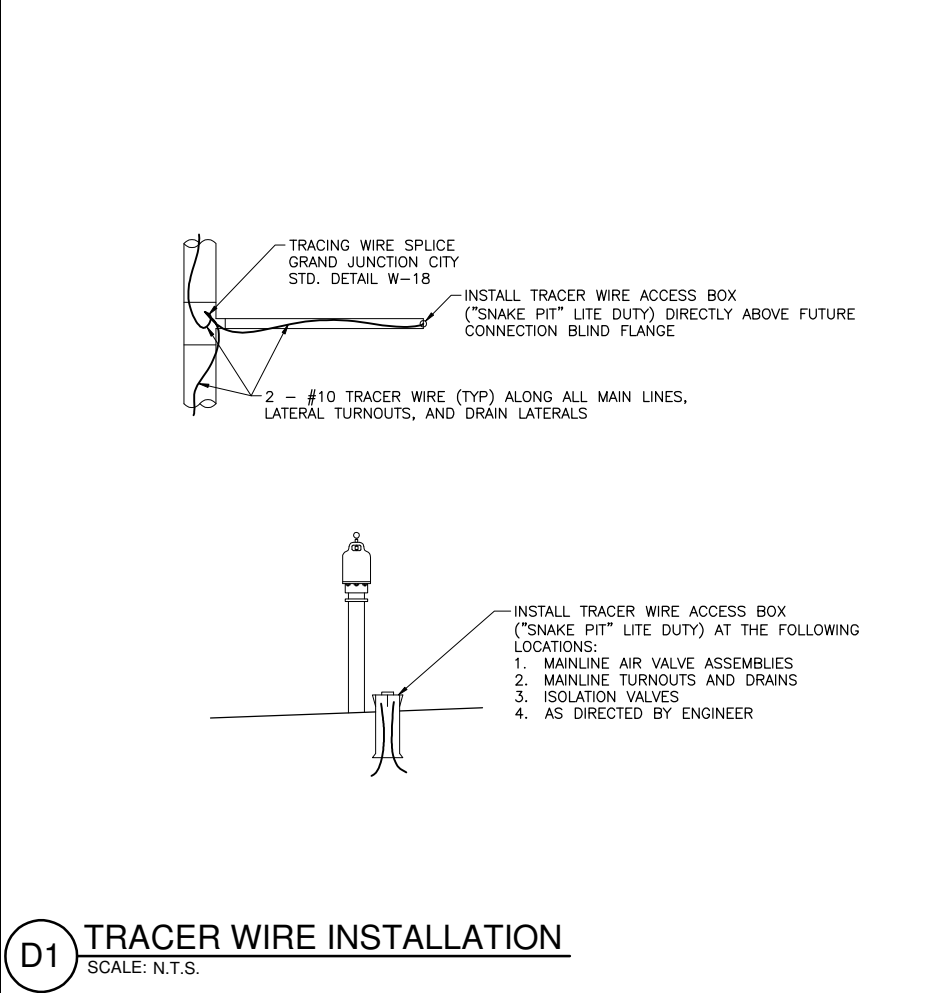
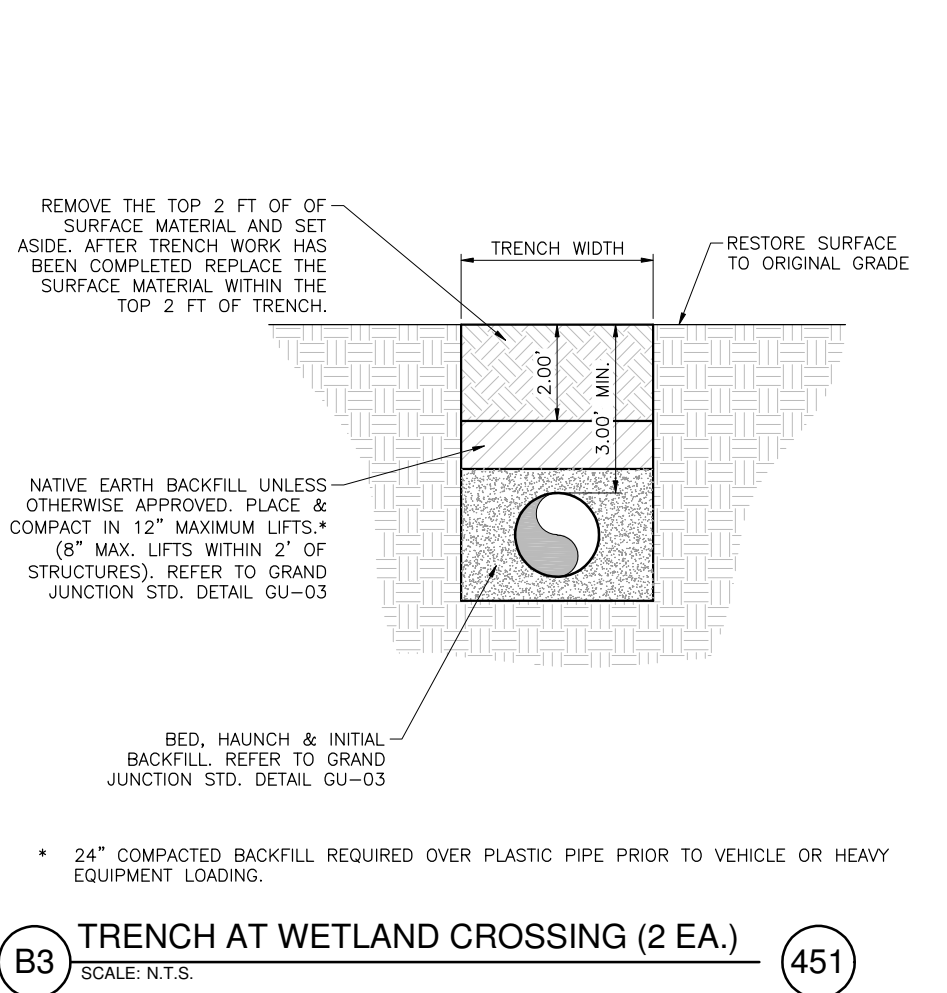
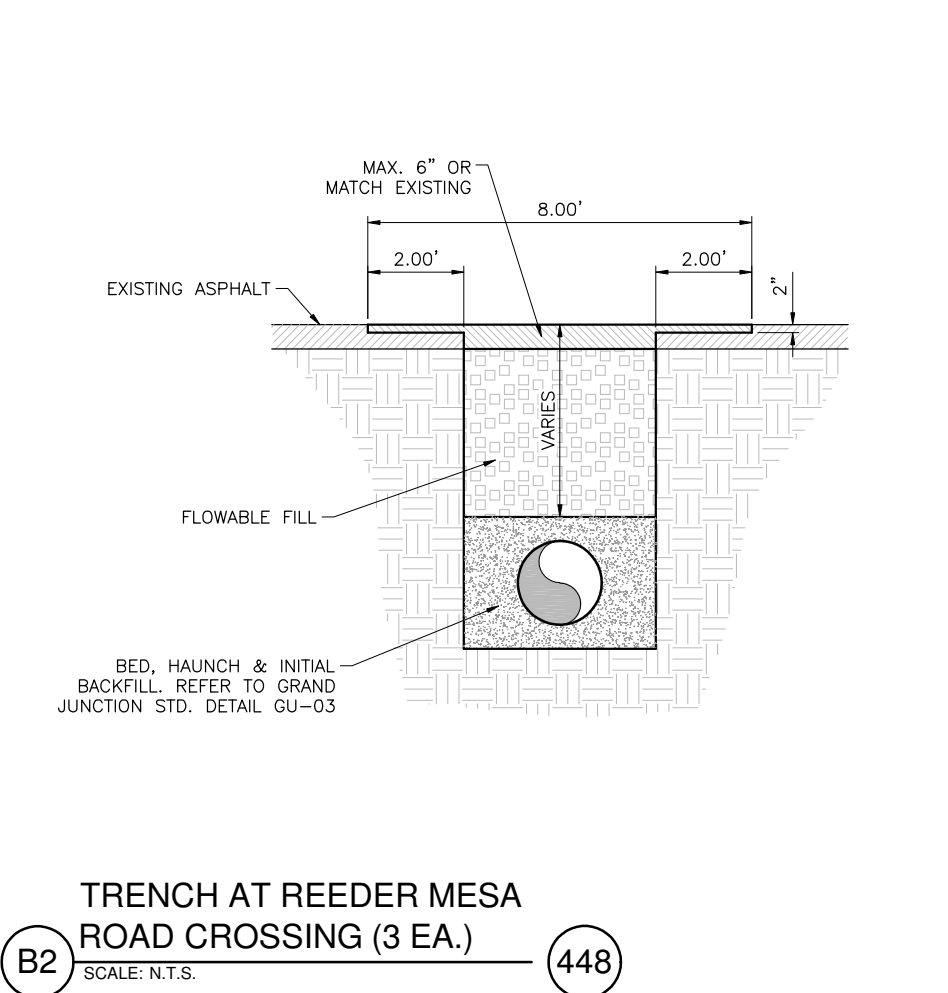
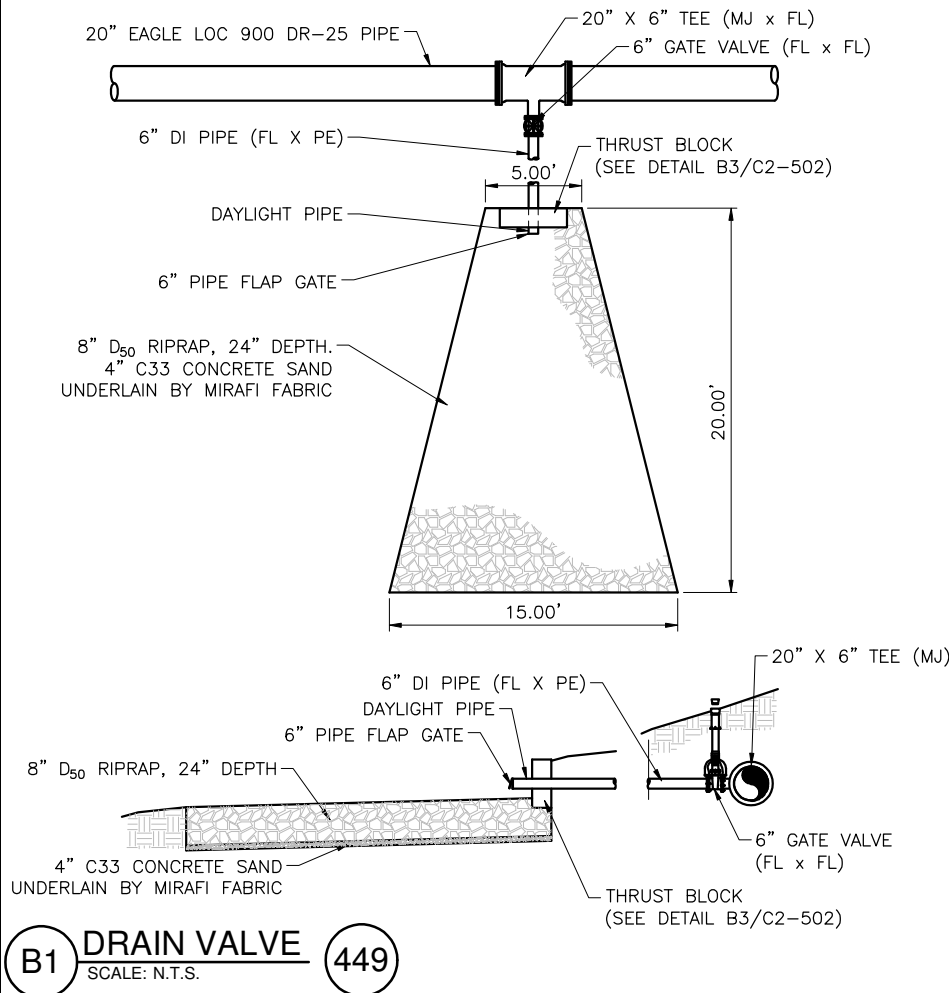
Plot Date: 8/20/2018 4:07 PM Plotted By: Juba Myers  
 Date Created: 8/17/2018 10:06 AM Project: PURDY MESA FLOWLINE REPLACEMENT SHEET: C-20X.DWG

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PURDY MESA FLOWLINE REPLACEMENT  
CITY OF GRAND JUNCTION  
ALTERNATIVE 2  
DETAILS



Plot Date: 8/20/2018 7:55 AM, Plotted By: Juba Myers, Date Created: 8/17/2018, I:\GROWTH\EST\PROJECTS\JUB\GRAND JUNCTION\81-18-013-CITY OF GRAND JUNCTION PURDY MESA FLOWLINE CAD\81-18-013-C-801X-DETAILS.DWG

Plot Date: 02/20/2018 7:55 AM Plotted By: Juba Myers  
 Date Created: 01/22/18 10:06 AM File Path: \\P:\PROJECTS\JUB\GRAND JUNCTION\81-18-013-CITY OF GRAND JUNCTION PURDY MESA FLOWLINE CAD\SH018-18-013-C-01A-DETAILS.DWG



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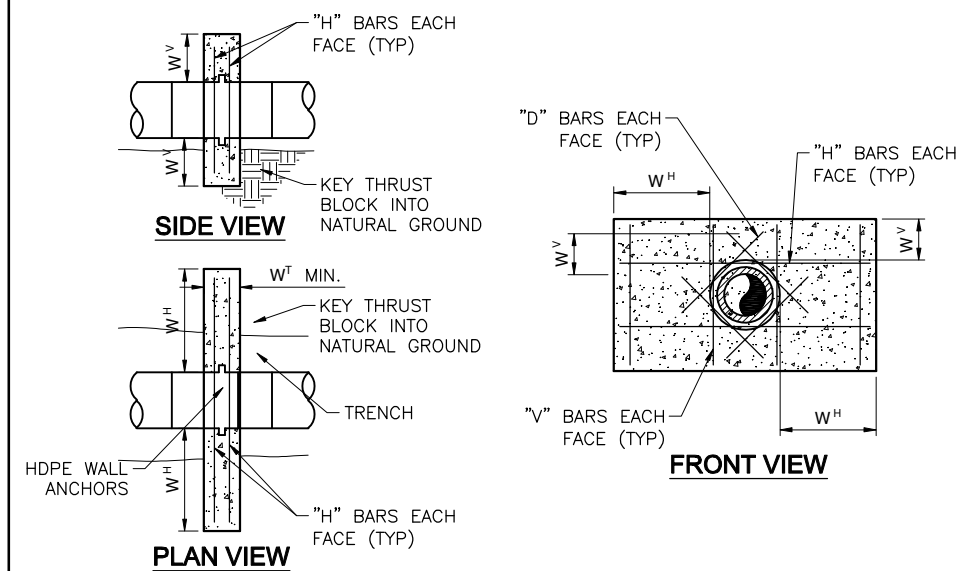
NO.	REVISION	DESCRIPTION	BY	DATE

PURDY MESA FLOWLINE REPLACEMENT  
 CITY OF GRAND JUNCTION  
 BID ALTERNATIVE 2  
 DETAILS

FILE: 81-18-013-C-801X-DETAILS  
 JUB PROJ #: 81-18-013  
 DRAWN BY: JMM  
 DESIGN BY: CSF  
 CHECKED BY: SBG

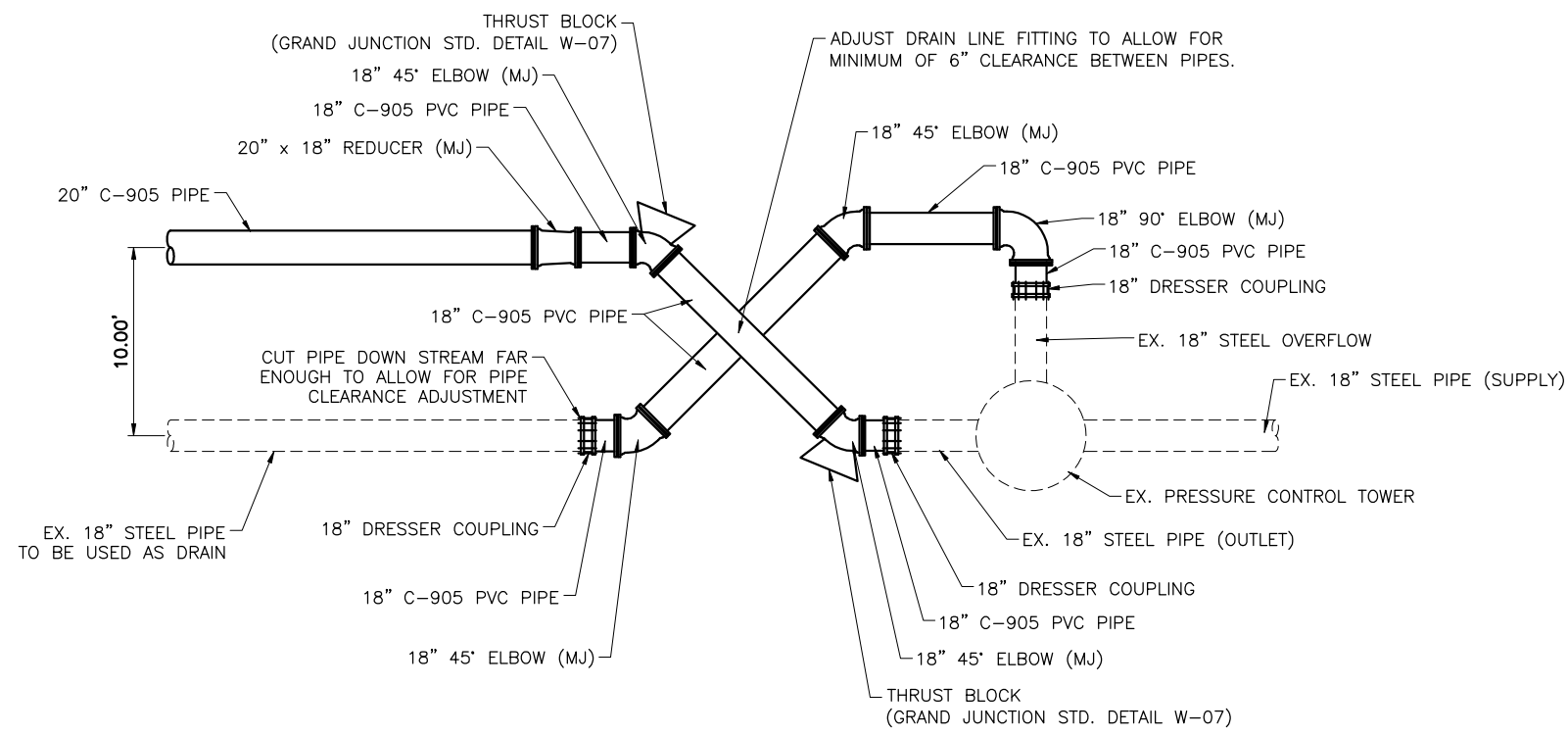
ONE INCH  
 AT FULL SIZE, IF NOT ONE  
 INCH, SCALE ACCORDINGLY

LAST UPDATED: 8/17/2018  
 SHEET NUMBER:  
**C2-502**



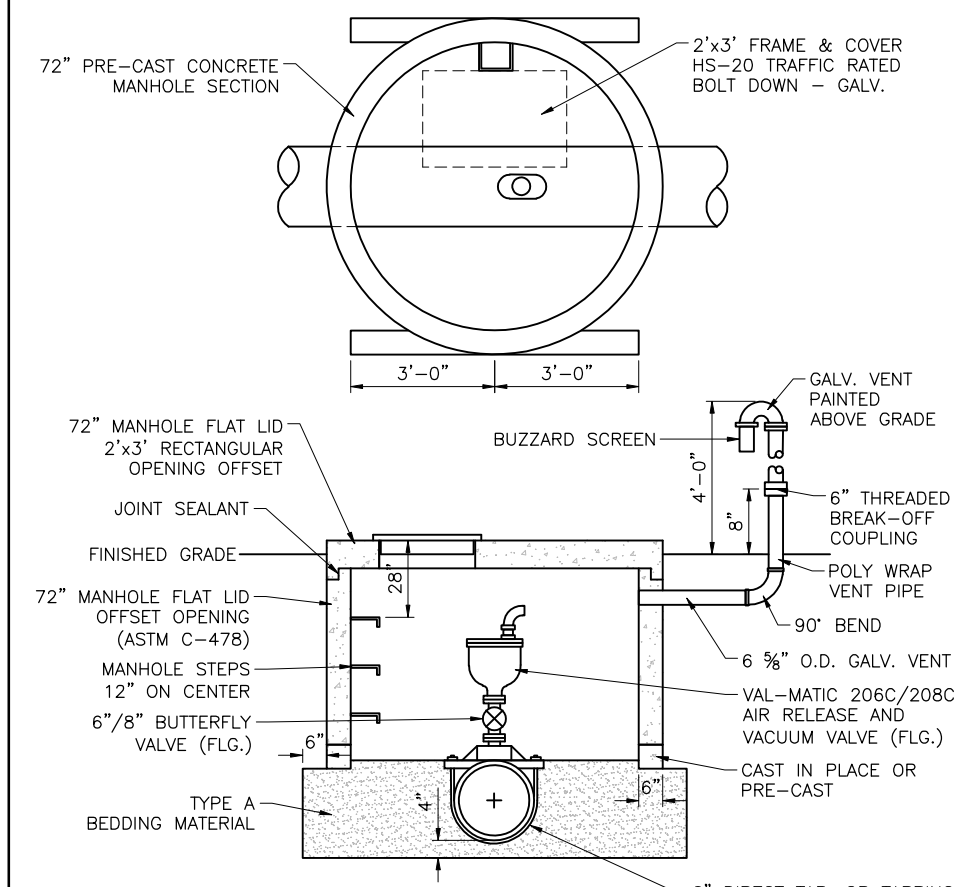
THRUST BLOCK DIMENSIONS									
PIPE SIZE	W <sup>H</sup>	W <sup>V</sup>	W <sup>T</sup>	"H" BARS		"V" BARS		"D" BARS	
				SIZE	NO.	SIZE	NO.	SIZE	NO.
4"-8"	1.5'	0.5'	1.0'	#4	2	#4	4	#4	4
10"-12"	1.5'	1.0'	1.0'	#4	4	#4	4	#4	4
14"-20"	2.0'	1.0'	1.0'	#4	4	#4	6	#4	4
22"-24"	2.5'	1.0'	1.0'	#4	4	#4	6	#4	4
30"	2.75'	1.5'	2.0'	#5	6	#5	8	#5	4
32"	2.75'	1.75'	2.0'	#5	8	#5	8	#5	4
34"	2.75'	2.0'	2.0'	#5	8	#5	8	#5	4

**B3** INLINE THRUST BLOCK DIMENSIONS MAINLINE  
 SCALE: N.T.S.



**D1** ALTERNATE CONNECTION TO EXISTING PRESSURE CONTROL TOWER  
 - TO BE INCLUDED IF BID ALTERNATE 3 IS NOT CONSTRUCTED  
 SCALE: N.T.S.

461

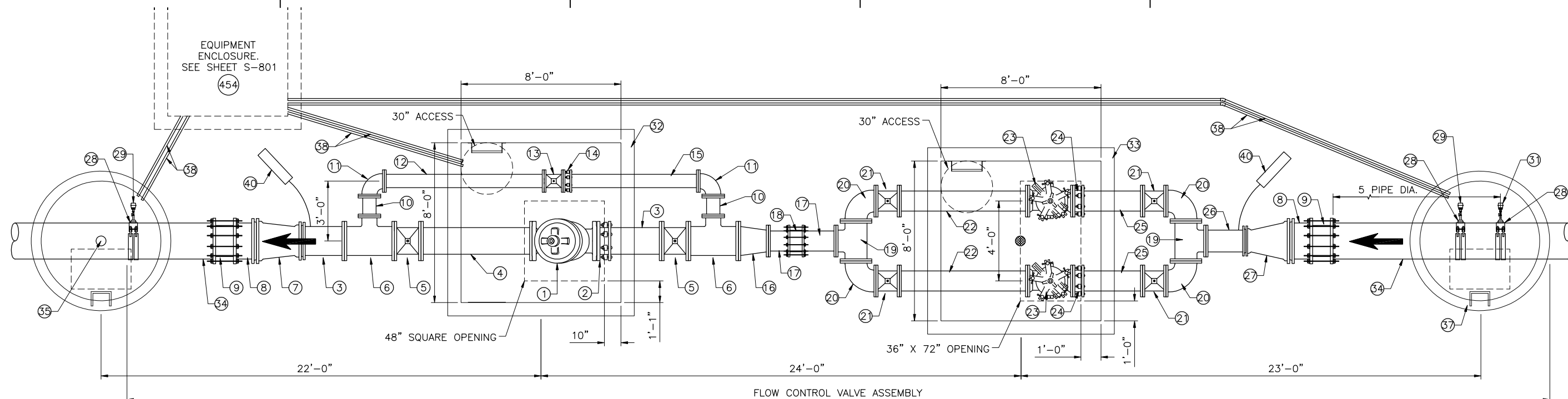


**D3** 6\"/>
 SCALE: N.T.S.

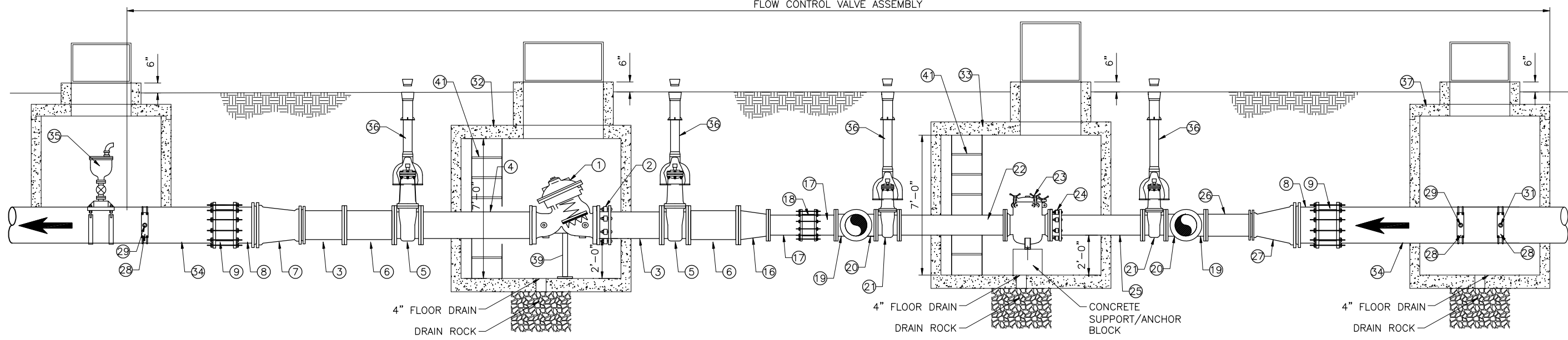
411

**PIPE SCHEDULE**

- |  |   |   |   |
|--|---|---|---|
| <ul style="list-style-type: none"> <li>1. 16" BERHAD 718-03 CONTROL VALVE (FLG).</li> <li>2. 16" DISMANTLING JOINT (FLG).</li> <li>3. 16" DI SPOOL (PEXFLG).</li> <li>4. 16" DI SPOOL (FLGXFLG).</li> <li>5. 16" GATE VALVE.</li> <li>6. 16"x16"x8" TEE (FLG).</li> <li>7. 20"x16" REDUCER (MJ).</li> <li>8. 20" DI SPOOL (PEXMJ).</li> <li>9. 20" DI RESTRAINED FLANGED COUPLING ADAPTER.</li> <li>10. 8" DI SPOOL (FLG).</li> <li>11. 8" 90° ELBOW (FLG).</li> <li>12. 8" DI SPOOL (FLG).</li> <li>13. 8" GATE VALVE (FLG).</li> <li>14. 8" DISMANTLING JOINT (FLG).</li> <li>15. 8" DI SPOOL (PEXFLG).</li> <li>16. 16"x12" REDUCER (FLG).</li> </ul> | <ul style="list-style-type: none"> <li>17. 12" DI SPOOL (FLG).</li> <li>18. 12" DRESSER COUPLING.</li> <li>19. 12" TEE (FLG).</li> <li>20. 12" 90° ELBOW (FLG).</li> <li>21. 12" GATE VALVE (FLG).</li> <li>22. 12" DI SPOOL (FLG).</li> <li>23. 12" EATON 73 STRAINER OR EQUAL (FLG).</li> <li>24. 12" DISMANTLING JOINT (FLG).</li> <li>25. 12" DI SPOOL (PEXFLG).</li> <li>26. 12" DI SPOOL (PEXFLG).</li> <li>27. 20"x12" REDUCER (MJ).</li> <li>28. 2" SERVICE SADDLE W/CORP STOP. TAP AT 3 O'CLOCK IN FLOW DIRECTION.</li> <li>29. PRESSURE TRANSMITTER W/DISPLAY. RANGE 0-150 PSI. E&amp;H PMP51 SERIES OR EQUAL.</li> </ul> | <ul style="list-style-type: none"> <li>30. 16" BERHAD 730 PRESSURE SUSTAINING VALVE (FLG).</li> <li>31. INSERTION MAGNETIC FLOW METER SEAMETRICS EX-250 WITH FT-440 DISPLAY OR EQUAL.</li> <li>32. 8' x 8' PRE-CAST CONCRETE VAULT, W/4' x 4' HATCH &amp; 30" ACCESS OPENING W/ACCESS LADDER. CONTRACTOR TO SUBMIT SHOP DRAWINGS OF VAULT AND REBAR SCHEDULE TO ENGINEER FOR REVIEW.</li> <li>33. 8' x 8' PRE-CAST CONCRETE VAULT W 3' x 6' ACCESS HATCH &amp; 30" ACCESS OPENING W/ACCESS LADDER. CONTRACTOR TO SUBMIT SHOP DRAWINGS OF VAULT AND REBAR SCHEDULE TO ENGINEER FOR REVIEW.</li> <li>34. 20" EAGLE LOC DR-25 PIPE WITH EAGLE INSERTION STOP.</li> </ul> | <ul style="list-style-type: none"> <li>35. 6" COMBINATION AIR VALVE (SEE DETAIL D3/C2-502)(PAID UNDER SEPERATE BID ITEM.</li> <li>36. VALVE BOX</li> <li>37. 72" PRE-CAST CONCRETE MANHOLE SECTION W/72" MANHOLE FLAT LID, 2' x 3' RECTANGULAR OFFSET W/ ACCESS HATCH.</li> <li>38. 1" CONDUIT</li> <li>39. PIPE SUPPORT. SEE DETAIL D1/C2-505.</li> <li>40. MESA PRODUCTS MODEL 17D2 HIGH CAPACITY MAGNESIUM ANODE. CAD WELD TO D.I. PIPE WITH 12 GA. INSULATED WIRE CONNECTION.</li> <li>41. ACCESS LADDER. SEE DETAIL B2/C2-505</li> </ul> |
|--|---|---|---|



FLOW CONTROL VALVE ASSEMBLY  
**PLAN**  
SCALE:N.T.S.



FLOW CONTROL VALVE ASSEMBLY  
**ELEVATION**  
SCALE:N.T.S.

**D1 FLOW CONTROL VALVE AND STRAINERS ASSEMBLY** 446  
SCALE:N.T.S.

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**BID SET**

NO.	DESCRIPTION	BY	APPR.	DATE

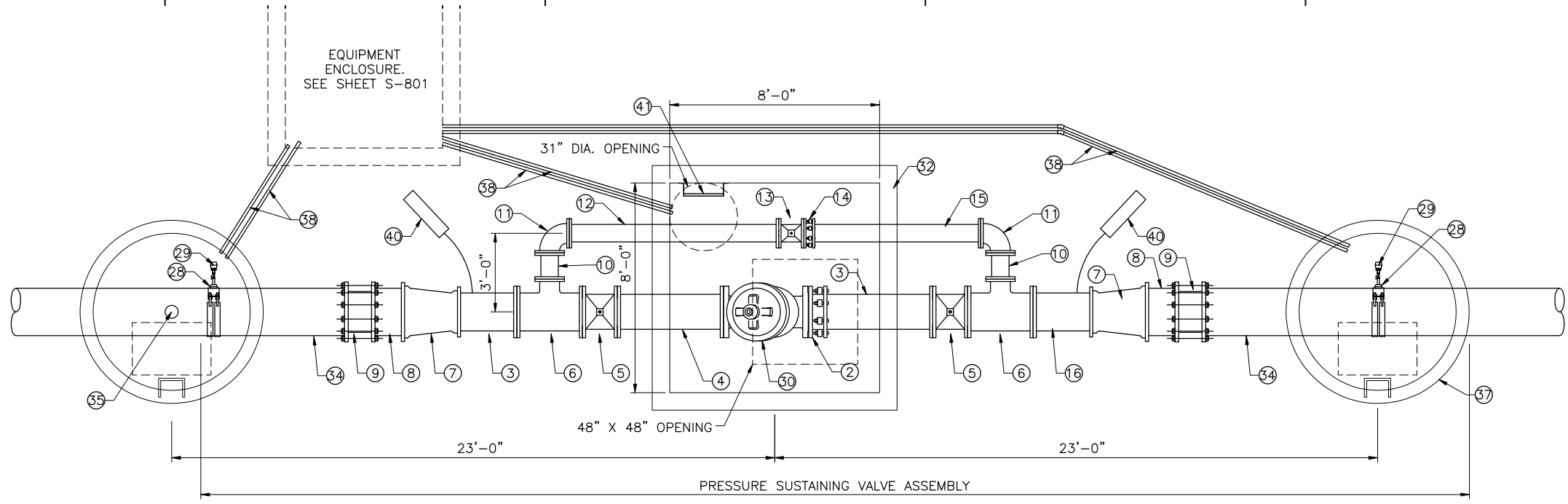
**PURDY MESA FLOWLINE REPLACEMENT**  
CITY OF GRAND JUNCTION  
ALTERNATIVE 2  
DETAILS

FILE: 81-18-013 C-503X VAULTS  
JUB PROJ. #: 81-18-013  
DRAWN BY: JMM  
DESIGN BY: CSF  
CHECKED BY: SBG  
ONE INCH  
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY  
LAST UPDATED: 8/17/2018  
SHEET NUMBER:  
**C2-503**

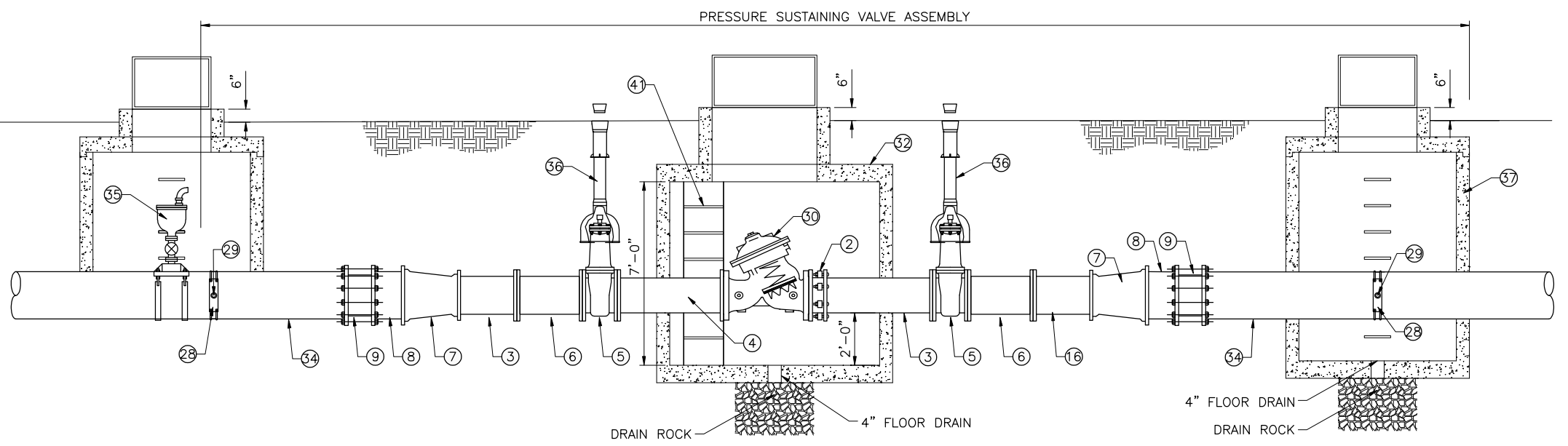
Plot Date: 8/20/2018 7:55 AM, Plotted By: Jubal Myers  
 Date Created: 8/17/2018 10:06 AM, Project: JUB GRAND JUNCTION, PURDY MESA FLOWLINE CAD SHEET 18-013 C-503X VAULTS.DWG

**PIPE SCHEDULE**

- |  |   |   |  |
|--|---|---|--|
| 1. 16" BERMAD 718-03 CONTROL VALVE (FLG).      | 17. 12" DI SPOOL (FLG)  | 30. 16" BERMAD 730 PRESSURE SUSTAINING VALVE (FLG).   | 35. 6" COMBINATION AIR VALVE (SEE DETAIL D3/C2-502)(PAID UNDER SEPERATE BID ITEM.  |
| 2. 16" DISMANTLING JOINT (FLG).                | 18. 12" DRESSER COUPLING.   | 31. INSERTION MAGNETIC FLOW METER SEAMETRICS EX-250 WITH FT-440 DISPLAY OR EQUAL.   | 36. VALVE BOX  |
| 3. 16" DI SPOOL (PEXFLG).                      | 19. 12" TEE (FLG).  | 32. 8' x 8' PRE-CAST CONCRETE VAULT, W/4' X 4' HATCH & 30" ACCESS OPENING W/ACCESS LADDER. CONTRACTOR TO SUBMIT SHOP DRAWINGS OF VAULT AND REBAR SCHEDULE TO ENGINEER FOR REVIEW.       | 37. 72" PRE-CAST CONCRETE MANHOLE SECTION W/72" MANHOLE FLAT LID, 2' X 3' RECTANGULAR OFFSET W/ ACCESS HATCH.            |
| 4. 16" DI SPOOL (FLGXFLG).                     | 20. 12" 90° ELBOW (FLG).  | 33. 8' x 8' PRE-CAST CONCRETE VAULT W 3' x 6' ACCESS HATCH & 30" ACCESS OPENING W/ACCESS LADDER. CONTRACTOR TO SUBMIT SHOP DRAWINGS OF VAULT AND REBAR SCHEDULE TO ENGINEER FOR REVIEW. | 38. 1" CONDUIT   |
| 5. 16" GATE VALVE.                             | 21. 12" GATE VALVE (FLG).   | 34. 20" EAGLE LOC DR-25 PIPE WITH EAGLE INSERTION STOP.   | 39. PIPE SUPPORT. SEE DETAIL D1/C2-505.  |
| 6. 16"x16"x8" TEE (FLG).                       | 22. 12" DI SPOOL (FLG).   |   | 40. MESA PRODUCTS MODEL 17D2 HIGH CAPACITY MAGNESIUM ANODE. CAD WELD TO D.I. PIPE WITH 12 GA. INSULATED WIRE CONNECTION. |
| 7. 20"x16" REDUCER (MJ).                       | 23. 12" EATON 73 STRAINER OR EQUAL (FLG).                                       |   | 41. ACCESS LADDER. SEE DETAIL B2/C2-505  |
| 8. 20" DI SPOOL (PEXMJ).                       | 24. 12" DISMANTLING JOINT (FLG)   |   |  |
| 9. 20" DI RESTRAINED FLANGED COUPLING ADAPTER. | 25. 12" DI SPOOL (PEXFLG).  |   |  |
| 10. 8" DI SPOOL (FLG).                         | 26. 12" DI SPOOL (PEXFLG).  |   |  |
| 11. 8" 90° ELBOW (FLG).                        | 27. 20"x12" REDUCER (MJ).   |   |  |
| 12. 8" DI SPOOL (FLG).                         | 28. 2" SERVICE SADDLE W/CORP STOP. TAP AT 3 O'CLOCK IN FLOW DIRECTION.          |   |  |
| 13. 8" GATE VALVE (FLG).                       | 29. PRESSURE TRANSMITTER W/DISPLAY. RANGE 0-150 PSI. E&H PMP51 SERIES OR EQUAL. |   |  |
| 14. 8" DISMANTLING JOINT (FLG).                |   |   |  |
| 15. 8" DI SPOOL (PEXFLG).                      |   |   |  |
| 16. 16"x12" REDUCER (FLG).                     |   |   |  |



**PLAN**  
SCALE:N.T.S.



**ELEVATION**  
SCALE:N.T.S.

**D1 PRESSURE SUSTAINING VALVE ASSEMBLY** 447



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NO.	DESCRIPTION	BY	DATE

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**PURDY MESA FLOWLINE REPLACEMENT**  
**CITY OF GRAND JUNCTION**  
**BID ALTERNATIVE 2**  
**DETAILS**

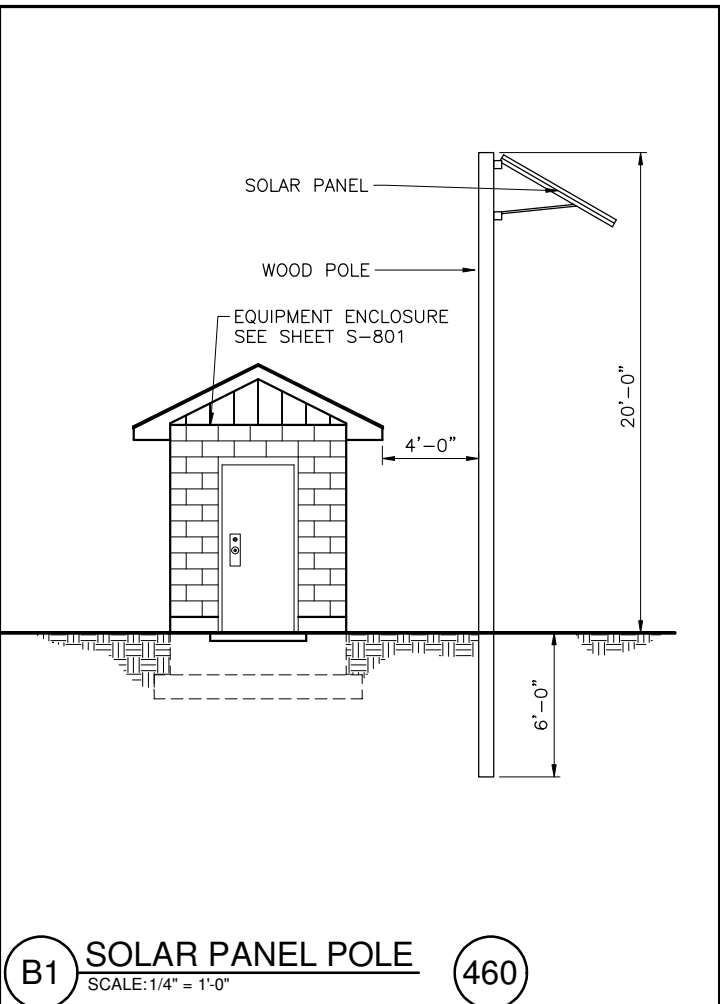
FILE: 81-18-013 C-503X VAULTS  
JUB PROJ #: 81-18-013  
DRAWN BY: JMM  
DESIGN BY: CSF  
CHECKED BY: SBG  
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY  
LAST UPDATED: 8/17/2018  
SHEET NUMBER:  
**C2-504**

Plot Date: 8/20/2018 7:55 AM Plotted By: Jubal Myers Date Created: 8/17/2018 10:05 AM File Path: C:\PROJECTS\JUB\GRAND JUNCTION\81-18-013 CITY OF GRAND JUNCTION PURDY MESA FLOWLINE CAD\SHR018-18-013 C-503X VAULTS.DWG

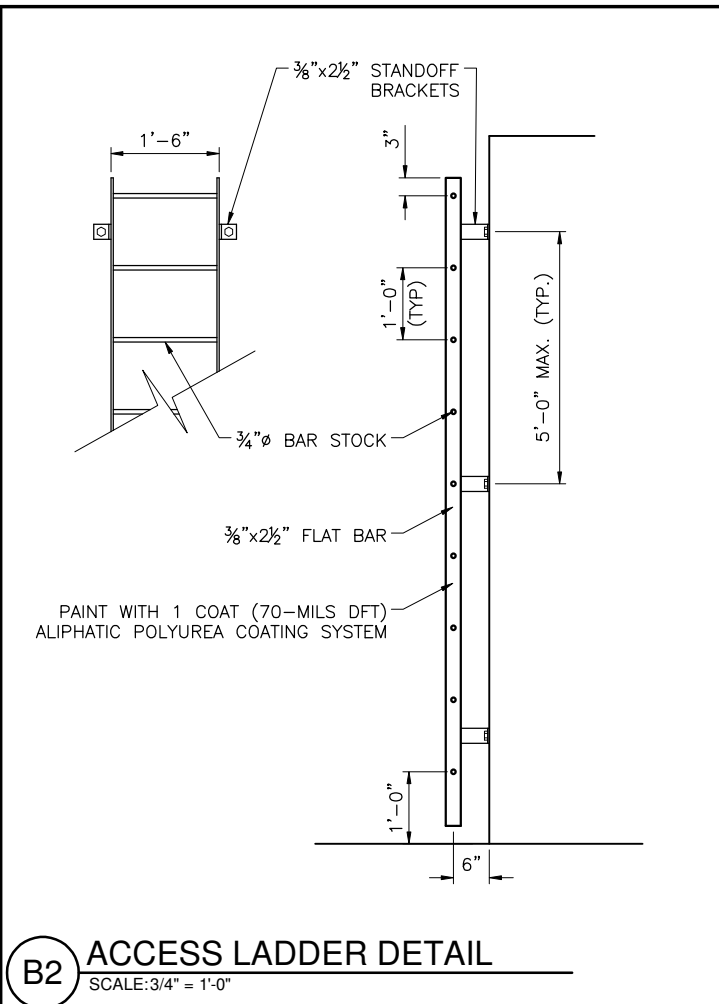


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**B1** SOLAR PANEL POLE  
SCALE: 1/4" = 1'-0"  
**460**

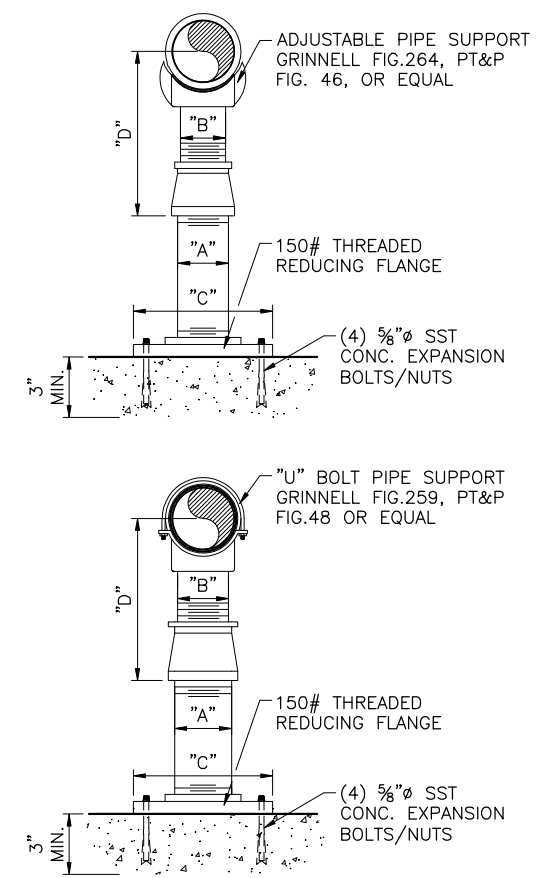


**B2** ACCESS LADDER DETAIL  
SCALE: 3/4" = 1'-0"

**D1** ADJUSTABLE PIPE SUPPORT  
SCALE: 3/4" = 1'-0"

ADJUSTABLE PIPE SUPPORT						
APPROXIMATE DIMENSIONS IN INCHES						
PIPE SIZE	A	B	C	D MINIMUM	D MAXIMUM	
2 1/2	2 1/2	1 1/2	9	8	13	
3				8 1/4	13 1/4	
3 1/2				8 1/2	13 1/2	
4	3	2 1/2		9 1/4	14	
5				10	14 3/4	
6				10 1/2	15 1/4	
8				11 3/4	16 1/2	
10				13 1/2	18 1/4	
12				15	19 3/4	
14	4	3	11	16 1/4	20 3/4	
16				17 3/4	22 1/4	
18				19 1/2	24	
20	6	3 1/2		13 1/2	21	25 1/2
22					21 5/8	25 3/8
24					23 3/4	28 1/4
26					24 3/8	28 1 3/8
30					27	31 1/2
32					28 1/4	32 3/4
36	4	16		16	30 1/4	34 3/4

NOTE:  
PIPE SUPPORTS TO BE HOT DIP GALVANIZED AFTER FABRICATION.



Plot Date: 8/20/2018 7:56 AM Plotted By: Jubal Myers  
 Date Created: 8/17/2018 10:06 AM File Path: C:\PROJECTS\JUB\GRAND JUNCTIONS\18-013 CITY OF GRAND JUNCTION PURDY MESA FLOWLINE CAD\DWG\81-18-013 C-503X VAULTS.DWG

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NO.	REVISION	DESCRIPTION	BY	DATE

PURDY MESA FLOWLINE REPLACEMENT  
CITY OF GRAND JUNCTION

BID ALTERNATIVE 2  
SCADA

FILE: 81-18-013 C-506
JUB PROJ #: 81-18-013
DRAWN BY: JMM
DESIGN BY: ---
CHECKED BY: SBG
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY
LAST UPDATED: 9/21/2018

Notes: (General and location specific)

- 12vdc Solar power system shall be sized for full system load for minimum of 3 consecutive days of full cloud cover. Batteries shall be kept in a separate box appropriate for storage. Solar panel(s) shall be mounted on contractor provided pole outside of building. Power wiring shall be run in conduit between the solar panel and the battery system.
- Purdy Mesa Tank site will send the tank level signal to the existing Kannah Creek WTP site via the Kannah Creek Tank site. Integrator will add the Purdy Mesa tank level signal and associated high / low alarms to the Kannah Creek SCADA system.
- Integrator will setup communications via internet connection to the operator interface at the control vault location (cell link with fixed IP address). The Integrator will ensure that the WTP interface is secure to prevent unwanted outside access.
- The flow vault will be the primary pressure control site for the pipeline. Communications to this site will be via cellular modem. The modem will need additional security to prevent access from networks outside of the water treatment plant (Tosibox 500 or equivalent)
- Pressure / flow control will be accomplished by monitoring both up and downstream pressures as well as system flow. In automatic mode, the PLC will actuate either the open or close solenoid on the Burmad valve in order to increase / decrease pressure as needed to maintain desired pressure / flow. The operator interface will display system pressures and flow as well as any alarm conditions (low / high pressure, sensor failure, low battery). A graphical representation of the vault will also be displayed. The operator will be able to enter desired flow / pressure setpoints (password protected). In manual mode, the operator will be able to actuate either the open or close solenoid as needed from the Operator interface (password protected.). Alarms will be emailed (or text via email) to appropriate city personnel.
- The city has been granted access to the radio tower on Whitewater hill (Clifton Water District). The integrator may do a radio path survey to determine if this will allow for a more desirable communications path than cellular network.
- Integrator will ensure that they provide all necessary components and setup so that the system operates as intended.
- Integrator will provide a minimum of (2) 3 hr. training sessions on the operation and maintenance of the system
- Project submittals shall include bill of materials with associated cut sheets on all proposed equipment. Control panel layout and wiring drawings shall also be provided (11x17).
- Project O&M shall include bill of materials and equipment manuals. As-built drawings shall be provided in 11x17 format. A flash drive shall be furnished with all O&M data as well as copy of drawings in PDF and Autocad 2016 or higher. Additionally, copies of the PLC and OIT programs shall be furnished on the flash drive.

**WTP SITE**

- Monitor and control the flow vault site via IP address link
- Monitor the new tank level via existing remote connection to Kannah Creek
- Add new control panel in main flow control vault to monitor and control new pressure sustaining valve.
- All equipment will be fuse protected.
- Panel will need ethernet link to WTP control room and wiring from new vault to panel.
- Primary Components
  - Allen Bradley Micrologix1100 PLC with 1762-IF4 analog input module
  - Red Lion G07S0000 Operator interface or equal. All data shall be logged to the OIT data storage device every 5 minutes.
  - Pressure transmitter with display. Range 0-150 PSI 4-20mA Output. (2) Rosemount 2088 series or equal
  -

**LOWER PRESSURE VAULT**

- Enclosure shall be lockable NEMA12. White in color.
- System monitoring of upstream and downstream pressure and system flow
- All equipment shall be fuse protected.
- All I/O shall be wired through terminal blocks and tagged with Radio input / output address.
- Primary Components
  - Phoenix Contact RAD-900-IFS radio system with RAD-A14-IFS analog module with appropriate lightning protection.
  - Pressure transmitter with display. Range 0-150 PSI 4-20mA Output. (2) Rosemount 2088 series or equal

**UPPER PRESSURE VAULT**

- Enclosure shall be lockable NEMA12.
- System monitoring of upstream and downstream pressure and system flow
- System control of upstream pressure
- All equipment shall be fuse protected.
- All I/O shall be wired through terminal blocks and tagged with PLC input / output address.
- Primary Components
  - Allen Bradley Micrologix1100 PLC with 1762-IF4 analog input module
  - Red Lion G07S0000 Operator interface or equal. All data shall be logged to the OIT data storage device every 5 minutes.
  - Phoenix Contact RAD-900-IFS. Use PLC serial port to communicate to lower vault.
  - Pressure transmitter with display. Range 0-150 4-20mA Output. (2) Rosemount 2088 series or equal
  - Insertion magnetic flowmeter Seametrics EX-250 with FT-440 display or equal
  - 4-20mA Loop powered Battery Voltage monitor

**TANK SITE**

- Enclosure shall be lockable NEMA12.
- System monitoring of tank level.
- Tank level will be sent to the Kannah Creek WTP via the Kannah Creek Tank RTU for control of the Purdy Mesa Intake valve. Operations shall enter desired tank level setpoint for valve control.
- All equipment shall be fuse protected.
- All I/O shall be wired through terminal blocks and tagged with PLC input / output address.
- Primary components
  - Phoenix Contact point to point 900Mhz radio system to link to Kannah Creek. Radio shall have appropriate lightning protection.
  - Submersible Pressure transmitter Range 0-10 PSI 4-20mA Output. E&H Waterpilot or equal
  - The tank level transmitter shall have appropriate lightning protection

**KANNAH CREEK WTP (EXISTING PHOENIX 900MHZ RADIOS)**

P/N 2885346  
RAD-ISM-900-XD-BUS

- Tank level setpoint shall be added to the existing valve control system

NUMBER	REVISION	BY	DATE
6			
5	Change of material mfg.		9/18
4	90% Review Modifications		8/9/18
3	Addition of Pressure Vault at WTP		7/16/18
2	60% Review Modifications		6/27/18
1	60% Drawing Set		6/12/18

DRAWN BY: BRM	5/15/18
DESIGNED BY: BRM	5/15/18
APPROVED BY:	
WITNESSED BY:	

PROJECT NUMBER: 81-18-013
CAD NUMBER: C2-505
DRAWING SCALE: NONE

**PROJECT:**  
JUB ENGINEERS  
PURDY MESA PIPELINE PROJECT

**DRAWING TITLE:**  
SCADA SYSTEM  
COMMUNICATIONS OVERVIEW

SHEET NO. C2-505
REVISION 5

**GENERAL STRUCTURAL NOTES AND SPECIFICATIONS**

- 1. GENERAL**
- A. These general structural notes and specifications supplement the project written technical specifications and the project structural drawings.
  - B. The structures shown on the drawings have been designed for stability under final conditions only. These plans do not include the necessary components or equipment for the structures during construction. The Contractor is responsible for all construction bracing, temporary shoring, and other site safety controls required during construction in accordance with all applicable Local, State and Federal regulations, to insure the stability and safety of all construction until it is completed and self-supporting.
  - C. The Contractor is responsible for all water, both above and below ground, runoff and other environmental controls required during construction to insure the site is maintained in compliance with all applicable Local, State and Federal regulations.
  - D. Details on these plans are intended to depict the general construction details and methods for this structure. Connection details and conditions not specifically shown that are similar in nature to those that are specified shall be assumed one and the same. If questions regarding the application of details are encountered, notify the Engineer for clarification or instruction.
  - E. Where these General Structural Notes, the Project Geotechnical Report and/or the Project Technical Specifications differ or conflict, the more stringent requirement shall apply, unless otherwise directed by the Project Engineer.
  - F. Visits to the job site by the Engineer to observe, the construction do not in any way mean that they are guarantors of the Contractor's work, nor responsible for comprehensive or special inspections, coordination, supervision, nor safety at the job site.

- 2. CONTRACTOR RESPONSIBILITY FOR COORDINATION**
- A. It is the Contractors Prime responsibility to coordinate the work shown on all of the Project Drawings, general, special and technical specifications.
  - B. The Contractor is responsible to verify all existing construction material types dimensions, elevations and conditions.
  - C. The Contractor shall verify and coordinate the dimensions among all drawings and in the field prior to proceeding with any work or fabrication, any discrepancy shall be immediately reported to the Engineer for direction and/or clarification. Any construction work done by the Contractor before obtaining such clarification from the project Engineer shall be at the Contractor's own risk and cost. Furthermore; any work required to correct, replace and/or restore the work as directed by the Engineer shall be at the Contractor's own risk and cost.
  - D. No structural members shall be cut for pipes, ducts, etc. unless specifically detailed or approved in writing by the Engineer.

- 3. CODES**
- A. Unless otherwise noted, all referenced building codes and standards refer to their current editions, including any local, state, or federal amendments or changes, as adopted in the locality of the Project on the date these drawings are signed and sealed by the Project Engineer.
  - B. GENERAL:
    - B.1. International Code Council, ICC, International Building Code, IBC.
    - B.2. Minimum Design Loads for Buildings and Other Structures, ASCE 7.
  - C. CONCRETE:
    - C.1. American Concrete Institute, ACI 301, Specifications for Structural Concrete.
    - C.2. American Concrete Institute, ACI 318, Building Code Requirements for Structural Concrete.
  - D. MASONRY:
    - D.1. The Masonry Society, TMS 402, Building Code Requirements for Masonry Structures.
    - D.2. The Masonry Society, TMS 602, Specification for Masonry Structures.
  - E. WOOD:
    - E.1. American Wood Council National Design Specification for Wood Construction, NDS.

- 4. DESIGN CRITERIA**
- A. Occupancy or Use; IBC Table 1607.1:
    - A.1. Equipment Enclosure:
      - A.1.a. Occupancy Category: U
      - A.1.b. Risk Category; ASCE Table 1.5-2: II
  - B. DEAD LOADS:
    - B.1. Equipment Enclosure Roof Dead Load: 20 psf
  - C. LIVE LOADS:
    - C.1. Equipment Enclosure Floor Live Load: 100 psf
    - C.2. Equipment Enclosure Roof Live Load: 20 psf
  - D. SNOW LOADS:
    - D.1. Ground Snow Load:  $P_g = 40$  psf
    - D.2. Sloped Roof Snow Load:  $P_s = 21.2$  psf
    - D.3. Unbalanced Snow Load Max.  $P_u = 43$  psf
    - D.4. Importance Factor:  $I_s = 1.10$
    - D.5. Snow Exposure Factor:  $C_e = 1.0$
    - D.6. Thermal Factor:  $C_t = 1.2$
  - E. WIND:
    - E.1. Basic Wind Speed:  $V = 115$  mph
    - E.2. Wind Site Exposure: C
  - F. SEISMIC:
    - F.1. Seismic Importance Factor:  $I_e = 1.25$
    - F.2. Mapped Spectral Response Acceleration:
      - F.2.a. Short Period Acceleration:  $S_s = 0.253$
      - F.2.b. 1-Second Acceleration:  $S_1 = 0.072$
    - F.3. Site Class (Soil Profile): D
    - F.4. Spectral Response Coefficients:
      - F.4.a. Short Period Acceleration:  $S_{ds} = 0.269$
      - F.4.b. 1-Second Acceleration:  $S_{d1} = 0.115$
    - F.5. Seismic Design Category: B
  - G. SOIL LOADS:
    - G.1. Soil density: 130 pcf
    - G.2. Active Lateral Equivalent Fluid Pressure: 45 pcf
    - G.3. At-Rest Lateral Equivalent Fluid Pressure: 65 pcf
    - G.4. Passive Lateral Equivalent Fluid Pressure: 300 pcf

- 5. SPECIAL INSPECTIONS** Special Inspections per IBC Chapter 17 are required for the following items:

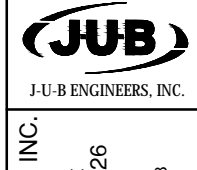
Special Inspections		
All special inspection shall be performed by approved inspectors.		
	Material	Frequency
<b>A. Soils. (By Geotechnical Engineer)</b>		
A.1.	Site preparation	Periodic
A.2.	Site excavations	Periodic
A.3.	Fill material verification	Continuous
A.4.	Fill placement and compaction	Continuous
A.5.	Lift thickness	Continuous
<b>B. Concrete</b>		
B.1.	Reinforcement placement	Periodic
B.2.	Reinforcing welding	Refer to Steel Welding Requirements
B.3.	Placement of cast-in-place anchors	Periodic
B.4.	Verification of use of required mix	Periodic
B.5.	Concrete placement	Continuous
B.6.	Concrete curing maintenance	Periodic
B.7.	Verification of in-situ concrete prior to removal of forms and shores from elevated beams and slabs	Periodic
B.8.	Verification of formwork	Periodic
<b>C. Post Installed Concrete Anchors</b>		
C.1.	Installation	Continuous
<b>D. Structural Masonry</b>		
E.1.	Verification of site proportioned mortar & grout	Periodic
E.2.	Observation of prism preparation	Continuous
E.3.	Placement of masonry units & mortar joints	Periodic
E.4.	Verification of size and location of structural elements	Periodic
E.5.	Anchorage of masonry to structural members and diaphragms including type, size and location of anchors	Periodic
E.6.	Type, grade and size of reinforcing steel	Periodic
E.7.	Reinforcing steel and connector placement	Periodic
E.8.	Cold/Hot weather masonry protection	Periodic
E.9.	Verify use of grout mix design	Periodic
E.10.	Verify grout space is clean prior to grouting	Continuous
E.11.	Grout placement	Continuous
<b>E. Wood</b>		
F.1.	Fabrication of pre-fabricated structural elements	Periodic
F.2.	Material verification of structural panels and nails for diaphragms and shear walls with edge nailing	Periodic
F.3.	Verification of framing size at diaphragm and shear wall panel edges with edge nailing less than or equal to 4'	Periodic

- 6. SUBMITTALS**
- A. Submit required copies, one (1) electronic .pdf file or three (3) minimum hardcopy, of product or material design information to the Engineer for review for the following items:
    - A.1. Concrete mix designs and admixtures.
    - A.2. Non-shrink grout.
    - A.3. Expansion bolts.
    - A.4. Epoxy Anchors.
    - A.5. Structural masonry grout and mortar mix designs.
    - A.6. Structural concrete block or brick.
  - B. Submit required copies of shop drawings, one (1) electronic .pdf file or three (3) minimum hardcopy, to the Engineer for review prior to fabrication of the following items:
    - B.1. Reinforcing steel for all concrete.
    - B.2. Reinforcing steel for masonry walls.
  - C. The following items to be designed by others are considered "Deferred Submittals". Deferred submittals shall be accompanied by design drawings, shop drawings and structural calculations, stamped and signed by a Professional Structural Engineer currently registered in the State of Colorado.
    - C.1. Pre-engineered and shop fabricated wood joists and trusses.

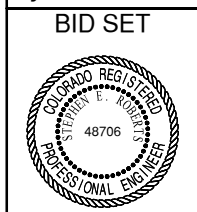
- 7. FOUNDATIONS**
- A. All footings to be placed on firm undisturbed, inorganic material. Proof roll sub-grade prior to placing concrete where the material has been disturbed by the excavating equipment.
  - B. All soil bearing surfaces shall be inspected by the Geotechnical Engineer prior to placement of reinforcing steel.
  - C. All piers and footings outside or at the perimeter of the structure, or in other unheated areas shall be set to a depth of at least 30" below finish grade, unless otherwise noted on the plans.
  - D. All foundations and retaining walls below finish grade shall receive an approved damp-proof coating. Foundation walls below maximum anticipated ground water levels shall receive an approved water-proof coating; extend water-proofing to a minimum of 1-ft above the maximum anticipated ground water level.
  - E. Allowable bearing pressure for all footings  $Q_a = 3,000$  psf on 24 inches of structural fill.
  - F. Excavations shall be shored as required to prevent subsidence or damage to adjacent existing structures, streets, utilities, etc.
  - G. Local areas of soft and/or unacceptable material encountered at bottom of footing

- elevations indicated on the plans must be over-excavated and brought up to design grade with compacted structural fill or lean concrete fill, at no additional cost to the owner.
- H. All structural fill and/or backfill shall be a CDOT Class 6 base course or granular, free draining, material; Unified Soils Classification GW, GP, GM or SW; maximum aggregate size of 3-in. and no more than 15% passing a number 200 sieve. Material shall be placed in lifts no greater than 6-in. in depth and compacted to 95% of maximum density as determined per ASTM D1557.
- I. Design for the mitigation of subsurface water flow and/or perched water tables shall be the responsibility of others.
- J. The Engineer shall be notified in writing if any ground water, clay type soils, debris or unconsolidated materials are encountered during excavations for foundations.
- K. Refer to the final Project Geotechnical Report by Huddleston-Berry Engineering & Testing, LLC which includes a letter dated June 5, 2018 titled "Geotechnical Investigation, Purdy Mesa Flowline, Whitewater, Colorado" and a second letter dated June 19, 2018 titled "Geotechnical Engineering, Purdy Mesa Flowline Project, Whitewater, Colorado" which shall be considered part of these plans and specifications.

- 8. CONCRETE**
- A. GENERAL**
- A.1. Concrete shall be proportioned to provide an average compressive strength,  $f'_c$ , as prescribed in ACI 318 and shall satisfy the durability criteria of ACI 318.
- B. PROJECT CONCRETE MIX TYPES:** Concrete shall be proportioned and furnished for the various project uses as indicated on the plans and as follows:
- B.1. M4000-std: Standard structural concrete mix for all structural walls and foundation:  $f'_c = 4,000$  psi, Absolute water-cement ratio by weight = 0.45, Air Content = 6% (+/-1.5%), maximum aggregate size 3/4-inch.
- C. CONCRETE MIX COMPONENTS.**
- C.1. A water-reducing admixture conforming to ASTM C494, used in strict conformance with the manufacturer's instructions, shall be incorporated in all concrete mix designs.
  - C.2. For all water-retaining concrete structural walls and slabs, a high-range water-reducing (HRWR) admixture conforming to ASTM C494, Type F or G, shall be used. The total slump shall be less than 10-in.
  - C.3. Higher water-cement ratios than shown above may be used if substantiated in accordance with ACI 318.
  - C.4. Fly-ash conforming to ASTM C618 Type F or C, may replace up to 20% of the cement content, provided that the mix strength is substantiated by test data.
  - C.5. Cement: ASTM C150 Type II.
  - C.6. Cement: ASTM C845 Type E-1 (K) for Shrinkage Compensating mixes.
  - C.7. Water: Clean & Potable.
  - C.8. Air entraining agent: ASTM C260. Except where concrete is noted to be non-air entrained.
  - C.9. Aggregate: 1-inch Maximum aggregate per ASTM C33. Unless noted otherwise.
  - C.10. Mix Proportioning: ACI 211.1 and 350R.
- D. CONCRETE ACCESSORIES:**
- D.1. REINFORCING STEEL: Reinforcing steel shall conform to ASTM A615 Grade 60; #3 bars may be Grade 40.
  - D.2. WELDED WIRE FABRIC: ASTM A185 or A497.
  - D.3. WIRE: Plain wire shall conform to ASTM A 82. Deformed wire shall conform to ASTM A 496, and Epoxy coated wire shall conform to ASTM A 884.
  - D.4. JOINTING MATERIALS: In accordance with ACI 350 Section 4.5.2. All jointing materials including water-stops, expansion joints and sealants, shall be resistant to chemical attack for the design life of the facility. Sealants shall conform to ASTM C 920 and Federal Specification TT-S-00277E and PVC Water-stop shall conform to ASTM D 570, ASTM D 746, STM D 1149 and CRD-C572.
- E. NON-SHRINK GROUT:** All non-shrink grout noted on the plans shall be non-shrink, non-metallic grout with a minimum 28-day compressive strength of 7,000 psi.
- F. EXPANSION BOLTS:** Bolts noted on the plans as Expansion Bolts shall be HILTI Kwik Bolt-II, stud anchors; size and embedment as noted on the drawings, installed per the manufacturers recommendations; or an approved equal.
- G. EPOXY SET BOLTS & REBAR:** Bolts and reinforcing steel bars noted on the plans as Epoxy or Construction Adhesive Set Bolts or Rebar shall be set in place utilizing the SIMPSON SET High Strength Epoxy system; size and embedment as noted on the drawings, installed per the manufacturers recommendations; or an approved equal.
- H. CONCRETE PROPORTIONS.**
- H.1. Concrete mix proportioning shall be in accordance with ACI 211.1; Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
  - H.2. Concrete mix proportioning for lightweight concrete shall be in accordance with ACI 211.2; Standard Practice for Selecting Proportions for Lightweight Concrete.
- I. CONCRETE MIX VERIFICATION:** Concrete mix designs shall be verified by standard 28-day cylinder tests per ASTM C39.
- J. EVALUATION AND ACCEPTANCE OF CONCRETE.** Concrete shall be tested in accordance with the requirements of ACI 318/350.
- K. MIXING & PLACING CONCRETE.** Concrete shall be prepared, mixed, placed and consolidated in accordance with ACI 318/350 and as follows:
- K.1. ACI 304; Guide for Measuring, Mixing, Transporting, and Placing Concrete.
  - K.2. ACI 309; Guide for Consolidation of Concrete.
- L. MINIMUM TIME BETWEEN ADJACENT PLACEMENTS:**
- L.1. Non-liquid Retaining Structures:
    - L.1.a. Construction Joints: Five (5) days wet cure, or seven (7) days dry cure.
    - L.1.b. Control Joints: Two (2) days.
    - L.1.c. Expansion Joints: One (1) day.
  - L.2. Floor Slabs:
    - L.2.a. Construction Joints: Seven (7) days wet cure, or ten (10) days dry cure.
    - L.2.b. Control Joints: Four (4) days.
    - L.2.c. Expansion Joints: One (1) day.
- M. CONCRETE CURING.** Concrete shall be maintained above 50-degrees F and in a moist condition for at least 7 days after placement, except when cured in accordance with ACI 318.
- M.1. Curing of concrete shall be per the recommendations given in ACI 308; Guide to Curing Concrete.
- N. COLD WEATHER REQUIREMENTS.** Adequate equipment shall be provided for heating concrete materials and protecting concrete during freezing or near-freezing weather. The recommended procedures listed in ACI 306; Cold Weather Concreting shall be followed.
- N.1. Cold weather is defined as a period when, for more than three (3) consecutive days, the following conditions exist:



J-U-B ENGINEERS, INC.  
305 Main Street  
Palisade, CO 81526  
Phone: 970.208.6506  
www.jub.com



NO.	DESCRIPTION	BY	DATE

PURDY MESA FLOWLINE REPLACEMENT  
CITY OF GRAND JUNCTION

BID ALTERNATIVE 2  
GENERAL STRUCTURAL NOTES AND SPECIFICATIONS

FILE: 81-18-013\_S2-001X  
JUB PROJ. #: 81-18-013  
DRAWN BY: JMM  
DESIGN BY: ---  
CHECKED BY: ---

ONE INCH  
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY

LAST UPDATED: 8/23/2018

SHEET NUMBER:  
**S2-001**

File Date: 8/23/2018 8:57 PM, Plotted By: Erica Chidester  
 Date Created: 8/15/2018 10:06 AM, PROJECT: JUB GRAND JUNCTION, PURDY MESA FLOW LINE, CAD SHEET: 81-18-013\_S2-001X.DWG



**GENERAL STRUCTURAL NOTES AND SPECIFICATIONS CONTINUED**

- N.1.a. The average daily air temperature is less than 40-degrees F and
  - N.1.b. The air temperature is not greater than 50-degrees F, for more than one-half of any 24-hour period.
  - O. HOT WEATHER REQUIREMENTS. During hot weather, proper attention shall be given to ingredients, production methods, handling, placing, protection, and curing to prevent excessive concrete temperatures or water evaporation that could impair required strength or serviceability of the member or structure. The recommended procedures listed in ACI 305; Hot Weather Concreting shall be followed.
  - O.1. Hot weather is any combination of the following conditions that tends to impair the quality of freshly mixed or hardened concrete by accelerating the rate of moisture loss and rate of cement hydration, or otherwise causing detrimental results:
    - O.1.a. High ambient temperature.
    - O.1.b. High concrete temperature.
    - O.1.c. Low relative humidity.
    - O.1.d. Wind speed.
    - O.1.e. Solar radiation.
- 9. FORMWORK.**
- A. Forms shall result in a final structure that conforms to shapes, lines, and dimensions of the members as required by the design drawings and specifications.
    - A.1. Design of formwork shall be in accordance with ACI 318.
    - A.2. Formwork shall be in accordance with ACI 347; Guide to Formwork for Concrete.
  - B. Tolerances for finished concrete surfaces shall meet the following requirements, class of surface is per ACI 117 Section 4.8.3:
    - B.1. Footings: Class C
    - B.2. Foundation walls: Class B
    - B.3. Above grade concrete not visible to sight: Class B
    - B.4. Above-grade concrete visible to sight: Class A
  - C. REMOVAL OF FORMS.
    - C.1. Concrete forms shall not be removed until the retained concrete has reached the following minimum percentage of the required 28 day compressive strength:
      - C.1.a. Footings and base slabs on grade: 50% of f'c.
      - C.1.b. Foundation walls and columns: 67% of f'c.
      - C.1.c. Elevated structural slabs, beams & joists: 95% f'c.
    - C.2. Where concrete cylinder tests are not available for strength verification the following guide may be used when permitted by the Project Engineer:
      - C.2.a. Footings and base slabs on grade: 12 hours.
      - C.2.b. Foundation walls and columns: 24 hours.
      - C.2.c. Elevated structural slabs, beams and joists:
        - C.2.c.1. Spans under 10-feet: 4 days
        - C.2.c.2. Spans between 10-feet and 15-feet: 7 days.
        - C.2.c.3. Spans between 15-feet and 20-feet: 10 days
        - C.2.c.4. Spans greater than 20-feet: by cylinder strength verification only.
  - D. OPENINGS AND EMBEDMENTS IN CONCRETE.
    - D.1. Conduits, pipes, and sleeves of any material not harmful to concrete and within limitations of ACI 318 shall be permitted to be embedded in concrete with approval of the Project Engineer, provided they are not considered to replace structurally the displaced concrete, except as provided per code requirements.
    - D.2. The Contractor shall coordinate placement of all openings, curbs, dowels, sleeves, conduits, bolts, and inserts prior to placement of concrete.
    - D.3. Conduits and pipes of aluminum shall not be embedded in structural concrete unless effectively coated or covered to prevent aluminum-concrete reaction or electrolytic action between aluminum and steel.
  - E. CONSTRUCTION JOINTS.
    - E.1. Construction joints shall only be placed where indicated on the project drawings or as approved by the Project Engineer. Contractor may revise the locations of joints, subject to specified requirements, and shall submit all revised joint locations for review by the engineer prior to placing any concrete.
    - E.2. Roughen and clean all construction joints as specified prior to placing adjacent concrete. Sandblasting or other preparation of horizontal and vertical joints is required.
    - E.3. Construction joints shall be constructed in accordance with ACI 318.
- 10. DETAILS OF REINFORCEMENT.**
- A. Placement of all reinforcing steel within concrete structures shall be in conformance with ACI 318.
  - B. All reinforcing steel shall be uncoated unless specifically noted otherwise.
  - C. Reinforcing steel hooks, bends, ties, splices and other reinforcement details shall be in accordance with ACI 315; Details and Detailing of Concrete Reinforcement.
  - D. All reinforcing steel shall be bent by the fabricator prior to delivery to the site. Reinforcing steel shall not be field bent, unless specifically approved by the Engineer in writing.
  - E. Spacing limits for reinforcement shall be in conformance with ACI 318.
  - F. Concrete protection for reinforcement. Unless noted elsewhere on the drawings, all reinforcing steel shall have the following concrete cover:
    - F.1. For non-liquid containing concrete structures; per ACI 318:
      - F.1.a. Concrete cast against earth: 3.00 inch
      - F.1.b. Concrete exposed to earth or weather;
        - F.1.b.1. No. 5 or smaller bars: 1.50-inch
        - F.1.b.2. No. 6 or larger bars: 2.00-inch
      - F.1.c. Concrete not exposed to earth or weather;
        - F.1.c.1. No. 11 or smaller bars: 0.75-inch
        - F.1.c.2. No. 14 or larger bars: 1.50-inch
      - F.1.d. Beams and columns;
        - F.1.d.1. Primary rein., ties, stirrups or spirals: 1.50-inch
  - G. Concrete blocks or plastic-coated bar chairs shall be provided for support of all slab reinforcing steel, sufficient in number to prevent settlement or sagging, but in no case shall such support be continuous. Metal clips or supports shall not be placed in contact with the forms or the sub-grade.
  - H. Dowels and anchor bolts shall be wired or otherwise held in correct position prior to placing concrete. Care shall be taken to insure that dowels and anchor bolts remain plum after concrete is poured and vibrated. In no case shall dowels or anchor bolts be stabbed into freshly poured concrete.

- I. Provide dowels in footings and at construction joints to match vertical reinforcing bar size and spacing, unless otherwise noted on the drawings.
  - J. Where drilled in anchors are to be post-installed into concrete surfaces take care to locate reinforcing steel so that it will not interfere with the drilling operations. Move bars plus or minus 1 to 2 inches in order to avoid drilling conflicts.
  - K. All bar bends, hooks, splices and other reinforcing steel details shall conform to the requirements of ACI 315.
  - L. Unless otherwise noted on the plans all bars shall be spliced with a minimum Class B lap splice; lap splices of deformed bars and deformed wire in tension zones shall be Class A splices.
  - M. At all corners and wall intersections provide bent bars to match the horizontal reinforcing steel and in accordance with the typical corner reinforcing details.
  - N. Chamfer all exposed corners and fillet entrant angles 3/4-inch unless otherwise noted on the drawings.
  - O. At slab and wall openings provide a minimum of (4) #5 bars; over, under and at either side of the openings. Extend these bars a minimum of 24-in. past the opening edge. Provide (1) mat of (4) #5 bars for walls or slabs with single-layer reinforcing and (2) mats of (4) #5 bars for double-layer reinforcing walls or slabs. Provide #4, 48-inch long diagonal bars at each re-entrant corner in slabs; (1) bar for slabs with single layer reinforcing and (2) bars for slabs with double layer reinforcing.
- 11. CONCRETE FINISHING.** All concrete surfaces shall be finished in accordance with ACI 301.
- A. Formed Concrete Surfaces. After removal of forms, give each formed surface one or more of the following finishes in conformance with ACI 301:
    - A.1. Non-liquid Retaining Concrete Structures:
      - A.1.a. Foundation wall and other surfaces below grade and not exposed to view. Provide an As-Cast, SF-1.0 surface finish.
      - A.1.b. Interior, exterior and top surfaces exposed to view to 6-inches below grade. Provide an Smooth-rubbed, SF-2.0 surface finish.
      - A.1.c. Interior concrete surfaces to be painted or receive other coating systems. Provide an As-cast, SF-3.0 surface finish.
  - B. Unformed Concrete Surfaces. Unformed concrete surfaces including the top surface of all concrete roof and floor slabs shall be finished in accordance with ACI 301 and ACI 302.
    - B.1. For the top surfaces of walls, provide a scratch finish.
    - B.2. Interior areas receiving only light foot traffic shall receive a Troweled finish.
    - B.3. Provide a Nonslip finish for exterior surfaces and where indicated on the plans.
  - C. Sawed contraction joints. Conform to ACI 301.
- 13. STRUCTURAL MASONRY REQUIREMENTS**
- A. MASONRY: The masonry assemblage shall have a minimum 28 day compressive strength of 1,500 psi. Assembly shall be verified per IBC standards.
  - B. STRUCTURAL MASONRY UNITS:
    - B.1. CONCRETE MASONRY UNITS: All concrete masonry units (CMU) shall conform to ASTM C-90, Grade N, with a minimum net area compressive strength of 1,900 psi.
    - B.2. All block shall be laid up with a standard running bond unless specifically noted otherwise on the drawings.
    - B.3. Place masonry units in accordance with TMS 402/602.
  - C. MORTAR:
    - C.1. All mortar for use with structural masonry units shall conform to ASTM C270, Class S and have a minimum 28 day compressive strength of 1,900 psi.
    - C.2. Mortar shall be in accordance with TMS 402/602.
  - D. GROUT:
    - D.1. All grout for use with structural masonry units shall conform to ASTM C476 and have a minimum 28 day compressive strength of 2,500 psi.
    - D.2. Grout shall be in accordance with TMS 402/602.
    - D.3. Place grout in accordance with TMS 402/602.
    - D.4. Grout Pour Height. Do not exceed the maximum grout pour height listed in TMS 402/602.
    - D.5. Grout Lift Height. Do not exceed the maximum grout lift heights as defined by TMS 402/602.
  - E. CELLS: Fill all cells containing reinforcing steel and as directed on the drawings solid full height with grout.
  - F. BOND BEAMS: All bond beams shall be grouted solid to a minimum height of 8".
  - G. LINTELS: All masonry lintels (units over wall openings greater than 8" in length) shall be grouted solid from the bottom of the lintel to a total structural depth as indicated on the plans, or 16" minimum. Extend the length of solid grouting past the edge of each opening as indicated on the plans or 16" minimum.
  - H. REINFORCING:
    - H.1. REINFORCING STEEL: Reinforcing steel shall conform to ASTM A615 Grade 60; #3 bars may be Grade 40.
    - H.2. Fabricate bars used in masonry reinforcement in accordance with the fabricating tolerances of ACI 315, and in accordance with TMS 402/602.
    - H.3. Place reinforcement in accordance with TMS 402/602.
    - H.4. All reinforcing steel shall be in place and secured against displacement prior to grouting with wire ties, spacers or other suitable devices at tops and bottoms and intervals not exceeding 192 bar diameters nor 10-feet.
    - H.5. BAR PLACEMENT: Where one vertical bar is called for in each vertical core the bar is to be placed in the center of the masonry core. Where two vertical bars are called for they shall be placed near each wall face with 1/2" of clearance for fine grout and 1/2" of clearance for course grout.
    - H.6. LAPS: Lab all masonry reinforcing per bar size as follows:
      - H.6.1. Required lap lengths for single bars centered in each cell:
 


#3 = 16"	#6 = 43"	#9 = 82"
#4 = 22"	#7 = 60"	
#5 = 26"	#8 = 72"	
      - H.6.2. Required lap lengths for flush wall pilaster/column, 2 bars per cell with 2.5" cover:
 

#3 = 16"	#6 = 54"	#9 = 82"
#4 = 22"	#7 = 63"	
#5 = 32"	#8 = 72"	

- L. Bond beams with one (1) #5 bar horizontally shall be provided at all floor and roof lines and at the top of walls. Provide a bond beam with one (1) #5 bar horizontally above and below all openings, and extend these bars 2'-0" past the opening edge. Provide full height vertical reinforcement, matching typical vertical reinforcing, each side of openings, at wall ends and intersections.
  - M. COLD-WEATHER CONSTRUCTION. When ambient air temperature is below 40-degrees F, implement Cold Weather procedures in accordance with TMS 402/602.
  - N. FIELD QUALITY CONTROL: Provide special inspection and verification in accordance with TMS 402/602.
  - O. CLEANING: Clean all exposed masonry surfaces in accordance with TMS 402/602.
- 14. WOOD**
- A. LUMBER: Grading shall be to the Standard Grading Rules of the WWP. Typical structural lumber shall be Number 2 Douglas-Fir/Larch or better. Members noted as wood beams, posts or columns shall be Number 1 Douglas-Fir/Larch or better. Studs for interior non-bearing walls may be stud grade lumber. Lumber to be left exposed, without other finish and lumber in contact with concrete shall be pressure treated.
  - B. TREATED LUMBER: Lumber, including wood sheathing, to be left exposed without other finish, located within 8" of finish grade, or in contact with concrete shall be pressure treated material. Contractor shall coordinate and verify that all steel items in contact with the treated material, including steel hangers, connectors and fasteners have a galvanized finish of sufficient thickness, or other type of protection, that is compatible with the specific treatment type selected.
  - C. BOLTS & LAG SCREWS FOR WOOD CONSTRUCTION: Conform to ANSI/ASME Standards B18.2.1 and the National Design Specification for Wood Construction (NDS).
  - D. WOOD SCREWS: Conform to ANSI/ASME Standards B18.6.1 and the National Design Specification for Wood Construction (NDS).
  - E. NAILS & SPIKES: Conform to Federal Specification FF-N-105B and the National Design Specification (NDS).
  - F. NAILING: Where not otherwise specified on the plans, nailing shall conform to IBC Table 2304.9.1, Fastening Schedule. All nails shall be common wire nails or pneumatically driven nails with an equivalent cross-section and penetration, unless noted otherwise.
  - G. LUMBER HARDWARE: Wood construction connectors shall be as manufactured by Simpson Strong-Tie Company; current catalog, or an approved equal. Hardware exposed to weather or view, in unheated portions of the structure, or as indicated on the drawings or in the specifications shall be hot-dipped galvanized with galvanized fasteners.
  - H. ROOF SHEATHING: All roof sheathing shall be as noted in the plan drawings, details, and schedules. When a specific sheathing is not called for in the drawings, the contractor shall use 1 1/2" nominal, APA rated Exterior Sheathing (4%<sub>20</sub>) installed with ply-clips.
    - I. All wood framing, blocking and nailing shall conform to the current local building code.
    - J. All rafters, trusses and joists shall have full depth blocking, unless noted otherwise on the plans and details, at bearing supports, shear transfer supports, intermediate and cantilever supports and at mid-span, and as required by the building code or product supplier.
    - K. All framing hardware including column caps and bases, joist hangers, truss anchors, straps, etc. shall be approved (i.e. Simpson Co. or equivalent) or custom fabricated specifically as detailed on the plans. They shall be installed with nails, screws or bolts exactly as called for by the manufacturer or as noted on the plans.
  - L. WOOD SHEATHED ROOF DIAPHRAGMS:
    - L.1. Unless otherwise noted on the drawings, orient roof sheathing with face-grain, perpendicular to supporting members, with joints in adjacent rows staggered 1/2 panel length.
    - L.2. Provide 2x4 flat blocking with continuous strapping (Simpson CS18) at unsupported panel edges in areas noted as "Blocked Roof Diaphragm".
    - L.3. Nail sheathing per roof sheathing schedule shown on drawings.
    - L.4. Minimum nailing where not noted otherwise shall be 10d nails @ 6" o.c. to all panel edges and 12" o.c. at intermediate supporting members.
- 15. PRE-ENGINEERED/FABRICATED WOOD TRUSSES**
- A. All pre-engineered/fabricated wood (PFT) trusses indicated on the drawings shall be metal press-plate connected wood trusses designed by a Professional Engineer registered in the State of Colorado per these notes and the specifications.
  - B. Design PFT trusses to the following deflection limits:
    - B.1. Roof Dead + Live Load: Span/240 or 1" maximum
    - B.2. Roof Live Load only: Span/360 or 1/2" maximum
  - C. Design PFT trusses to support the concentrated and other distributed loads as shown on the plans in addition to the following loads:
    - C.1. Dead Load (Top Chord) = 10 psf
    - C.2. Dead Load (Bottom Chord) = 10 psf
    - C.3. Snow Load (Top Chord) = 43 psf
    - C.4. Live Load\* (Bottom Chord) = 10 psf

73 psf Max Total Load
  - \* Does not occur concurrently with top chord live load
  - D. Design all PFT trusses and bearing attachments for wind uplift, assuming a dead load of 8 psf to resist uplift.
  - E. Shop drawings and design calculations signed and stamped by the Design Engineer shall be submitted to the Engineer for review prior to fabrication.
  - F. All necessary bridging, blocking, pre-notched or beveled plates, hangers, etc. shall be detailed or specified on the shop drawings and furnished by the truss manufacturer.
  - G. Truss manufacturer shall verify all setbacks, dimensions, overhangs, vertical controls and dimensions prior to fabrication.
  - H. Alteration of the truss layout shown on the plans may require supporting structural and foundation changes, therefore, prior approval by the Engineer is required for any proposed layout change.
  - I. Trusses shall not be field modified without written authorization from the truss manufacturer's Engineer of Record.
  - J. Trusses shall be handled, erected and braced as directed by the truss manufacturer and per the requirements of the Truss Plate Institute Manual HIB-91 or current edition.

File Date: 02/20/2018 05:57 PM. Plotted By: Erica Chidester  
 Date Created: 01/22/2018 10:06 AM. PROJECT: JUB GRAND JUNCTION 15-013 CITY OF GRAND JUNCTION PUREY MESA FLOW LINE CAD SHEET 15-013 S2-002.DWG




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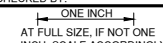
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**PURDY MESA FLOWLINE REPLACEMENT**  
**CITY OF GRAND JUNCTION**

**BID ALTERNATIVE 2**  
**GENERAL STRUCTURAL NOTES AND SPECIFICATIONS**

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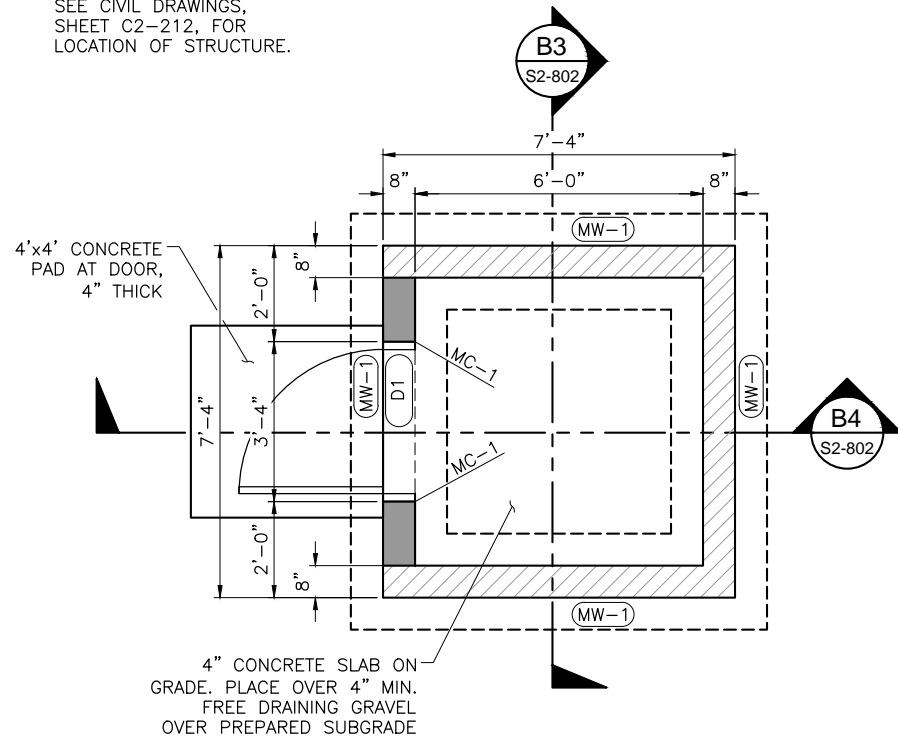
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LAST UPDATED: 8/23/2018

**SHEET NUMBER:**  
**S2-002**

NOTE:  
SEE CIVIL DRAWINGS,  
SHEET C2-212, FOR  
LOCATION OF STRUCTURE.



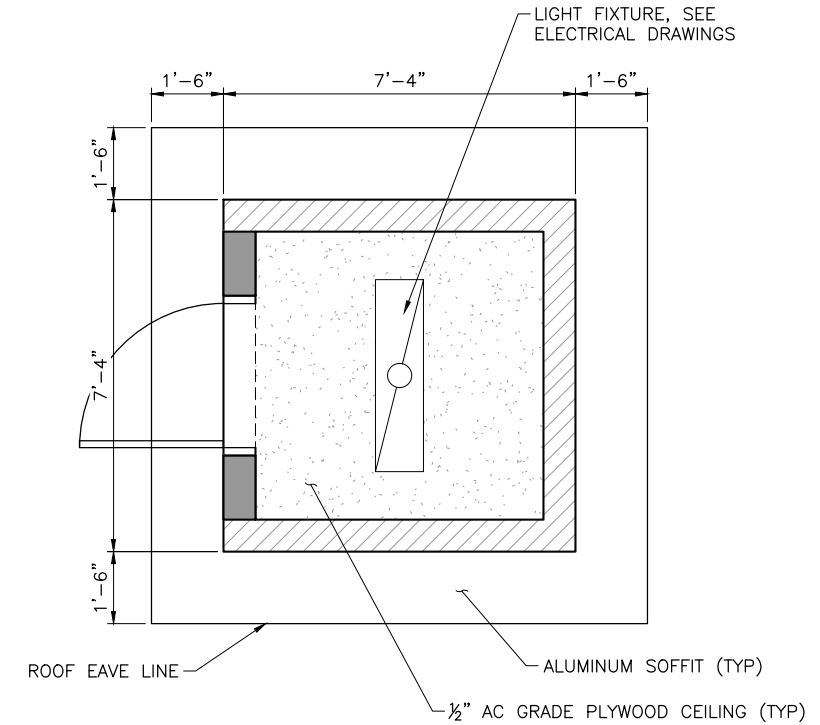
**B1** EQUIPMENT ENCLOSURE FLOOR AND FOUNDATION PLAN  
SCALE: 1/2" = 1'-0"

**MARKS & SYMBOLS LEGEND**

MARK	DESCRIPTION
	SECTION MARK SHEET NUMBER
	DEPRESSED FOUNDATION WALL, POUR SLAB OVER, SEE SECTIONS ON (S2-803)
	CONCRETE WALL, SEE DETAILS ON (S2-803) AND (S2-805)
	MASONRY WALL, SEE SCHEDULE ON (S2-806)
	MASONRY COLUMN, SEE SCHEDULE ON (S2-806)
	MASONRY WALL, SEE SCHEDULE ON (S2-806)
	FLOOR CONTROL JOINT, SEE TYPICAL DETAILS
	MASONRY COLUMN, SEE SCHEDULE ON (S2-806)

**FOUNDATION PLAN NOTES:**

1. SEE LAYOUT AND DIMENSION DRAWINGS FOR EXTERIOR CONCRETE WORK AT DOORS, SIDEWALKS, ETC.
2. SEE CONCRETE DETAILS ON SHEET (S2-805) FOR STRUCTURAL FILL BENEATH FOOTINGS, IF REQUIRED BY SITE SOIL CONDITIONS.
3. SEE CONCRETE DETAILS ON SHEET (S2-805) FOR REINFORCING AROUND MISCELLANEOUS OPENINGS IN CONCRETE WALLS.
4. SEE CONCRETE DETAILS ON SHEET (S2-805) FOR BURIED PIPES RUNNING PARALLEL AND PERPENDICULAR TO FOOTINGS.
5. SEE CONCRETE DETAILS ON SHEET (S2-805) FOR CONCRETE REINFORCING STEEL LAP SCHEDULE.
6. SEE MASONRY DETAILS ON SHEET (S2-806) FOR REINFORCING AROUND MISCELLANEOUS OPENINGS IN MASONRY WALLS.
7. SEE MASONRY DETAILS ON SHEET (S2-806) FOR TERMINATION OF HORIZONTAL WALL REINFORCING AT ENDS OF WALLS AND OPENINGS.
8. SEE DETAILS ON SHEET (S2-804) FOR DOOR FRAME ATTACHMENT.



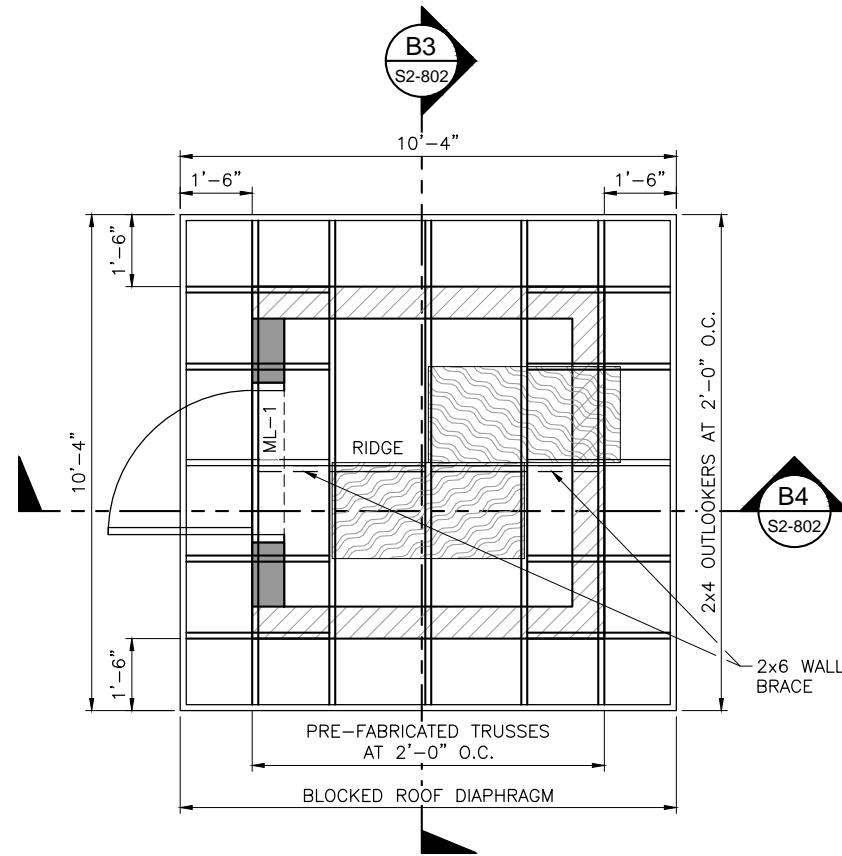
**B3** EQUIPMENT ENCLOSURE REFLECTED CEILING PLAN  
SCALE: 1/2" = 1'-0"

**MARKS & SYMBOLS LEGEND:**

MARK	DESCRIPTION
	SECTION MARK SHEET NUMBER
	MASONRY WALL BELOW
	ROOF SHEATHING ORIENTATION, SEE SCHEDULE ON (S2-807)
	MASONRY COLUMN, SEE SCHEDULE ON (S2-806)
	MASONRY LINTEL, SEE SCHEDULE ON (S2-806)
$T=C=x\#$	PFT TOP CHORD SHALL BE DESIGNED FOR AN ADDITIONAL LOAD OF "x"# IN TENSION AND COMPRESSION. LOADS PROVIDED ARE AT SERVICE LEVEL.

**ROOF FRAMING PLAN NOTES:**

1. VERIFY ROOF SLOPES, DRAINS, AND DECK BEARING ELEVATIONS WITH ENCLOSURE ELEVATIONS.
2. SEE ENCLOSURE ELEVATIONS FOR ALL CEILING, AND SOFFIT ELEVATIONS AND DETAILS.
3. ALL ROOF SHEATHING SHALL HAVE FACE GRAIN PERPENDICULAR TO FRAMING MEMBERS, UNLESS NOTED OTHERWISE. SEE SCHEDULE ON SHEET (S2-807) FOR SHEATHING TYPE AND NAILING REQUIREMENTS.
4. WEIGHTS AND LOCATIONS OF MECHANICAL EQUIPMENT SHALL BE SUBMITTED TO ENGINEER IN WRITING FOR REVIEW PRIOR TO PLACEMENT OF ROOF FRAMING.
5. TRUSS MANUFACTURER TO SUBMIT SHOP DRAWINGS FOR REVIEW OF ALL FRAMING WORK.
6. SEE GENERAL STRUCTURAL NOTES ON SHEET (S2-002) FOR DESIGN LOADS OF PREFABRICATED WOOD TRUSSES.
7. ALL TRUSS DETAILS, AND TRUSS TO GIRDER TRUSS DETAILS SHALL BE PROVIDED BY THE TRUSS MANUFACTURER.
8. TRUSS MANUFACTURER SHALL VERIFY ALL CEILING ELEVATIONS AND SPECIAL CONDITIONS PRIOR TO FABRICATION.
9. CONTRACTOR SHALL BE RESPONSIBLE TO PROPERLY BRACE BEAMS, TRUSSES, ETC. AS REQUIRED DURING CONSTRUCTION.



**D1** EQUIPMENT ENCLOSURE ROOF FRAMING PLAN  
SCALE: 1/2" = 1'-0"



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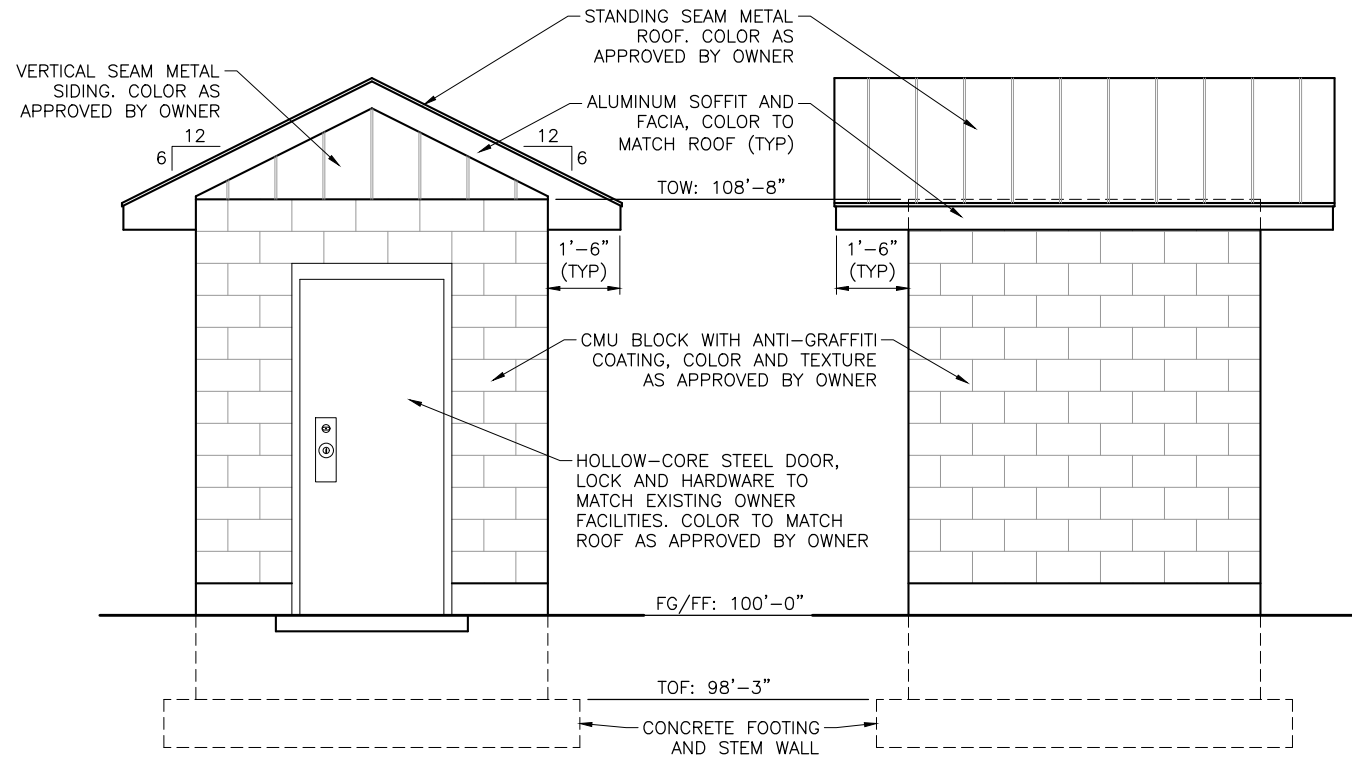
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NO.	DESCRIPTION	BY	APPR.	DATE

PURDY MESA FLOWLINE REPLACEMENT  
CITY OF GRAND JUNCTION  
BID ALTERNATIVE 2  
EQUIPMENT ENCLOSURE DETAILS

FILE: 81-18-013 S-801X  
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**S2-801**

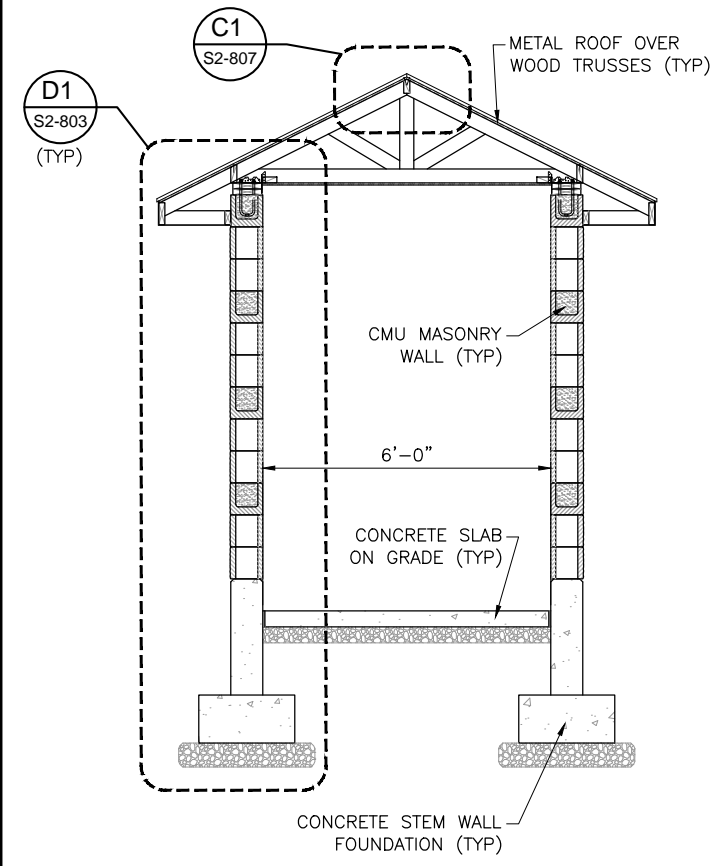


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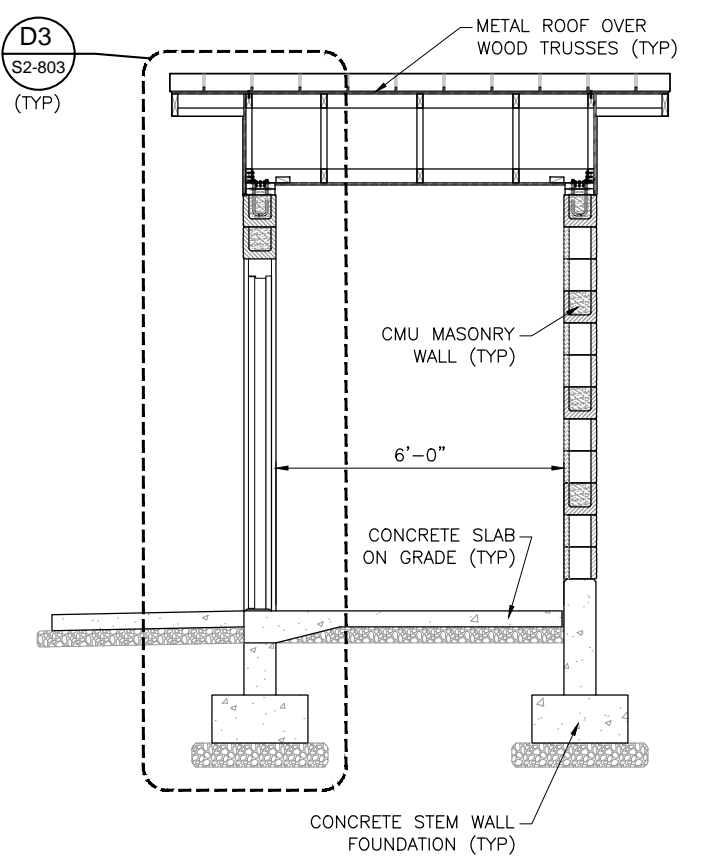
**SIDE**

- NOTES:**
1. ALL COLORS SHALL BE VERIFIED AND APPROVED WITH OWNER. PROVIDE SAMPLES TO VERIFY COLOR.
  2. PROVIDE ANTI-GRAFFITI COATING TO ALL CMU BLOCK. COATING SHALL BE "PROSOCO" BLOK-GUARD AND GRAFFITI CONTROL OR APPROVED EQUAL.

**B1** TYPICAL EQUIPMENT ENCLOSURE ELEVATIONS  
SCALE: 1/2" = 1'-0"



**B3** TYPICAL EQUIPMENT ENCLOSURE SECTION  
SCALE: 1/2" = 1'-0"



**B4** TYPICAL EQUIPMENT ENCLOSURE SECTION  
SCALE: 1/2" = 1'-0"



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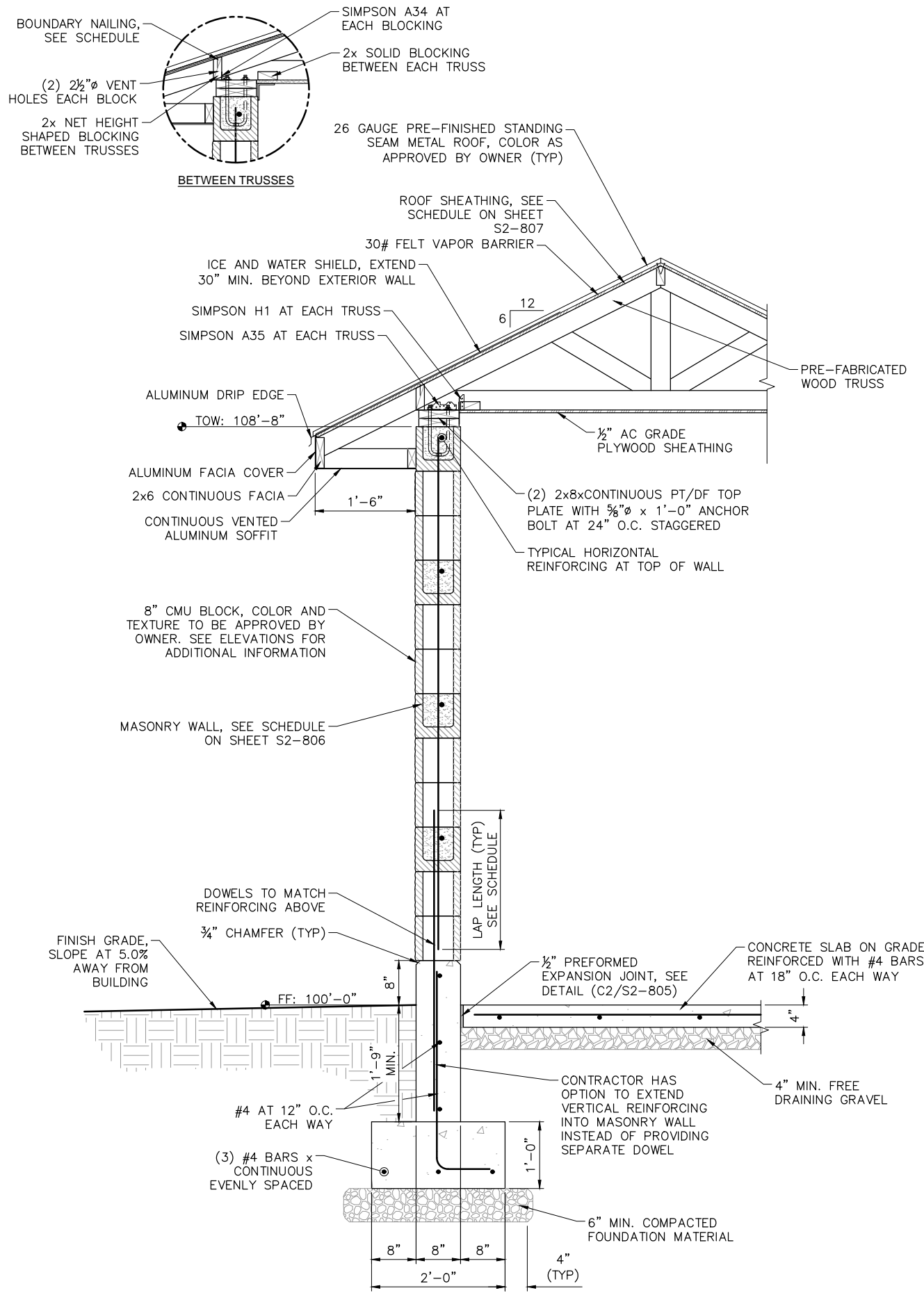
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CITY OF GRAND JUNCTION**  
BID ALTERNATIVE 2  
EQUIPMENT ENCLOSURE DETAILS

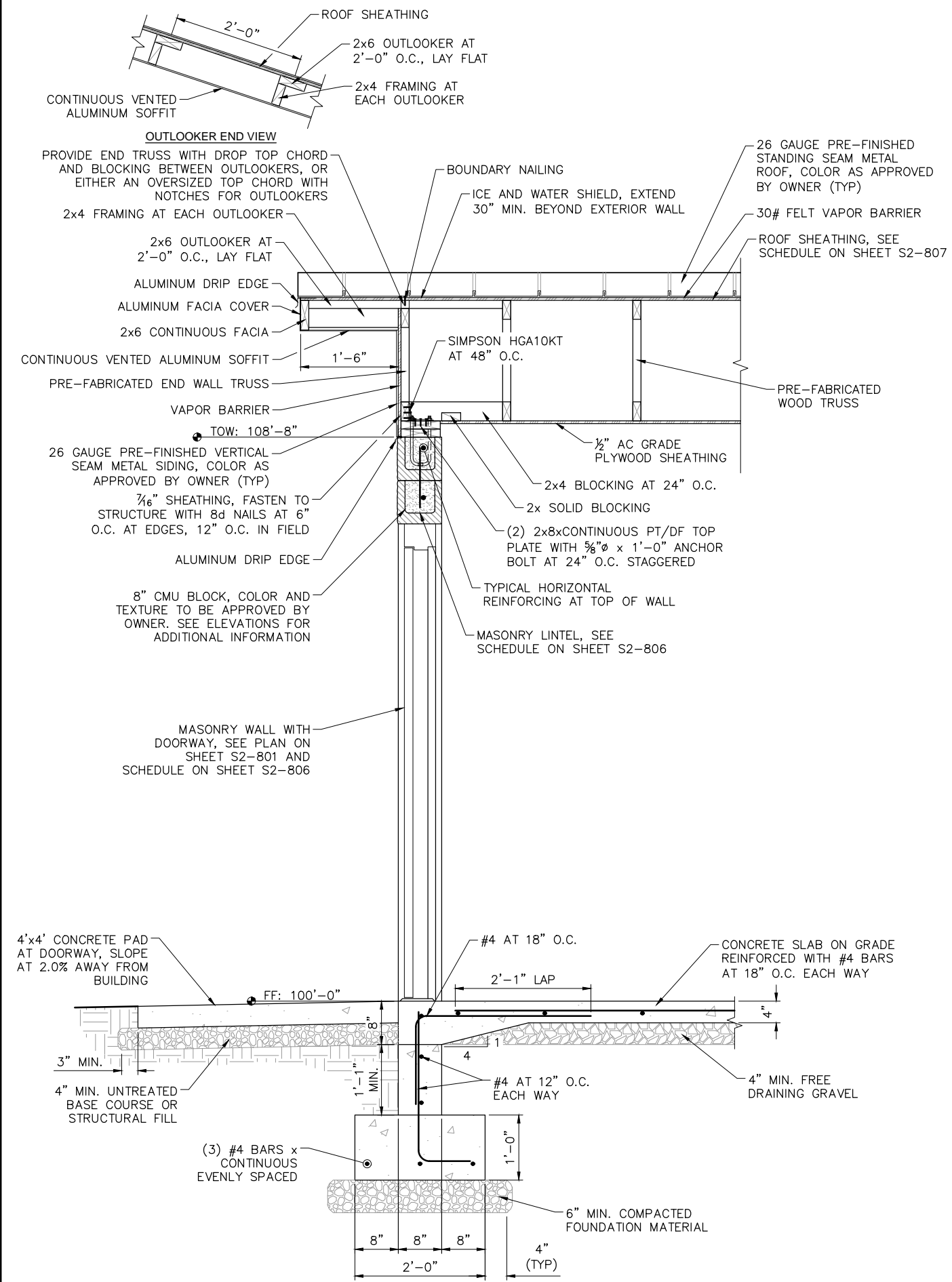
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SHEET NUMBER:  
**S2-802**



**D1 TYPICAL BEARING WALL AND ROOF SECTION**  
SCALE: 1" = 1'-0"



**D3 TYPICAL NON-BEARING WALL AND ROOF SECTION (AT DOOR)**  
SCALE: 1" = 1'-0"



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**CITY OF GRAND JUNCTION**

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**S2-803**

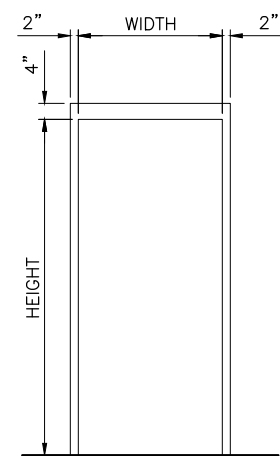
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 PROJECT NO.: 81-18-013  
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 SHEET: S2-803

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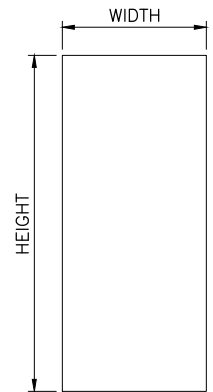
PURDY MESA FLOWLINE REPLACEMENT  
 CITY OF GRAND JUNCTION  
 BID ALTERNATIVE 2  
 TYPICAL DOOR DETAILS

DOOR SCHEDULE																																															
DOOR TAG	DOOR					FRAME		DETAILS			COMMENTS	HINGES					LOCKSETS <sup>1</sup>					STOPS		DOOR SEAL		MISCELLANEOUS																					
	TYPE	MATERIAL	WIDTH	HEIGHT	THICKNESS	TYPE	MATERIAL	HEAD	JAMB	THRESHOLD		GLAZING	FIRE RATING	NUMBER	PIVOTS	BALL BEARING	BRONZE / BRASS	STAINLESS STEEL	NON-REMOVABLE PINS	DEADBOLT	SINGLE CYLINDER	DOUBLE CYLINDER	KEYED ENTRY	EXIT DEVICE	INTERCONNECT	PASSAGE	PRIVACY	STORE ROOM	FLUSH BOLTS	SURFACE BOLTS	WALL STOP	FLOOR STOP	SMOKE STRIP	WEATHER STRIP	ASTRAGAL	SWEEP	THRESHOLD	CLOSER	PUSH / PULL	COORDINATOR	KICK PLATE	ARMOR PLATE	PANIC BAR				
D1	F	METAL	3'-0"	7'-0"	1 3/4"	M1	HOLLOW METAL						3		X		X	X		X									X					X	X	X			X								

DOOR SCHEDULE NOTES:  
 1. PROVIDE LOCKSETS TO MATCH EXISTING OWNER FACILITIES.

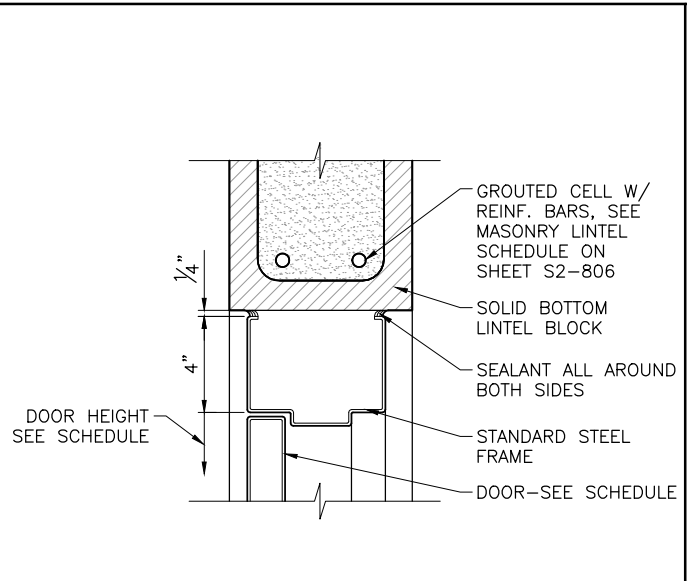


FRAME TYPE M1

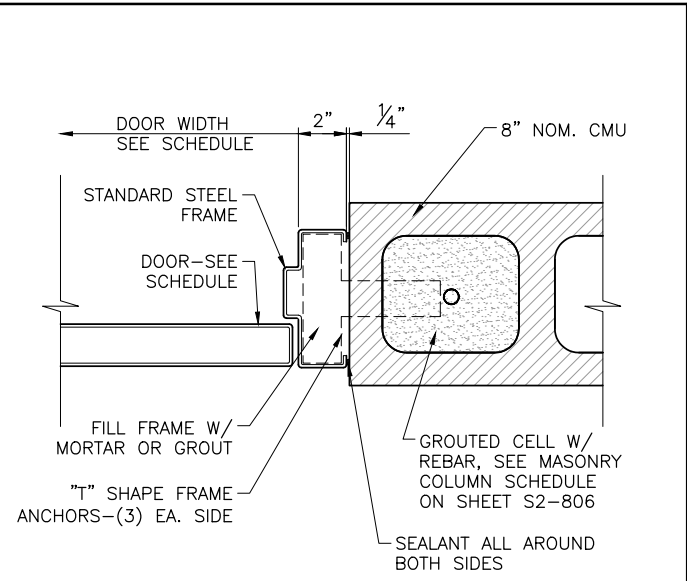


DOOR TYPE F

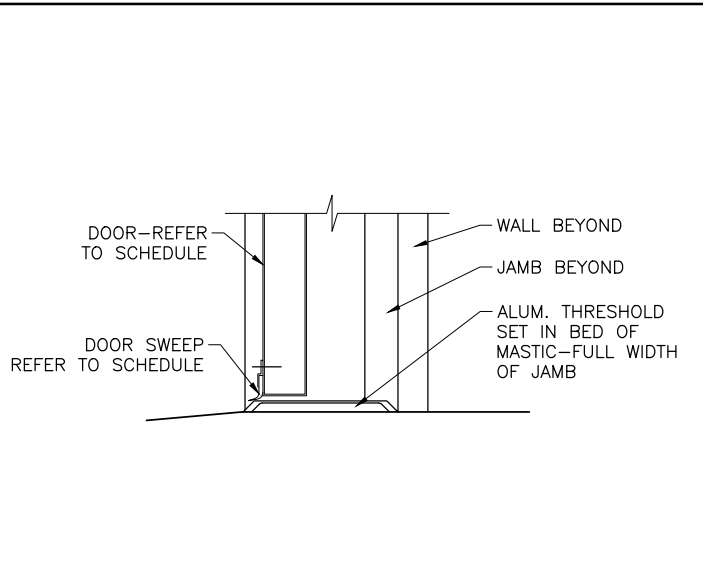
**A1** DOOR SCHEDULE  
 SCALE: NOT TO SCALE



**B1** DOOR HEAD-CMU PARTITION DETAIL  
 SCALE: NOT TO SCALE

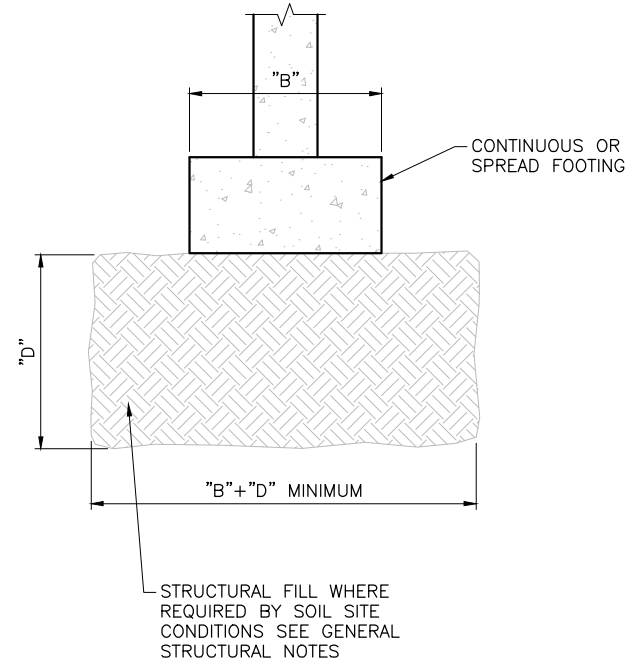


**B2** DOOR JAMB-CMU PARTITION  
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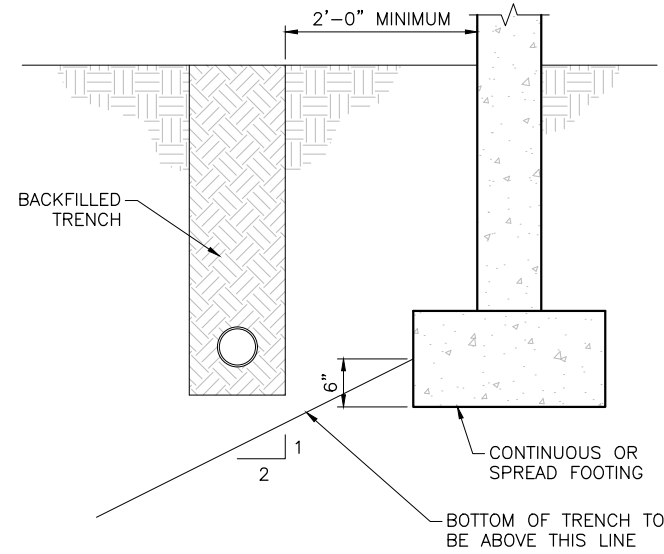


**B3** DOOR THRESHOLD  
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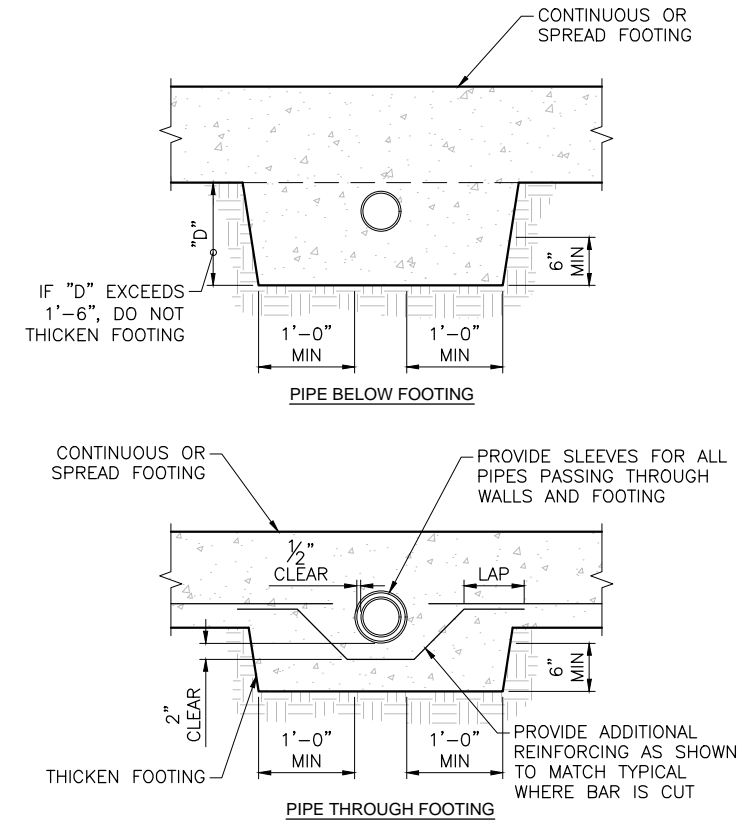




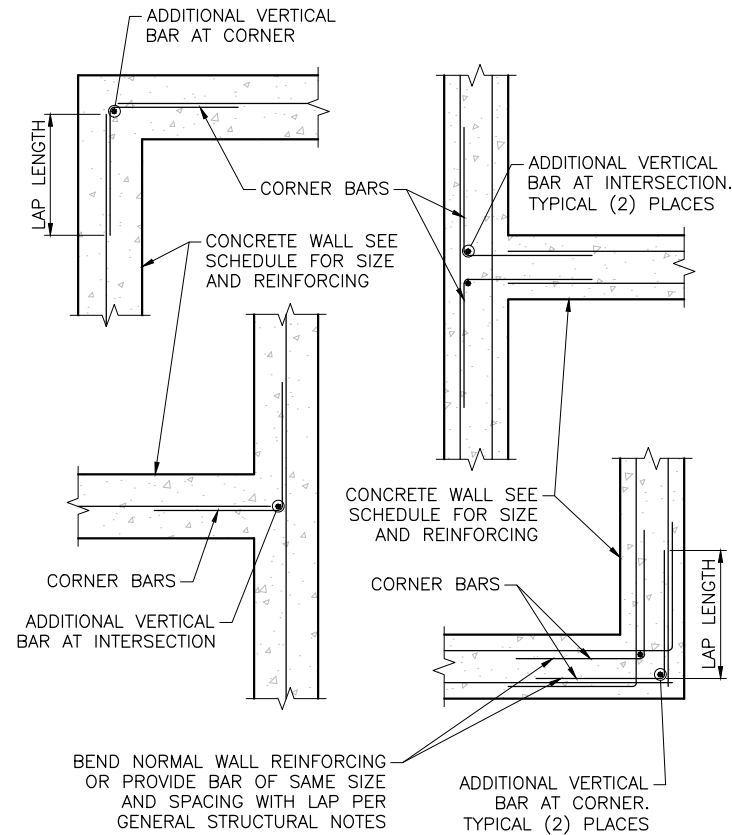
**B1** STRUCTURAL FILL DETAIL  
SCALE: NOT TO SCALE



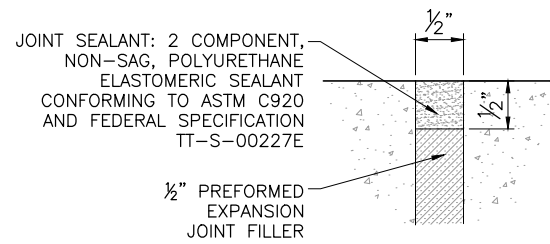
**B2** PIPE PARALLEL TO FOOTING DETAIL  
SCALE: NOT TO SCALE



**B3** PIPE PERPENDICULAR TO FOOTING DETAIL  
SCALE: NOT TO SCALE



**D1** CORNER REINFORCEMENT DETAIL FOR CONCRETE WALLS  
SCALE: NOT TO SCALE



**C2** EXPANSION JOINT SEALANT DETAIL  
SCALE: NOT TO SCALE



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NO.	DESCRIPTION	BY	APPR.	DATE

PURDY MESA FLOWLINE REPLACEMENT  
CITY OF GRAND JUNCTION

BID ALTERNATIVE 2  
TYPICAL CONCRETE DETAILS

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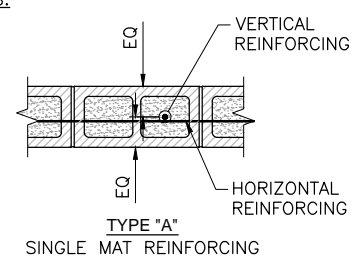
SHEET NUMBER:

S2-805

MASONRY WALL SCHEDULE							
WALL MARK	THICKNESS	f <sub>m</sub> (psi)	SOLID GROUT	REINFORCING			SPECIAL INSPECTION
				VERTICAL	HORIZONTAL	TYPE	
MW-1	8"	1500	NO	(1) #4 AT 24"oc	(1) #4 AT 24"oc	A	YES

- MASONRY WALL NOTES:**
- DO NOT SOLID GROUT WALLS UNLESS NOTED OTHERWISE.
  - INSTALL LOOSE FILL INSULATION IN ALL UNGROUTED CELLS WHERE NOTED.
  - ALL MASONRY BELOW GRADE SHALL BE SOLID GROUTED.
  - VERTICAL REINFORCING SHALL BE CENTERED IN THE WALL UNLESS NOTED OTHERWISE.
  - (1) VERTICAL BAR MINIMUM AT ALL CORNERS AND END OF WALLS.
  - HORIZONTAL WALL REINFORCING SHALL BE PLACED BETWEEN VERTICAL MASONRY COLUMN REINFORCING BARS.
  - HORIZONTAL WALL REINFORCING SHALL CONTINUE THROUGH MASONRY LINTELS. WHERE BOTH HORIZONTAL WALL REINFORCING AND LINTEL REINFORCING OCCUR IN THE SAME COURSE, USE THE LARGER REINFORCING.
  - SEE GENERAL STRUCTURAL NOTES FOR ALL OTHER REQUIREMENTS.

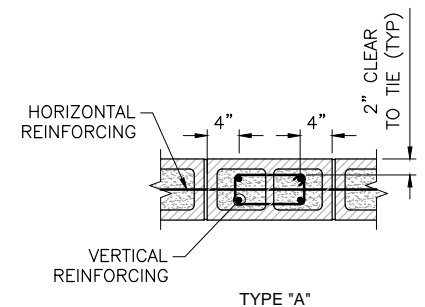
**WALL REINFORCING PLACEMENT TYPES:**



**B1 MASONRY WALL SCHEDULE**  
SCALE: NOT TO SCALE

MASONRY COLUMN SCHEDULE					
COLUMN MARK	COLUMN TYPE	COLUMN SIZE	REINFORCING		
			VERTICAL	TIES	CONFIGURATION
MC-1	A	8"x16"	(2) #5	NONE	• •

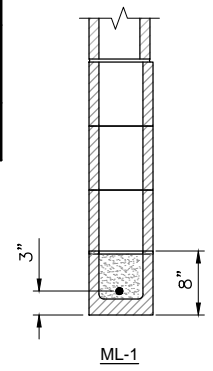
- MASONRY COLUMN NOTES:**
- THE CENTERLINE OF VERTICAL BARS SHALL BE LOCATED 2 1/2" FROM THE FACE OF THE MASONRY. HORIZONTAL WALL REINFORCING SHALL BE LOCATED TO THE INSIDE OF THE VERTICAL BARS.
  - UNLESS NOTED OTHERWISE, VERTICAL REINFORCING AND TIES SHALL EXTEND TO FULL WALL HEIGHT.
  - VERTICAL MASONRY COLUMN REINFORCING SHALL EXTEND INTO THE FOOTING AND TERMINATE WITH A STANDARD 90° HOOK.
  - IN CONCRETE FOUNDATION WALLS, VERTICAL MASONRY COLUMN REINFORCING SHALL BE TIED WITH #3 TIES AT THE SAME SPACING AND CONFIGURATION AS MASONRY COLUMNS ABOVE.
  - SEE GENERAL STRUCTURAL NOTES FOR ALL OTHER REQUIREMENTS.



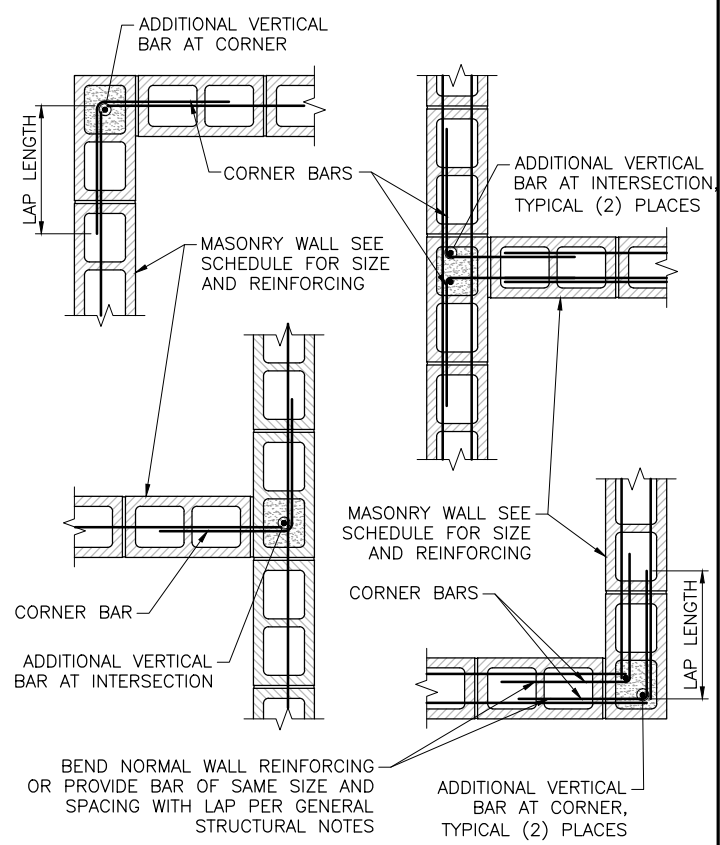
**B2 MASONRY COLUMN SCHEDULE**  
SCALE: NOT TO SCALE

MASONRY LINTEL SCHEDULE				
LINTEL MARK	LINTEL DEPTH	LINTEL SPAN MAXIMUM	REINFORCING	
			HORIZONTAL	STIRRUPS
ML-1	8"	3'-4"	(1) #6 BAR CONT.	NONE

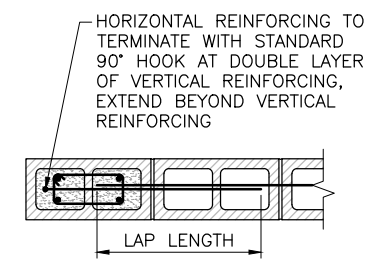
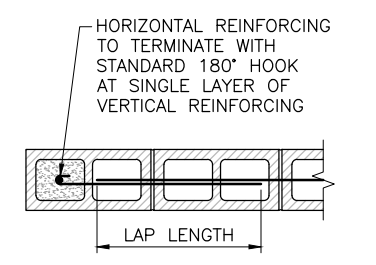
- MASONRY LINTEL NOTES:**
- LINTEL WIDTH AND MATERIAL TYPE SHALL BE THE SAME AS THE WALL IN WHICH THE LINTEL IS CONSTRUCTED.
  - GROUT MASONRY LINTELS MONOLITHICALLY WITH THE SUPPORT WALL OR COLUMN AT EACH END.
  - MASONRY LINTEL ML-1 SHALL BE USED OVER OPENINGS IN MASONRY WALLS WHEN A SPECIFIC MASONRY LINTEL IS NOT OTHERWISE SPECIFIED. WHEN A LINTEL IS SPECIFIED ON THE PLANS, THE MAXIMUM SPAN AS NOTED IN THIS SCHEDULE SHALL NOT APPLY. CONSULT THE STRUCTURAL ENGINEER FOR LINTELS NOT SPECIFIED ON THE PLANS WHICH HAVE A SPAN GREATER THAN 3'-4".
  - EXTEND ALL HORIZONTAL REINFORCING 48 BAR DIAMETERS MINIMUM BEYOND THE EDGE OF ALL OPENINGS. IF HORIZONTAL REINFORCING CANNOT EXTEND 48 BAR DIAMETERS BEYOND EDGE OF OPENING, PROVIDE 90° STANDARD HOOK.
  - SPLICE TOP BARS AT MID-SPAN OF LINTEL ONLY AND BOTTOM BARS OVER SUPPORTS ONLY.
  - HORIZONTAL WALL REINFORCING SHALL CONTINUE THROUGH MASONRY LINTELS. WHERE BOTH HORIZONTAL WALL REINFORCING AND LINTEL REINFORCING OCCUR IN THE SAME COURSE, USE THE LARGER REINFORCING.
  - DOWEL VERTICAL REINFORCING OF WALL ABOVE LINTEL INTO THE FULL DEPTH OF LINTEL OR 48 BAR DIAMETERS, WHICHEVER IS LESS.
  - SEE GENERAL STRUCTURAL NOTES FOR ALL OTHER REQUIREMENTS.



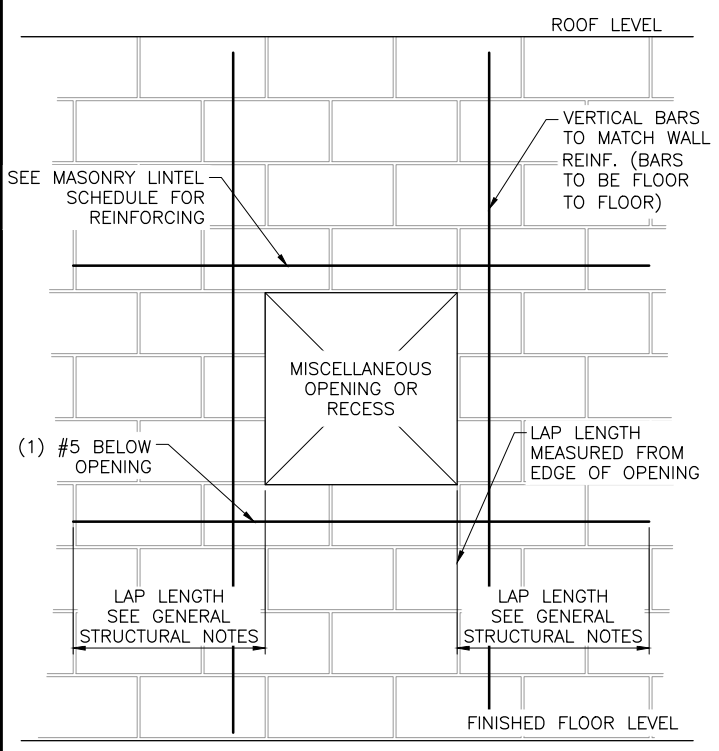
**B3 MASONRY LINTEL SCHEDULE**  
SCALE: NOT TO SCALE



**D1 CORNER REINFORCEMENT DETAIL FOR MASONRY WALLS**  
SCALE: NOT TO SCALE



**D2 TERMINATION OF HORIZONTAL REINFORCING IN MASONRY WALLS**  
SCALE: NOT TO SCALE



**D3 REINFORCING FOR MISCELLANEOUS OPENINGS IN MASONRY WALLS**  
SCALE: NOT TO SCALE

**JUB**  
J-U-B ENGINEERS, INC.  
305 Main Street  
Palisade, CO 81526  
Phone: 970.208.8508  
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**BID SET**  
COLORADO REGISTERED  
STRUCTURAL ENGINEER  
48706  
PROFESSIONAL ENGINEER

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NO.	REVISION	DESCRIPTION	BY	APPR.	DATE

PURDY MESA FLOWLINE REPLACEMENT  
CITY OF GRAND JUNCTION  
BID ALTERNATIVE 2  
TYPICAL MASONRY DETAILS

FILE: 81-18-013 S-801X  
JUB PROJ. #: 81-18-013  
DRAWN BY: JMM  
DESIGN BY: JMM  
CHECKED BY: JMM

ONE INCH  
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY  
LAST UPDATED: 8/23/2018  
SHEET NUMBER:  
**S2-806**

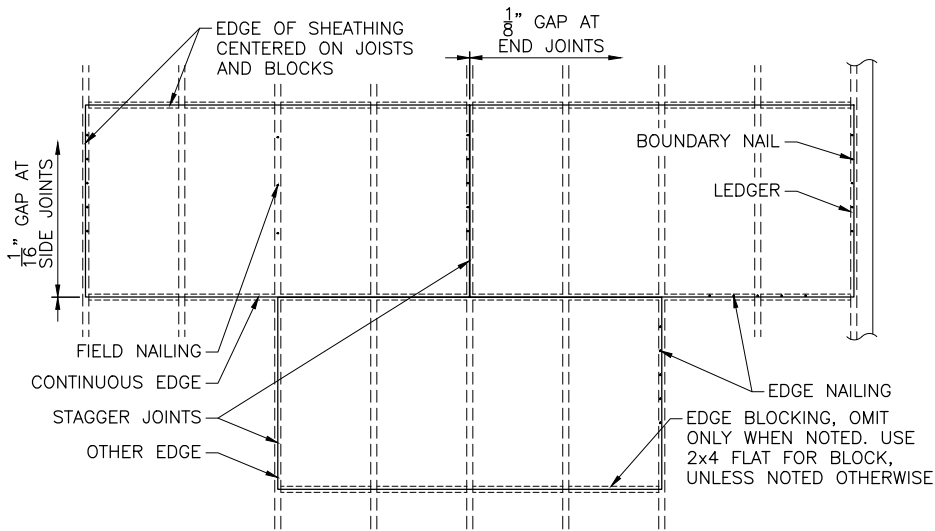
File: D:\m22\2018\8-23-18 PM Printed By: Erick Christensen  
 Date: 8/23/2018 10:06:15 AM PROJECT: JUB@GRAND JUNCTION@81-18-013 CITY OF GRAND JUNCTION PURDY MESA FLOWLINE REPLACEMENT SHEET: 81-18-013 S-801X.DWG

**ROOF SHEATHING SCHEDULE**

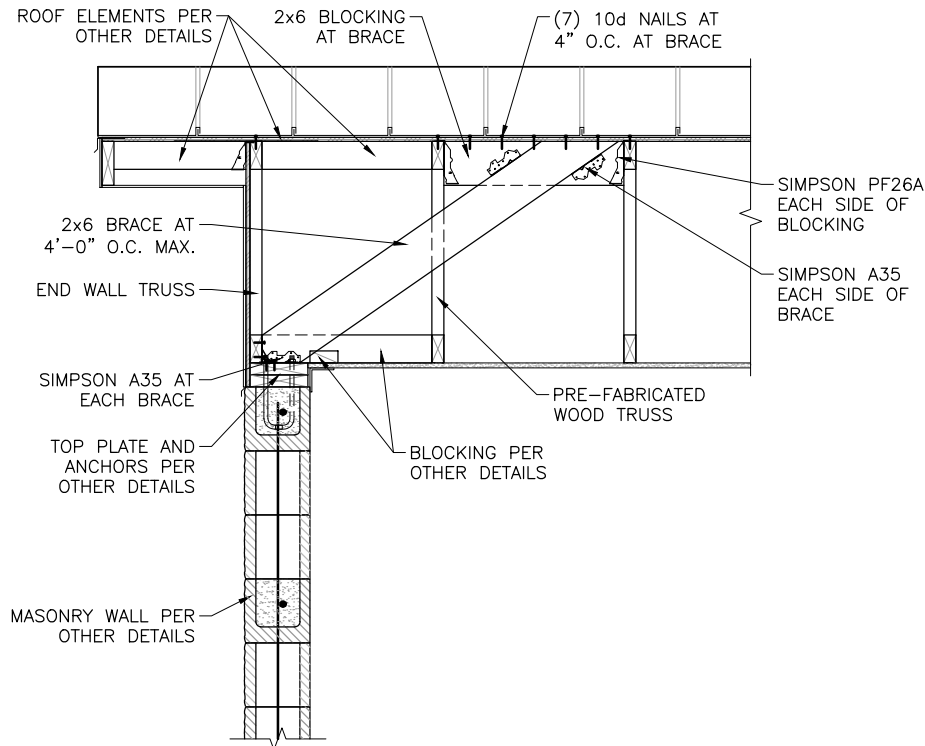
LOCATION	WOOD SHEATHING THICKNESS	NAIL SIZE	EDGE NAIL		FIELD NAIL	BOUNDARY NAIL	EDGE BLOCK
			CONT. EDGE	OTHER EDGE			
BLOCKED	1 5/8" (3 3/8")	8d	6"oc	6"oc	12"oc	6"oc	YES

**ROOF SHEATHING NOTES:**

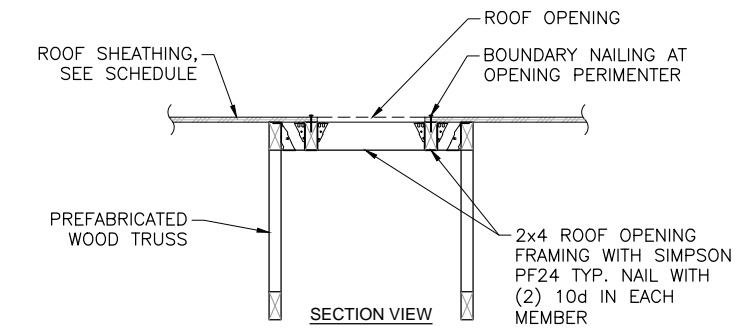
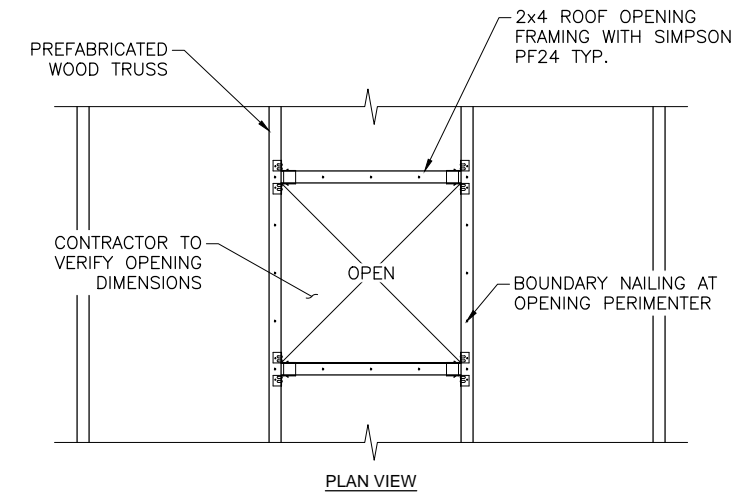
1. MINIMUM NAIL PENETRATION INTO FRAMING: 8d-1 1/2", 10d-1 3/8"
2. USE COMMON NAILS (8d DIAMETER=0.131", 10d DIAMETER=0.148")
3. SEE GENERAL STRUCTURAL NOTES FOR ALL OTHER REQUIREMENTS.



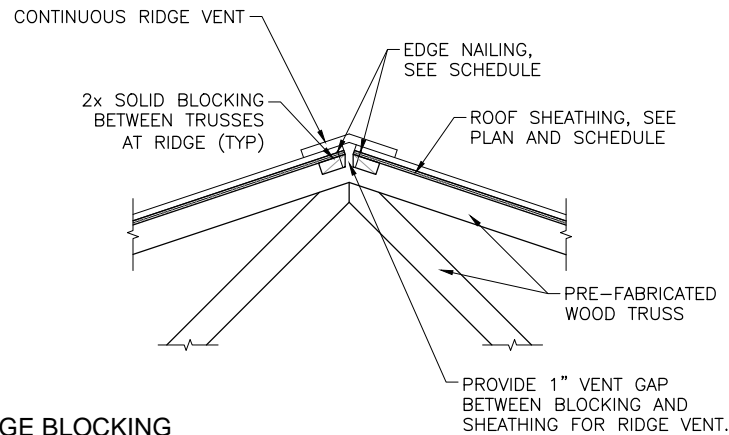
**B1** ROOF SHEATHING SCHEDULE  
SCALE: NOT TO SCALE



**B2** TYPICAL WALL BRACE AT NON-BEARING EXTERIOR WALLS  
SCALE: NOT TO SCALE



**B3** TYPICAL ROOF OPENING DETAIL (OPENING LESS THAN 24" SQUARE)  
SCALE: NOT TO SCALE



**C1** RIDGE BLOCKING  
SCALE: NOT TO SCALE



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NO.	DESCRIPTION	BY	APPR.	DATE

PURDY MESA FLOWLINE REPLACEMENT  
CITY OF GRAND JUNCTION

BID ALTERNATIVE 2  
TYPICAL ROOF FRAMING DETAILS

FILE: 81-18-013 S-801X  
JUB PROJ. #: 81-18-013  
DRAWN BY: JMM  
DESIGN BY: ---  
CHECKED BY: ---

ONE INCH  
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY  
LAST UPDATED: 8/23/2018

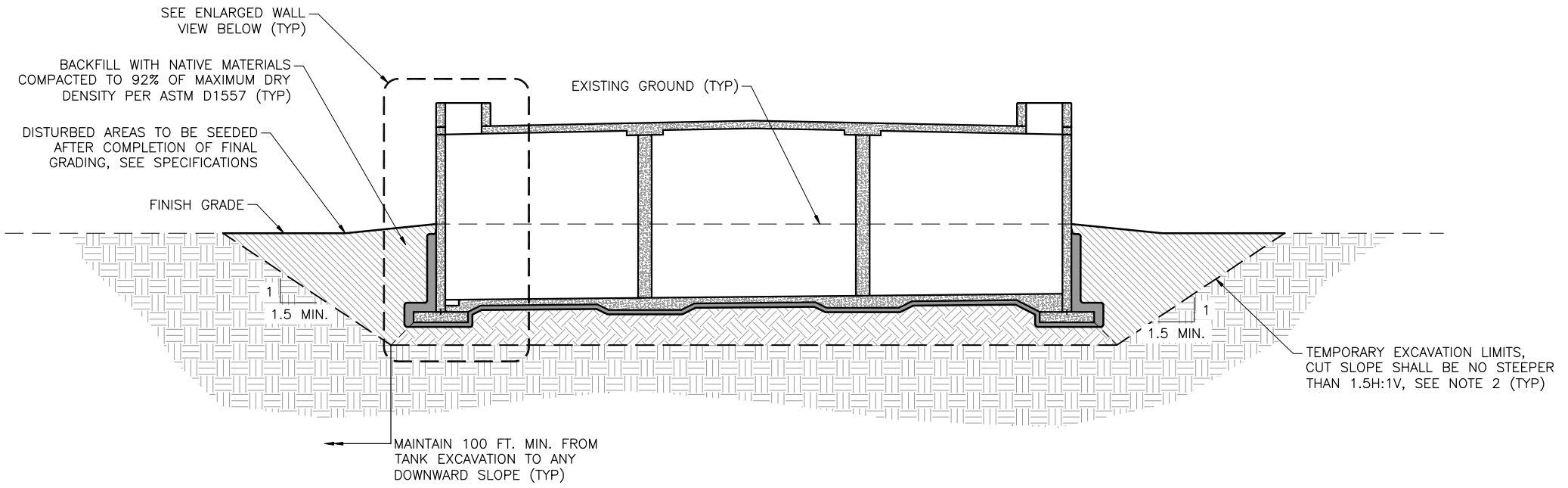
SHEET NUMBER:

**S2-807**

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NO.	DESCRIPTION	BY	DATE



**NOTES:**

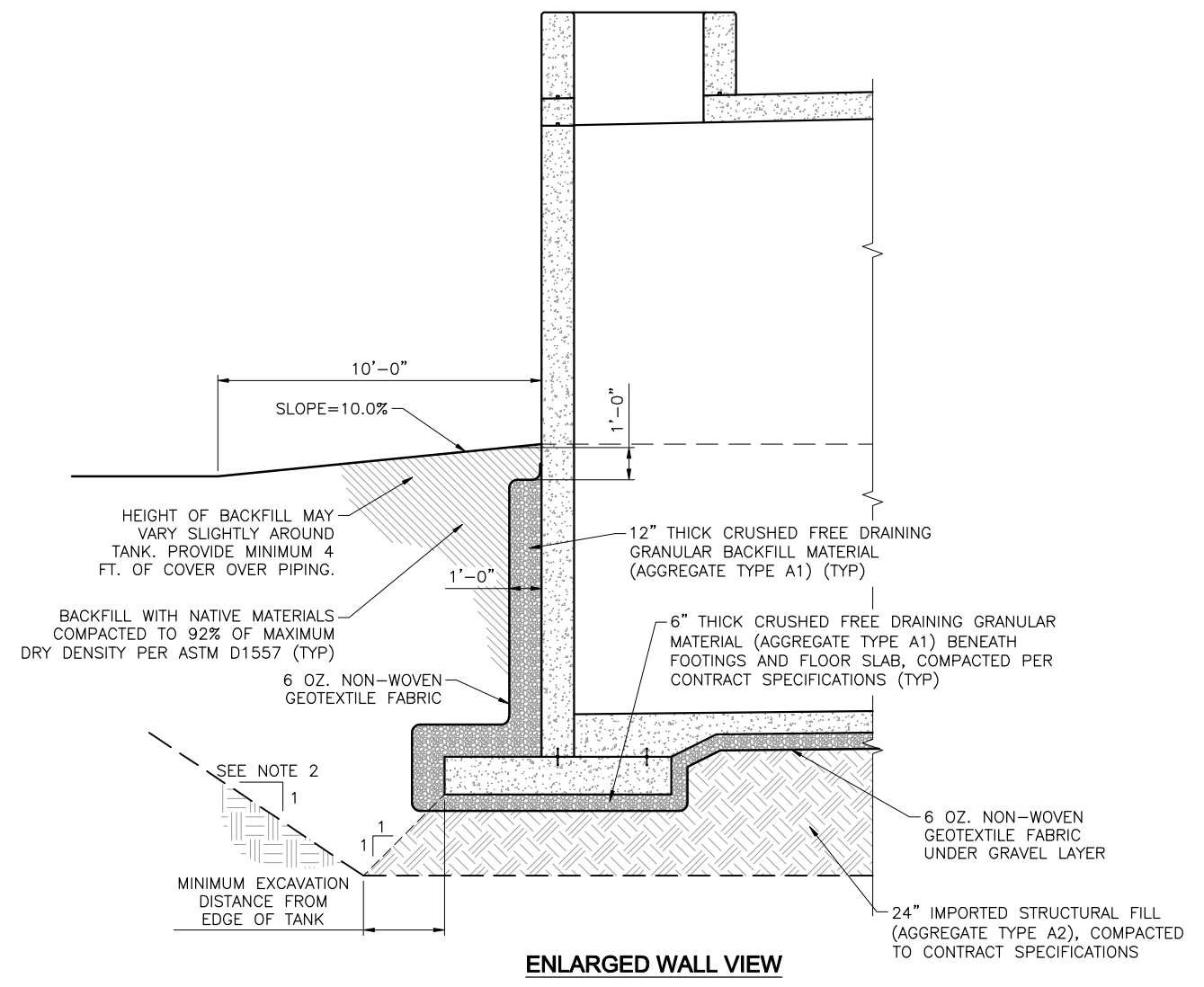
- SUBGRADE MATERIAL BENEATH THE TANK SHALL BE OVER-EXCAVATED AND REPLACED WITH 24 INCHES OF COMPACTED STRUCTURAL FILL AND 6" OF CRUSHED ROCK.
- IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO PROVIDE SAFE WORKING CONDITIONS IN CONNECTION WITH TEMPORARY SLOPES AND UNDERGROUND EXCAVATIONS. THE CONTRACTOR IS RESPONSIBLE FOR DESIGNING AND CONSTRUCTING STABLE, TEMPORARY EXCAVATIONS AS REQUIRED TO MAINTAIN STABILITY OF BOTH EXCAVATION SIDES AND BOTTOM. ALL EXCAVATIONS SHOULD BE SLOPED OR SHORED IN THE INTEREST OF SAFETY FOLLOWING LOCAL AND FEDERAL GUIDELINES, INCLUDING CURRENT OCCUPATIONAL SAFETY AND HEALTH STANDARDS (OSHA REQUIREMENTS).
- SOIL CONDITIONS ENCOUNTERED IN THE TEST EXCAVATIONS CONSISTED OF APPROXIMATELY 1.5 FEET OF TOP SOIL UNDERLAIN BY TAN, MOIST, DENSE SANDY GRAVEL AND COBBLE SOILS TO A DEPTH OF 10 FEET. REFER TO THE GEOTECHNICAL REPORT FOR ADDITIONAL INFORMATION.
- ONLY LIGHT HAND-OPERATED COMPACTION EQUIPMENT SHOULD BE OPERATED WITHIN 5 FEET OF THE TANK WALLS. THE TANK ROOF IS NOT TRAFFIC RATED.
- BACKFILL MATERIAL SHALL NOT BE PLACED UNTIL ROOF SLAB IS PLACED AND HAS OBTAINED A STRENGTH OF 95% OF  $f'_c$ . LEAK TEST TO BE PERFORMED BEFORE PLACEMENT OF BACKFILL.
- ALL FILL SHALL BE MOISTURE CONDITIONED TO NEAR OPTIMUM MOISTURE CONTENT, PLACED IN UNIFORM LIFTS NOT EXCEEDING 8 INCHES IN THICKNESS, AND BE COMPACTED TO MINIMUM OF 95% BENEATH THE FOUNDATIONS AND 92% FOR THE WALL BACKFILL OF THE SOIL MAXIMUM DRY DENSITY AS MEASURED BY ASTM D1557.

**NATIVE SEED MIX**

WESTERN WHEATGRASS (Pascopyrum smithii)	6.25 lbs/acre
IDAHO FESCUE (Festuca idahoensis)	5.00 lbs/acre
BLUEBUNCH WHEATGRASS (Pseudoroegneria spicata)	5.00 lbs/acre
INDIAN RICEGRASS (Achnatherum hymenoides)	3.75 lbs/acre
SLENDER WHEATGRASS (Elymus trachycaulus)	2.00 lbs/acre
THICKSPIKE WHEATGRASS (Elymus lanceolatus)	1.25 lbs/acre
SANDBERG'S BLUEGRASS (Poa secunda)	1.25 lbs/acre
BOTTLEBRUSH SQUIRRELTAIL (Elymus elymoides)	0.50 lbs/acre
TOTAL:	25.0 lbs/acre

**HATCH LEGEND**

	UNDISTURBED NATIVE MATERIAL
	COMPACTED STRUCTURAL FILL
	NATIVE OR IMPORTED BACKFILL MATERIAL
	FREE DRAINING GRANULAR BACKFILL MATERIAL



**PURDY MESA FLOWLINE REPLACEMENT  
CITY OF GRAND JUNCTION**

**BID ALTERNATIVE 3  
TYPICAL EXCAVATION AND BACKFILL DETAILS**

FILE: 81-18-013 C-601X

JUB PROJ. #: 81-18-013

DRAWN BY: JMM

DESIGN BY: ---

CHECKED BY: ---

AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

LAST UPDATED: 8/16/2018

**GENERAL STRUCTURAL NOTES AND SPECIFICATIONS**

1. **GENERAL**
  - A. These general structural notes and specifications supplement the project written technical specifications and the project structural drawings.
  - B. The structures shown on the drawings have been designed for stability under final conditions only. These plans do not include the necessary components or equipment for the structures during construction. The Contractor is responsible for all construction bracing, temporary shoring, and other site safety controls required during construction in accordance with all applicable Local, State and Federal regulations, to insure the stability and safety of all construction until it is completed and self-supporting.
  - C. The Contractor is responsible for all water, both above and below ground, runoff and other environmental controls required during construction to insure the site is maintained in compliance with all applicable Local, State and Federal regulations.
  - D. Details on these plans are intended to depict the general construction details and methods for this structure. Connection details and conditions not specifically shown that are similar in nature to those that are specified shall be assumed one and the same. If questions regarding the application of details are encountered, notify the Engineer for clarification or instruction.
  - E. Where these General Structural Notes, the Project Geotechnical Report and/or the Project Technical Specifications differ or conflict, the more stringent requirement shall apply, unless otherwise directed by the Project Engineer.
  - F. Visits to the job site by the Engineer to observe the construction do not in any way mean that they are guarantors of the Contractor's work, nor responsible for comprehensive or special inspections, coordination, supervision, nor safety at the job site.
2. **CONTRACTOR RESPONSIBILITY FOR COORDINATION**
  - A. It is the Contractors Prime responsibility to coordinate the work shown on all of the Project Drawings, general, special and technical specifications.
  - B. The Contractor is responsible to verify all existing construction material types dimensions, elevations and conditions.
  - C. The Contractor shall verify and coordinate the dimensions among all drawings and in the field prior to proceeding with any work or fabrication, any discrepancy shall be immediately reported to the Engineer for direction and/or clarification. Any construction work done by the Contractor before obtaining such clarification from the project Engineer shall be at the Contractor's own risk and cost. Furthermore; any work required to correct, replace and/or restore the work as directed by the Engineer shall be at the Contractor's own risk and cost.
  - D. No structural members shall be cut for pipes, ducts, etc. unless specifically detailed or approved in writing by the Engineer.

3. **CODES**
  - A. Unless otherwise noted, all referenced building codes and standards refer to their current editions, including any local, state, or federal amendments or changes, as adopted in the locality of the Project on the date these drawings are signed and sealed by the Project Engineer.
  - B. **GENERAL:**
    - B.1. International Code Council, ICC, International Building Code, IBC.
    - B.2. Minimum Design Loads for Buildings and Other Structures, ASCE 7.
  - C. **CONCRETE:**
    - C.1. American Concrete Institute, ACI 301, Specifications for Structural Concrete.
    - C.2. American Concrete Institute, ACI 350, Code Requirements for Environmental Engineering Concrete Structures
  - D. **STEEL:**
    - D.1. American Institute of Steel Construction, AISC, Steel Construction Manual.
    - D.2. American Institute of Steel Construction, AISC 360, Specifications for Structural Steel Buildings.
    - D.3. American Institute of Steel Construction, AISC 341, Seismic Provisions for Structural Steel Buildings.
    - D.4. American Welding Society, AWS D1.1, Structural Welding Code.

4. **DESIGN CRITERIA**
  - A. Occupancy or Use; IBC Table 1607.1:
    - A.1. Water Storage Facility
      - A.1.a. Occupancy Category: U
      - A.1.b. Risk Category; ASCE Table 1.5-2: III
  - B. **DEAD LOADS:**
    - B.1. Tank Roof Dead Load: 125 psf
  - C. **LIVE LOADS:**
    - C.1. Tank Floor Live Load: 1,219 psf
    - C.2. Tank Roof Live Load: 50 psf
  - D. **SNOW LOADS:**
    - D.1. Ground Snow Load:  $P_g = 40$  psf
    - D.2. Sloped Roof Snow Load  $P_s = 21.2$  psf
    - D.3. Unbalanced Snow Load Max.  $P_u = 43$  psf
    - D.4. Importance Factor:  $I_e = 1.10$
    - D.5. Snow Exposure Factor:  $C_e = 1.0$
    - D.6. Thermal Factor:  $C_t = 1.2$
  - E. **WIND:**
    - E.1. Basic Wind Speed:  $V = 120$  mph
    - E.2. Wind Site Exposure: C
  - F. **SEISMIC:**
    - F.1. Seismic Importance Factor:  $I_e = 1.25$
    - F.2. Mapped Spectral Response Acceleration:
      - F.2.a. Short Period Acceleration:  $S_s = 0.253$
      - F.2.b. 1-Second Acceleration:  $S_1 = 0.072$
    - F.3. Site Class (Soil Profile): D
    - F.4. Spectral Response Coefficients:
      - F.4.a. Short Period Acceleration:  $S_{ds} = 0.269$
      - F.4.b. 1-Second Acceleration:  $S_{d1} = 0.115$
    - F.5. Seismic Design Category: B
  - G. **SOIL LOADS:**
    - G.1. Soil density: 130 pcf
    - G.2. Active Lateral Equivalent Fluid Pressure: 45 pcf
    - G.3. At-Rest Lateral Equivalent Fluid Pressure: 65 pcf
    - G.4. Passive Lateral Equivalent Fluid Pressure: 300 pcf

5. **SPECIAL INSPECTIONS** Special Inspections per IBC Chapter 17 are required for the following items:


Special Inspections		
All special inspection shall be performed by approved inspectors.		
	Material	Frequency
<b>A. Soils. (By Geotechnical Engineer)</b>		
A.1.	Site preparation	Periodic
A.2.	Site excavations	Periodic
A.3.	Fill material verification	Continuous
A.4.	Fill placement and compaction	Continuous
A.5.	Lift thickness	Continuous
<b>B. Concrete</b>		
B.1.	Reinforcement placement	Periodic
B.2.	Reinforcing welding	Refer to Steel Welding Requirements
B.3.	Placement of cast-in-place anchors	Periodic
B.4.	Verification of use of required mix	Periodic
B.5.	Concrete placement	Continuous
B.6.	Concrete curing maintenance	Periodic
B.7.	Verification of in-situ concrete prior to removal of forms and shores from elevated beams and slabs	Periodic
B.8.	Verification of formwork	Periodic
<b>C. Post Installed Concrete Anchors</b>		
C.1.	Installation	Continuous
<b>D. Structural steel</b>		
D.1.	Fabrication of structural elements	Periodic
D.2.	Material verification of structural steel	Periodic
D.3.	Material verification of high strength bolts	Periodic
D.4.	Material verification of anchor bolts and threaded rods	Periodic
D.5.	Material verification of weld filler materials	Periodic
D.6.	Welding stair and railing systems	Periodic
D.7.	Snug-tight high strength bolt installation	Periodic
D.8.	Welding performed in the shop of an Approved Fabricator shall not require Special Inspection.	-----

6. **SUBMITTALS**
  - A. Submit required copies, one (1) electronic .pdf file or three (3) minimum hardcopy, of product or material design information to the Engineer for review for the following items:
    - A.1. Concrete mix designs and admixtures.
    - A.2. Non-shrink grout.
    - A.3. Expansion bolts.
    - A.4. Epoxy Anchors.
  - B. Submit required copies of shop drawings, one (1) electronic .pdf file or three (3) minimum hardcopy, to the Engineer for review prior to fabrication of the following items:
    - B.1. Reinforcing steel for all concrete.
    - B.2. Structural steel.
    - B.3. Miscellaneous steel fabrications including, but not limited to, stairs, ladders, grating, floor plate, railing, support brackets, vent pipes, access doors and hatches, etc.
    - B.4. Concrete control joint locations, and pour sequence in concrete tanks/basins for liquid retaining structures. Control joint spacing of 60'-0" maximum spacing.

7. **FOUNDATIONS**
  - A. All footings to be placed on firm undisturbed, inorganic material. Proof roll sub-grade prior to placing concrete where the material has been disturbed by the excavating equipment.
  - B. All soil bearing surfaces shall be inspected by the Geotechnical Engineer prior to placement of reinforcing steel.
  - C. All piers and footings outside or at the perimeter of the structure, or in other unheated areas shall be set to a depth of at least 36" below finish grade, unless otherwise noted on the plans.
  - D. All foundations and retaining walls below finish grade shall receive an approved damp-proof coating. Foundation walls below maximum anticipated ground water levels shall receive an approved water-proof coating; extend water-proofing to a minimum of 1-ft above the maximum anticipated ground water level.
  - E. Allowable bearing pressure for all footings  $Q_a=3,000$  psf on 24 inches of structural fill.
  - F. Excavations shall be shored as required to prevent subsidence or damage to adjacent existing structures, streets, utilities, etc.
  - G. Local areas of soft and/or unacceptable material encountered at bottom of footing elevations indicated on the plans must be over-excavated and brought up to design grade with compacted structural fill or lean concrete fill, at no additional cost to the owner.
  - H. All structural fill and/or backfill shall be a CDOT Class 6 base course or granular, free draining, material; Unified Soils Classification GW, GP, GM or SW; maximum aggregate size of 3-in. and no more than 15% passing a number 200 sieve. Material shall be placed in lifts no greater than 6-in. in depth and compacted to 95% of maximum density as determined per ASTM D1557.
  - I. Design for the mitigation of subsurface water flow and/or perched water tables shall be the responsibility of others.
  - J. The Engineer shall be notified in writing if any ground water, clay type soils, debris or unconsolidated materials are encountered during excavations for foundations.
  - K. For water retaining structures, do not backfill walls until structure has been leak tested and supporting floors or roof are completed and in place.

- L. Refer to the final Project Geotechnical Report by Huddleston-Berry Engineering & Testing, LLC which includes a letter dated June 5, 2018 titled "Geotechnical Investigation, Purdy Mesa Flowline, Whitewater, Colorado" and a second letter dated June 19, 2018 titled "Geotechnical Engineering, Purdy Mesa Flowline Project, Whitewater, Colorado" which shall be considered part of these plans and specifications.


8. **CONCRETE**
  - A. **GENERAL**
    - A.1. Concrete shall be proportioned to provide an average compressive strength,  $f'_c$ , as prescribed in ACI 350 and shall satisfy the durability criteria of ACI 350.
  - B. **PROJECT CONCRETE MIX TYPES:** Concrete shall be proportioned and furnished for the various project uses as indicated on the plans and as follows:
    - B.1. M3000-sec: Secondary concrete mix for fill and backfill around buried pipes which do not occur underneath structural footings and foundation slabs:  $f'_c = 3,000$  psi, Absolute water-cement ratio by weight = 0.55, Air Content = 6% (+/- 1.5%), maximum aggregate size 3/4-inch; slump 8-inch.
    - B.2. M4000-sec: Secondary concrete mix for fill and backfill around buried pipes underneath structural footings and foundation slabs:  $f'_c = 4,000$  psi, Absolute water-cement ratio by weight = 0.45, Air Content = 6% (+/- 1.5%), maximum aggregate size 1-inch; slump 3 to 5 inches.
    - B.3. M4000-std: Standard structural concrete mix for non-liquid-retaining structural concrete, including all structural walls, columns, foundation and roof slabs, and beams:  $f'_c = 4,000$  psi, Absolute water-cement ratio by weight = 0.45, Air Content = 6% (+/- 1.5%), maximum aggregate size 3/4-inch
    - B.4. M5000-std: Standard structural concrete mix for liquid-retaining structural concrete, including all structural walls, columns, foundation and roof slabs, and beams:  $f'_c = 5,000$  psi, Absolute water-cement ratio by weight = 0.45, Air Content = 6% (+/- 1.5%), maximum aggregate size 1-inch.
    - B.5. M5000-sps: Super-plasticized concrete mix for liquid-retaining concrete structural walls and foundation slabs:  $f'_c = 5,000$  psi, absolute water-cement ratio by weight = 0.40, air content = 6% (+/- 1.5%)
  - C. **CONCRETE MIX COMPONENTS.**
    - C.1. A water-reducing admixture conforming to ASTM C494, used in strict conformance with the manufacturer's instructions, shall be incorporated in all concrete mix designs.
    - C.2. For all water-retaining concrete structural walls and slabs, a high-range water-reducing (HRWR) admixture conforming to ASTM C494, Type F or G, shall be used. The total slump shall be less than 10-in.
    - C.3. Higher water-cement ratios than shown above may be used if substantiated in accordance with ACI 318.
    - C.4. Fly-ash conforming to ASTM C618 Type F or C, may replace up to 20% of the cement content, provided that the mix strength is substantiated by test data.
    - C.5. Cement: ASTM C150 Type II.
    - C.6. Cement: ASTM C845 Type E-1 (K) for Shrinkage Compensating mixes.
    - C.7. Water: Clean & Potable.
    - C.8. Air entraining agent: ASTM C260. Except where concrete is noted to be non-air entrained.
    - C.9. Aggregate: 1-inch Maximum aggregate per ASTM C33. Unless noted otherwise.
    - C.10. Mix Proportioning: ACI 211.1 and 350R.
  - D. **CONCRETE ACCESSORIES:**
    - D.1. REINFORCING STEEL: Reinforcing steel shall conform to ASTM A615 Grade 60; #3 bars may be Grade 40.
    - D.2. WELDED WIRE FABRIC: ASTM A185 or A497.
    - D.3. WIRE: Plain wire shall conform to ASTM A 82. Deformed wire shall conform to ASTM A 496, and Epoxy coated wire shall conform to ASTM A 884.
    - D.4. JOINTING MATERIALS: In accordance with ACI 350 Section 4.5.2. All jointing materials including water-stops, expansion joints and sealants, shall be resistant to chemical attack for the design life of the facility. Sealants shall conform to ASTM C 920 and Federal Specification TT-S-00277E and PVC Water-stop shall conform to ASTM D 570, ASTM D 746, STM D 1149 and CRD-C572.
    - E. NON-SHRINK GROUT: All non-shrink grout noted on the plans shall be non-shrink, non-metallic grout with a minimum 28-day compressive strength of 7,000 psi.
    - F. EXPANSION BOLTS: Bolts noted on the plans as Expansion Bolts shall be HILTI Kwik Bolt-II, stud anchors; size and embedment as noted on the drawings, installed per the manufacturers recommendations; or an approved equal.
    - G. EPOXY SET BOLTS & REBAR: Bolts and reinforcing steel bars noted on the plans as Epoxy or Construction Adhesive Set Bolts or Rebar shall be set in place utilizing the SIMPSON SET High Strength Epoxy system; size and embedment as noted on the drawings, installed per the manufacturers recommendations; or an approved equal.
    - H. **CONCRETE PROPORTIONS.**
      - H.1. Concrete mix proportioning shall be in accordance with ACI 211.1; Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
      - H.2. Concrete mix proportioning for lightweight concrete shall be in accordance with ACI 211.2; Standard Practice for Selecting Proportions for Lightweight Concrete.
    - I. **CONCRETE MIX VERIFICATION:** Concrete mix designs shall be verified by standard 28-day cylinder tests per ASTM C39.
    - J. **EVALUATION AND ACCEPTANCE OF CONCRETE.** Concrete shall be tested in accordance with the requirements of ACI 318/350.
    - K. **MIXING & PLACING CONCRETE.** Concrete shall be prepared, mixed, placed and consolidated in accordance with ACI 318/350 and as follows:
      - K.1. ACI 304; Guide for Measuring, Mixing, Transporting, and Placing Concrete.
      - K.2. ACI 309; Guide for Consolidation of Concrete.
    - L. **MINIMUM TIME BETWEEN ADJACENT PLACEMENTS:**
      - L.1. Non-liquid Retaining Structures:
        - L.1.a. Construction Joints: Five (5) days wet cure, or seven (7) days dry cure.
        - L.1.b. Control Joints: Two (2) days.
        - L.1.c. Expansion Joints: One (1) day.
      - L.2. Floor Slabs:
        - L.2.a. Construction Joints: Seven (7) days wet cure, or ten (10) days dry cure.
        - L.2.b. Control Joints: Four (4) days.
        - L.2.c. Expansion Joints: One (1) day.
      - L.3. Liquid Retaining Structures:
        - L.3.a. Construction Joints: Ten (10) days wet cure, or fourteen (14) days dry cure.
        - L.3.b. Control Joints: Six (6) days.
    - M. **HORIZONTAL JOINTS IN REINFORCED CONCRETE WALLS:**
      - M.1. Provide a layer of slurry concrete in the bottom of all horizontal wall joints, 2-inch thick. Thoroughly vibrate to mix concrete & slurry together.



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NO.	DESCRIPTION	BY	DATE

**PURDY MESA FLOWLINE REPLACEMENT  
CITY OF GRAND JUNCTION**

BID ALTERNATIVE 3  
GENERAL STRUCTURAL NOTES AND SPECIFICATIONS

FILE: 81-18-013\_S3-001X  
JUB PROJ. #: 81-18-013  
DRAWN BY: JMM  
DESIGN BY: ---  
CHECKED BY: ---  
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY  
LAST UPDATED: 8/23/2018  
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**S3-001**

File Date: 8/23/2018 8:58 PM, Plotted By: Erica Chidambaram  
 Date Created: 8/2/2018 10:06 AM, Project: JUB GRAND JUNCTION, PURDY MESA FLOW LINE CAD SHEET 18-013, S3-001X.DWG

**GENERAL STRUCTURAL NOTES AND SPECIFICATIONS CONTINUED**

- N. HORIZONTAL CONSTRUCTION JOINTS CONTAINING WATER—STOP.
- N.1. Unless otherwise specifically directed, in all horizontal construction joints in new concrete construction containing water—stops, provide an initial layer of slurry mix to aid in consolidation of freshly placed concrete at the joint interface.
- N.2. Slurry mix shall be a mixture of 3/8–inch maximum aggregate, sand, cement and water.
- N.3. Place slurry mix 2–inch minimum to 4–inch maximum in thickness.
- N.4. Place with buckets or other means permitting visual verification that only enough slurry mix is deposited in the vicinity of the concrete pour to meet the thickness requirements.
- N.5. Place concrete over slurry mix while slurry mix is still flowable.
- N.6. Limit initial concrete placement on top of slurry mix to 12–inches in thickness. Thoroughly vibrate and consolidate concrete and slurry mix together.
- O. CONCRETE CURING. Concrete shall be maintained above 50–degrees F and in a moist condition for at least 7 days after placement, except when cured in accordance with ACI 318.
- O.1. Curing of concrete shall be per the recommendations given in ACI 308; Guide to Curing Concrete.
- P. COLD WEATHER REQUIREMENTS. Adequate equipment shall be provided for heating concrete materials and protecting concrete during freezing or near-freezing weather. The recommended procedures listed in ACI 306; Cold Weather Concreting shall be followed.
- P.1. Cold weather is defined as a period when, for more than three (3) consecutive days, the following conditions exist:
- P.1.a. The average daily air temperature is less than 40–degrees F and
- P.1.b. The air temperature is not greater than 50–degrees F, for more than one-half of any 24–hour period.
- Q. HOT WEATHER REQUIREMENTS. During hot weather, proper attention shall be given to ingredients, production methods, handling, placing, protection, and curing to prevent excessive concrete temperatures or water evaporation that could impair required strength or serviceability of the member or structure. The recommended procedures listed in ACI 305; Hot Weather Concreting shall be followed.
- Q.1. Hot weather is any combination of the following conditions that tends to impair the quality of freshly mixed or hardened concrete by accelerating the rate of moisture loss and rate of cement hydration, or otherwise causing detrimental results:
- Q.1.a. High ambient temperature.
- Q.1.b. High concrete temperature.
- Q.1.c. Low relative humidity.
- Q.1.d. Wind speed.
- Q.1.e. Solar radiation.
9. FORMWORK.
- A. Forms shall result in a final structure that conforms to shapes, lines, and dimensions of the members as required by the design drawings and specifications.
- A.1. Design of formwork shall be in accordance with ACI 318/350.
- A.2. Formwork shall be in accordance with ACI 347; Guide to Formwork for Concrete.
- B. Tolerances for finished concrete surfaces shall meet the following requirements, class of surface is per ACI 117 Section 4.8.3:
- B.1. Footings: Class C
- B.2. Foundation walls: Class B
- B.3. Above grade concrete not visible to sight: Class B
- B.4. Above-grade concrete visible to sight: Class A
- C. REMOVAL OF FORMS.
- C.1. Concrete forms shall not be removed until the retained concrete has reached the following minimum percentage of the required 28 day compressive strength:
- C.1.a. Footings and base slabs on grade: 50% of f'c.
- C.1.b. Foundation walls and columns: 67% of f'c.
- C.1.c. Elevated structural slabs, beams & joists: 95% f'c.
- C.2. Where concrete cylinder tests are not available for strength verification the following guide may be used when permitted by the Project Engineer:
- C.2.a. Footings and base slabs on grade: 12 hours.
- C.2.b. Foundation walls and columns: 24 hours.
- C.2.c. Elevated structural slabs, beams and joists:
- C.2.c.1. Spans under 10–feet: 4 days
- C.2.c.2. Spans between 10–feet and 15–feet.: 7 days.
- C.2.c.3. Spans between 15–feet and 20–feet: 10 days
- C.2.c.4. Spans greater than 20–feet: by cylinder strength verification only.
- D. OPENINGS AND EMBEDMENTS IN CONCRETE.
- D.1. Conduits, pipes, and sleeves of any material not harmful to concrete and within limitations of ACI 318/350 shall be permitted to be embedded in concrete with approval of the Project Engineer, provided they are not considered to replace structurally the displaced concrete, except as provided per code requirements.
- D.2. The Contractor shall coordinate placement of all openings, curbs, dowels, sleeves, conduits, bolts, and inserts prior to placement of concrete.
- D.3. Conduits and pipes of aluminum shall not be embedded in structural concrete unless effectively coated or covered to prevent aluminum–concrete reaction or electrolytic action between aluminum and steel.
- E. CONSTRUCTION JOINTS.
- E.1. Construction joints shall only be placed where indicated on the project drawings or as approved by the Project Engineer. Contractor may revise the locations of joints, subject to specified requirements, and shall submit all revised joint locations for review by the engineer prior to placing any concrete.
- E.2. Continuous waterstop as specified shall be installed in all construction joints except where specifically noted otherwise.
- E.3. Roughen and clean all construction joints as specified prior to placing adjacent concrete. Sandblasting or other preparation of horizontal and vertical joints is required.
- E.4. Construction joints shall be constructed in accordance with ACI 318/350.
10. DETAILS OF REINFORCEMENT.
- A. Placement of all reinforcing steel within concrete structures shall be in conformance with ACI 318/350.
- B. All reinforcing steel shall be uncoated unless specifically noted otherwise.
- C. Reinforcing steel hooks, bends, ties, splices and other reinforcement details shall be in

- accordance with ACI 315; Details and Detailing of Concrete Reinforcement.
- D. All reinforcing steel shall be bent by the fabricator prior to delivery to the site. Reinforcing steel shall not be field bent, unless specifically approved by the Engineer in writing.
- E. Spacing limits for reinforcement shall be in conformance with ACI 318/350.
- F. Concrete protection for reinforcement. Unless noted elsewhere on the drawings, all reinforcing steel shall have the following concrete cover:
- F.1. For non-liquid retaining concrete structures; per ACI 318:
- F.1.a. Concrete cast against earth: 3.00 inch
- F.1.b. Concrete exposed to earth or weather;
- F.1.b.1. No. 5 or smaller bars: 1.50–inch
- F.1.b.2. No. 6 or larger bars: 2.00–inch
- F.1.c. Concrete not exposed to earth or weather;
- F.1.c.1. No. 11 or smaller bars: 0.75–inch
- F.1.c.2. No. 14 or larger bars: 1.50–inch
- F.1.d. Beams and columns;
- F.1.d.1. Primary rein., ties, stirrups or spirals: 1.50–inch
- F.2. For liquid containing concrete structures; per ACI 350 Section:
- F.2.a. Concrete cast against earth: 3.00 inch
- F.2.b. Concrete exposed to earth, liquid or weather;
- F.2.b.1. Slabs and joints: 2.00–inch
- F.2.b.2. Walls: 2.00–inch
- F.2.c. Beams and columns;
- F.2.c.1. Ties, stirrups or spirals: 2.00–inch
- F.2.c.2. Primary reinforcement: 2.50–inch
- F.2.d. Footings and base slabs;
- F.2.d.1. Formed surfaces: 2.00–inch
- F.2.d.2. Top of footings and base slabs: 2.00–inch
- G. Concrete blocks or plastic–coated bar chairs shall be provided for support of all slab reinforcing steel, sufficient in number to prevent settlement or sagging, but in no case shall such support be continuous. Metal clips or supports shall not be placed in contact with the forms or the sub–grade.
- H. Dowels and anchor bolts shall be wired or otherwise held in correct position prior to placing concrete. Care shall be taken to insure that dowels and anchor bolts remain plum after concrete is poured and vibrated. In no case shall dowels or anchor bolts be stabbed into freshly poured concrete.
- I. Provide dowels in footings and at construction joints to match vertical reinforcing bar size and spacing, unless otherwise noted on the drawings.
- J. Where drilled in anchors are to be post–installed into concrete surfaces take care to locate reinforcing steel so that it will not interfere with the drilling operations. Move bars plus or minus 1 to 2 inches in order to avoid drilling conflicts.
- K. All bar bends, hooks, splices and other reinforcing steel details shall conform to the requirements of ACI 315.
- L. Unless otherwise noted on the plans all bars shall be spliced with a minimum Class B lap splice; lap splices of deformed bars and deformed wire in tension zones shall be Class A splices.
- M. At all corners and wall intersections provide bent bars to match the horizontal reinforcing steel and in accordance with the typical corner reinforcing details.
- N. Chamfer all exposed corners and fillet entrant angles 3/4–inch unless otherwise noted on the drawings.
- O. WATERSTOP.
- O.1. All control and construction joints in liquid–retaining structures shall be doweled, keyed and provided with continuous water–stop, per the typical details, technical specifications or as directed by the Project Engineer.
- O.2. Install waterstop per manufacturer's recommendations. Waterstop shall be enveloped with concrete free of air pockets and debris. Prior to construction, the Contractor will demonstrate the method of placement of the concrete around the waterstop to the Engineer.
- P. At slab and wall openings provide a minimum of (4) #5 bars; over, under and at either side of the openings. Extend these bars a minimum of 24–in. past the opening edge. Provide (1) matt of (4) #5 bars for walls or slabs with single–layer reinforcing and (2) matts of (4) #5 bars for double–layer reinforcing walls or slabs. Provide #4, 48–inch long diagonal bars at each re–entrant corner in slabs; (1) bar for slabs with single layer reinforcing and (2) bars for slabs with double layer reinforcing.
11. CONCRETE FINISHING. All concrete surfaces shall be finished in accordance with ACI 301.
- A. Formed Concrete Surfaces. After removal of forms, give each formed surface one or more of the following finishes in conformance with ACI 301:
- A.1. Non-liquid Retaining Concrete Structures:
- A.1.a. Concrete footings and foundations not exposed to view. Provide an As–Cast, SF–1.0 surface finish.
- A.1.b. Foundation wall and other surfaces below grade and not exposed to view. Provide an As–Cast, SF–1.0 surface finish.
- A.1.c. Interior, exterior and top surfaces exposed to view to 6–inches below grade. Provide a Smooth–rubbed, SF–2.0 surface finish.
- A.1.d. Column, beam and joist surfaces that are exposed to Provide an Smooth–rubbed, SF–2.0 surface finish.
- A.1.e. Interior concrete surfaces to be painted or receive other coating systems. Provide an As–cast, SF–3.0 surface finish.
- A.2. Liquid Retaining Concrete Structures:
- A.2.a. Interior surfaces from top of wall to floor slab, exterior and top surfaces exposed to view to 6–inches below. Pressure wash all concrete surfaces with high–pressure water and provide a Grout–cleaned rubbed, SF–2.0 surface finish.
- A.2.b. Surfaces below grade and not exposed to view. Provide a Smooth–rubbed, SF–2.0 surface finish.
- B. Unformed Concrete Surfaces. Unformed concrete surfaces including the top surface of all concrete roof and floor slabs shall be finished in accordance with ACI 301 and ACI 302.
- B.1. For the top surfaces of walls, provide a scratch finish.
- B.2. Interior areas receiving only light foot traffic shall receive a Troweled finish.
- B.3. Interior garage, industrial or work areas subject to equipment or traffic loads shall receive a Broom finish.
- B.4. Provide a Nonslip finish for exterior surfaces and where indicated on the plans.
- C. Sawed contraction joints. Conform to ACI 301.

12. WATER–RETAINING CONCRETE STRUCTURES:
- A. All materials used for water–retaining structures and associated mechanical devices which may come into contact with culinary water shall comply with ANSI/NSF 61. This includes, but is not limited to, concrete, concrete admixtures, release agents, sealers, piping, and metals.
- B. Concrete tanks, vaults, wells and other structures intended to retain and hold water or other liquids shall be water–tight structures. The water–resisting walls and floor slabs shall be of monolithic concrete construction with water–tight joints, constructed as indicated on the plans or as directed by the Project Engineer. Water–resisting walls and floors shall be uniform in finished construction free of spalls, pockets, blemishes and or cracks that may weep or leak.
- C. Cracks found in water–resisting walls, floors and/or foundation slabs that may weep or leak shall be repaired and/or sealed per the Project Specifications, notes or as approved by the project engineer.
13. STRUCTURAL STEEL AND METAL FABRICATIONS
- A. STEEL MATERIALS:
- A.1. W & WT SHAPES: ASTM A572 Grade 50 with special requirements per AISC Technical Bulletin #3, dated March 1997; or ASTM A992 Grade 50, Fy=50 ksi.
- A.2. M & S SHAPES: ASTM A36, Fy=36 ksi.
- A.3. PLATES, BARS, CHANNELS & ANGLES: ASTM A36, Fy=36 ksi.
- A.4. STEEL PIPE: ASTM A53 Grade B, Fy=35 ksi.
- A.5. SQUARE, RECTANGULAR HSS, STEEL TUBING: ASTM A500 Grade B, Fy=46 ksi.
- A.6. RAISED PATTERN FLOOR PLATE: ASTM A786. Fy=36 ksi.
- B. STRUCTURAL BOLTS: High Strength Bolts shall be ASTM A325, Type 1. Nuts for High Strength Bolts shall conform to ASTM A563, Grade DH, Heavy Hex.
- C. ANCHOR RODS: Anchor Rods (bolts set into concrete) shall be ASTM F1554, Fy=36 ksi. Nuts for anchor rods shall conform to ASTM A563, Grade A, Heavy Hex.
- D. THREADED STEEL RODS: Threaded steel rods shall conform to ASTM A36, Fy=36 ksi. Nuts for threaded rods shall conform to ASTM A563, Grade A, Heavy Hex.
- E. WASHERS: All washers shall conform to ASTM F436.
- F. BOLT PLACEMENT: All bolts shall be on member standard gage lines except as noted otherwise.
- G. BLIND CONNECTION BOLTS FOR HSS SHAPES: Where bolted connections are indicated to be made to HSS shapes where access is unavailable to the back side of the fastener provide Type HB – Holo–Bolt by Lindapter or approved equal. Bolt size shall be as indicated on the plans for the thickness of materials to be joined as indicated. Install bolts per the manufacturer's specifications. Provide galvanized fasteners for all exterior applications.
- H. All structural steel shall be fabricated and erected in conformance with the AISC manual of steel construction, current edition.
- I. All structural steel and miscellaneous metal to be connected shall be clean and free of paint, oil, soil, or other materials which would inhibit weld bonding or connection of the members.
- J. All structural steel and miscellaneous metal to be embedded in concrete shall be clean and free of paint, oil, soil, or other materials which would inhibit bonding of metal and concrete.
- K. WELDING OF STRUCTURAL STEEL:
- K.1. All welding shall conform to the requirements of the current AWS Structural Welding Code D1.1, current edition
- K.2. Weld Metal: Fexx=70 ksi, typical unless otherwise noted or required by AWS.
- K.3. All welders shall be tested and certified by an independent testing agency.
- K.4. Qualification of welders shall be in accordance with the Specifications for Standard Qualification Procedure of the AWS.
- K.5. All welds found defective shall be repaired and/or replaced and retested for adequacy at the Contractor's expense.
- K.6. At all field welds, embed plates, and angles; low heat and intermittent welds shall be utilized to avoid spalling or cracking the existing concrete.

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PURDY MESA FLOWLINE REPLACEMENT  
 CITY OF GRAND JUNCTION  
 BID ALTERNATIVE 3  
 GENERAL STRUCTURAL NOTES AND SPECIFICATIONS

FILE: 18-013\_S3-001X  
 JUB PROJ. #: 18-013  
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PURDY MESA FLOWLINE REPLACEMENT  
CITY OF GRAND JUNCTION

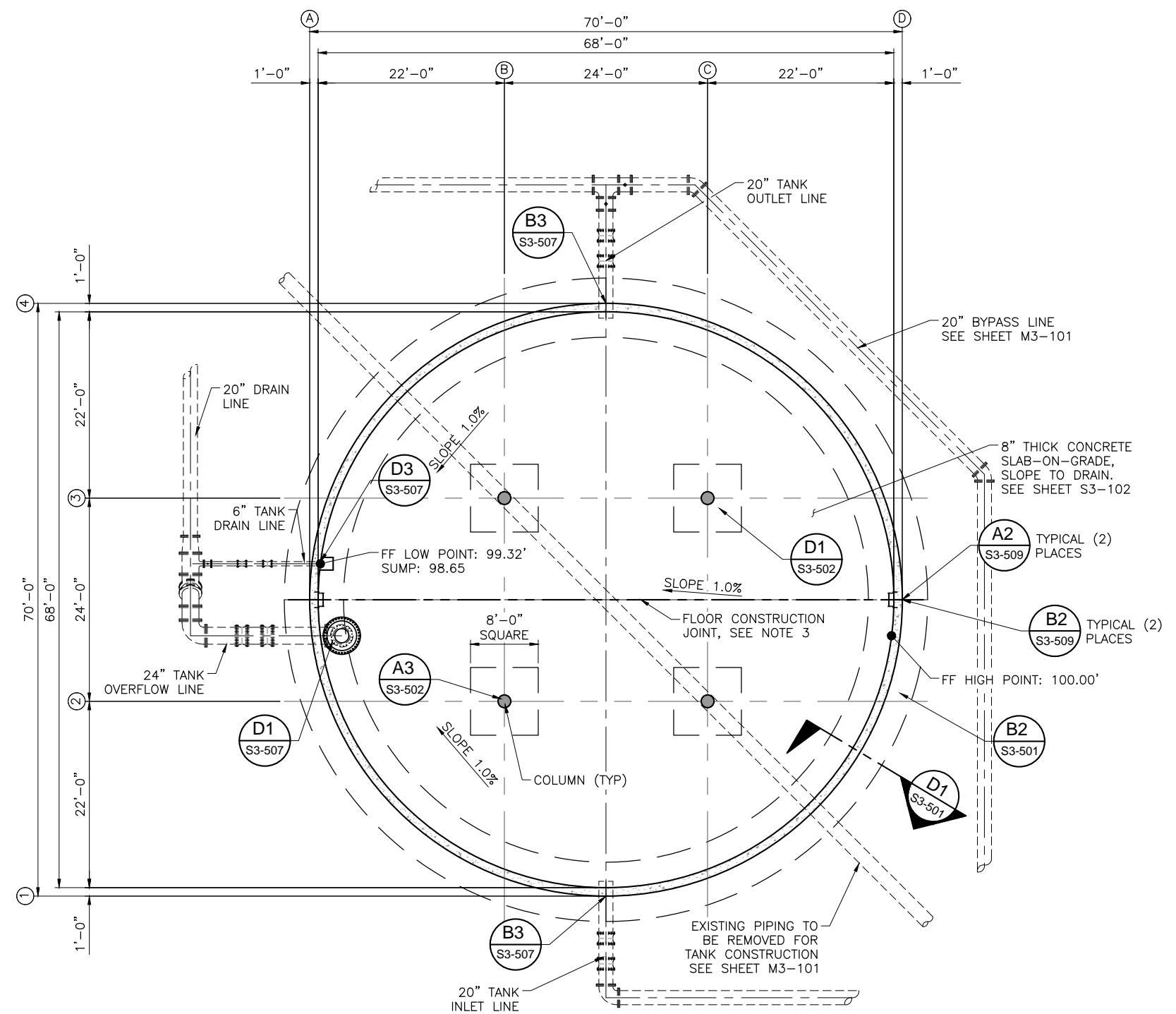
BID ALTERNATIVE 3  
FLOW CONTROL TANK FOUNDATION PLAN

FILE: 81-18-013 S-101X  
JUB PROJ. #: 81-18-013  
DRAWN BY: JMM  
DESIGN BY: ---  
CHECKED BY: ---

ONE INCH  
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY  
LAST UPDATED: 8/23/2018

SHEET NUMBER:

S3-101



TANK FLOOR AND FOOTING NOTES:

1. PLACE 6" MIN. OF FREE DRAINING GRANULAR MATERIAL AND GEOTEXTILE FABRIC BENEATH ENTIRE FOUNDATION. SEE SHEETS C3-601 AND S3-301. GRADATION PER SPECIFICATIONS.
2. CENTER FLOOR REINFORCING IN CONCRETE SLAB ON GRADE. BOTTOM BARS OF REINFORCING SHALL MAINTAIN 3" MINIMUM CLEAR FROM BOTTOM OF CONCRETE.
3. TANK FLOOR IS TO BE PLACED IN A MINIMUM OF TWO PLACEMENTS. IF CONSTRUCTION JOINT LOCATIONS ARE MODIFIED CONSTRUCTION JOINT LOCATIONS SHALL BE APPROVED BY THE ENGINEER PRIOR TO CONSTRUCTION. SEE THE TANK WALL FOOTING AND FLOOR SLAB CONSTRUCTION JOINT DETAIL (A2/S3-509).
4. FOR PIPING SEE SHEETS M3-101 AND C2-212.
5. ALL SURFACES, PIPING, MISCELLANEOUS METAL FABRICATIONS, AND RELATED COMPONENTS WITHIN THE TANK INTERIOR, OR IN CONTACT WITH WATER, SHALL BE NSF 61 APPROVED.

TANK FLOOR/FOUNDATION PLAN

SCALE: 1/8" = 1'-0"



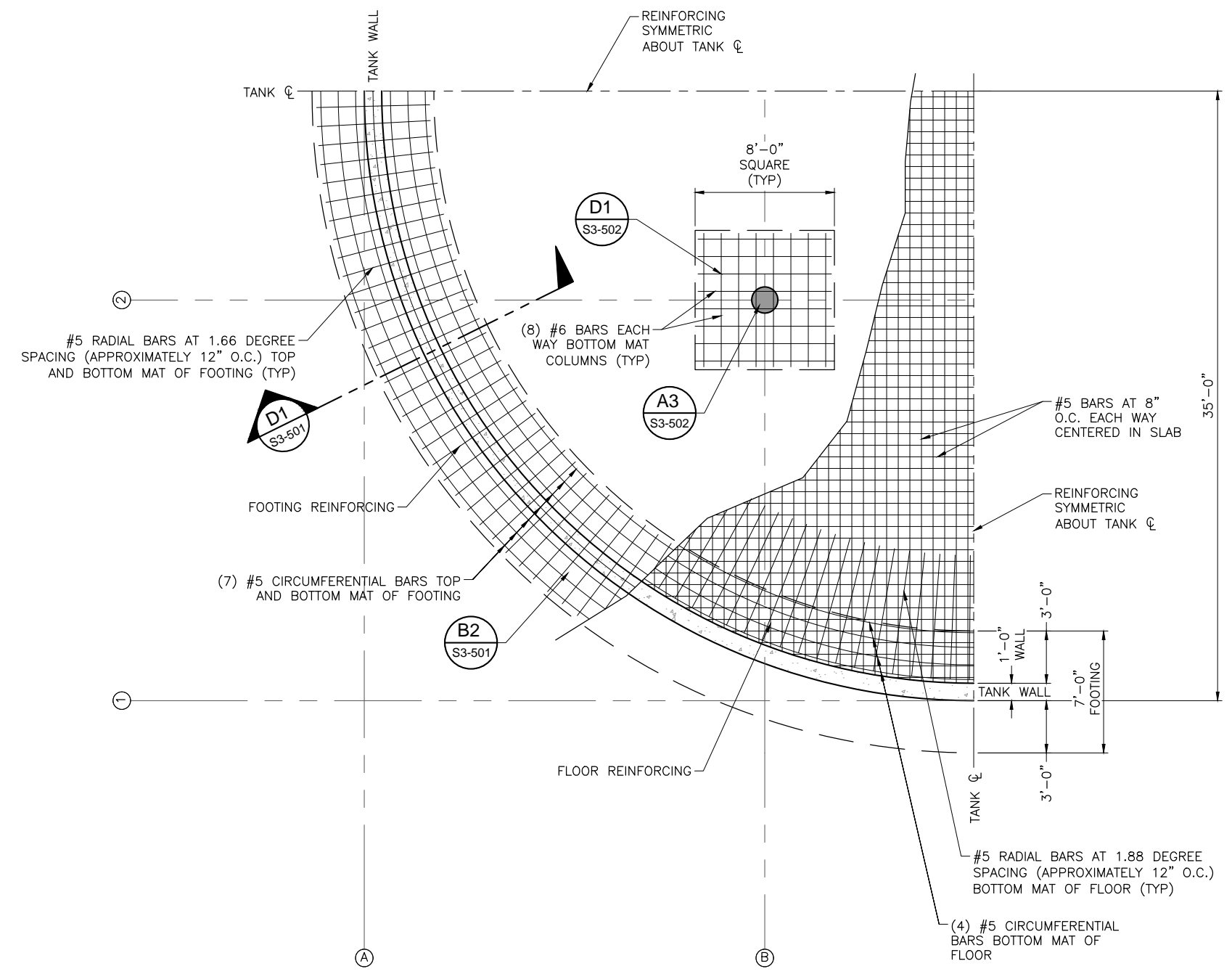
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PURDY MESA FLOWLINE REPLACEMENT  
 CITY OF GRAND JUNCTION  
 BID ALTERNATIVE 3  
 FLOW CONTROL TANK FOUNDATION REINFORCEMENT PLAN

FILE: 81-18-013 S-101X
JUB PROJ. #: 81-18-013
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ONE INCH AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY
LAST UPDATED: 8/23/2018

SHEET NUMBER:  
**S3-102**



TANK FLOOR REINFORCING:

1. WALL AND COLUMN DOWELS NOT SHOWN FOR CLARITY.
2. FOOTING/FLOOR REINFORCEMENT IS SYMMETRICAL ABOUT TANK CL.

**TYPICAL FOUNDATION REINFORCING PLAN**  
 SCALE: 1/4" = 1'-0"

File Date: 8/23/2018 5:58 PM Printed By: Erik Chelstman  
 Date Created: 8/23/18 10:06 AM Project: PURDY MESA FLOWLINE REPLACEMENT SUBPROJECT 3 BID ALTERNATIVE 3 S-101X.DWG





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PURDY MESA FLOWLINE REPLACEMENT  
CITY OF GRAND JUNCTION

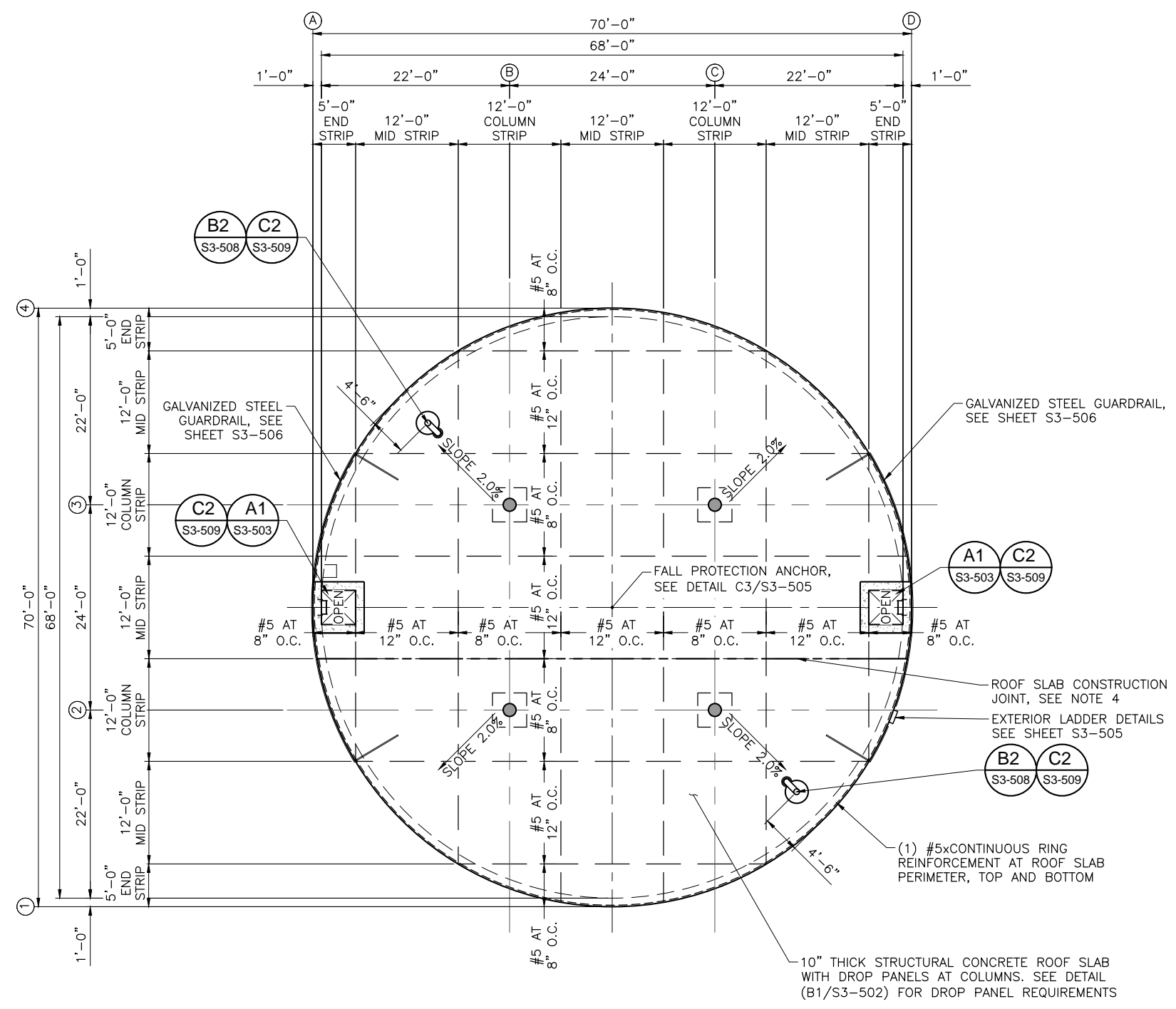
BID ALTERNATIVE 3  
FLOW CONTROL TANK ROOF REINFORCEMENT PLAN

FILE: 81-18-013 S-101X  
JUB PROJ. #: 81-18-013  
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AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY  
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SHEET NUMBER:

S3-103



TANK ROOF NOTES:

1. REINFORCING STEEL IS SYMMETRICAL AROUND TANK.
2. BAR LAP LOCATIONS SHALL BE IN ACCORDANCE WITH ACI 350 SECTION 13 AND SECTIONS SHOWN ON SHEET S3-301.
3. #X @ XX" O.C. DENOTES BAR SIZE AND SPACING FOR BARS RUNNING IN THIS ↓ DIRECTION (PERPENDICULAR TO TEXT). BAR SIZE AND SPACING CHANGES WITH EACH NEW CALL OUT. SEE SHEET S3-301 FOR TOP AND BOTTOM STEEL SPLICE LOCATIONS.
4. ROOF SLAB CONSTRUCTION JOINT LOCATIONS ARE SHOWN. ANY ALTERNATE CONSTRUCTION JOINT LOCATIONS MUST BE APPROVED BY THE ENGINEER PRIOR TO CONSTRUCTION. SEE THE ROOF SLAB CONSTRUCTION JOINT DETAIL (B1/S3-509).
5. THE COLUMNS AND ROOF SLAB ARE TO BE PLACED SEPARATELY. THE DROP PANELS ARE TO BE PLACED WITH THE ROOF SLAB.
6. THE ROOF SLAB IS TO BE FORMED AND PLACED AS SHOWN IN THE PLANS AND SPECIFICATIONS AND SHALL MEET THE ALLOWABLE TOLERANCES GIVEN IN THE SPECIFICATIONS. ANY PONDING ON THE ROOF SLAB SHALL BE REPAIRED AT THE CONTRACTOR'S OWN EXPENSE.
7. ROOF SLAB SLOPES 2.0% FROM CENTER OUT TO EDGE OF TANK (TYP). CONTRACTOR TO SLOPE ROOF AROUND TANK ACCESSES TO ASSURE ROOF SLAB IS ABLE TO DRAIN.

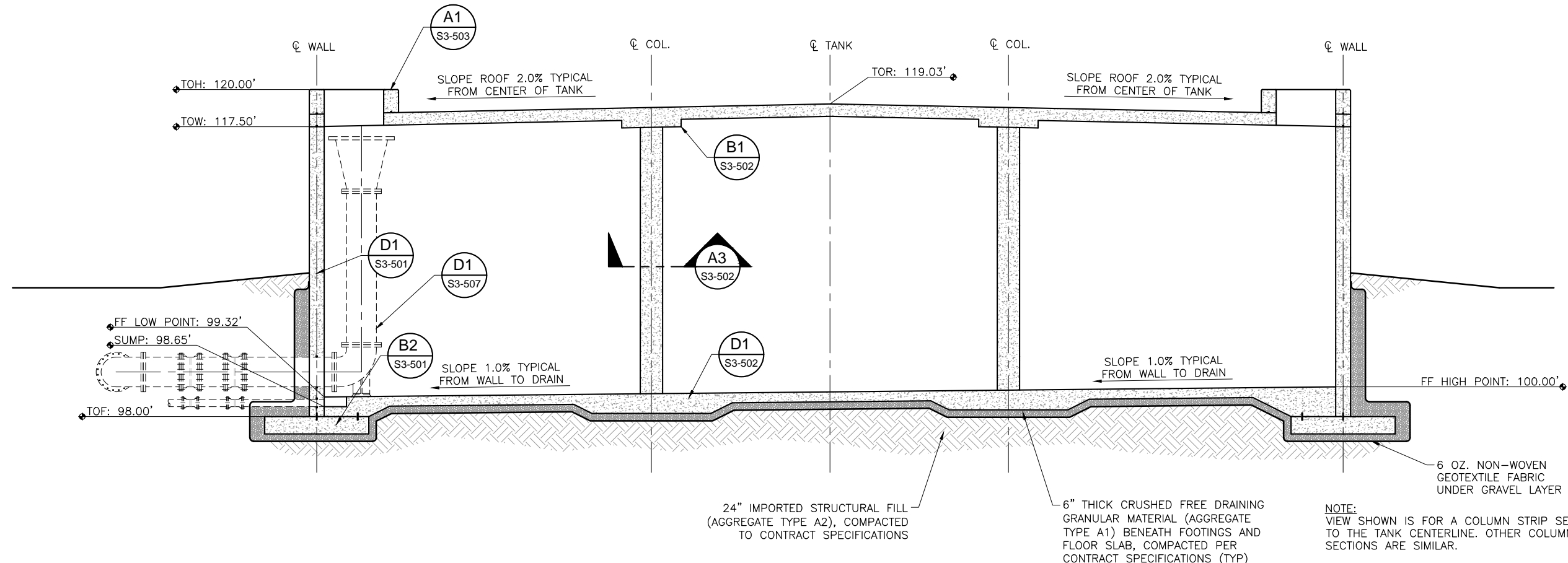
ROOF REINFORCING PLAN - TOP AND BOTTOM MAT REINFORCING STEEL

SCALE: 1/8" = 1'-0"

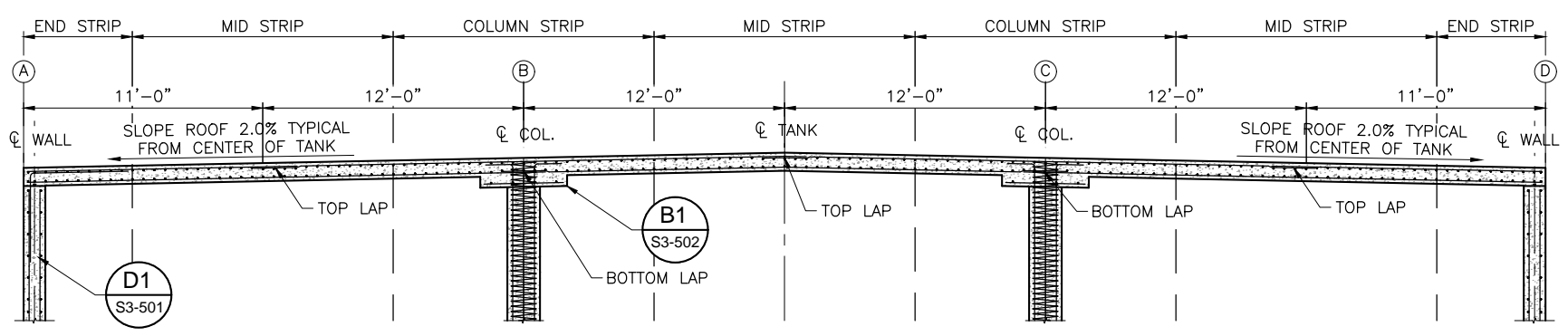


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**B1** TYPICAL TANK SECTION  
SCALE: 1/4" = 1'-0"



- NOTES:**
- SECTION SHOWN IS FOR TYPICAL COLUMN STRIPS AND IS INTENDED TO CLARIFY ACCEPTABLE LAP LOCATIONS FOR TANK ROOF REINFORCEMENT. OTHER COLUMN STRIPS AND MIDDLE STRIPS ARE SIMILAR.
  - REFER TO ROOF REINFORCING PLAN, SHEET S3-103 FOR REINFORCEMENT REQUIREMENTS.
  - BOTTOM BARS SHALL BE 2" CLEAR AT BOTTOM OF SLAB, AND TOP BARS SHALL BE 2" CLEAR AT TOP OF SLAB.
  - ALL BARS IN THE SAME DIRECTION IN THE SAME LAYER (TOP AND BOTTOM) SHALL BE IN THE SAME PLANE. DO NOT WEAVE REINFORCEMENT.
  - IF REINFORCEMENT BAR IS CONTINUOUS ACROSS ADJACENT SPANS, NO LAP IS REQUIRED. IF LAPS ARE NEEDED, THEY MUST BE MADE AT THE LOCATIONS SHOWN. DIMENSIONS SHOWN ARE TO THE CENTER OF THE LAP.

**D1** TYPICAL ROOF SLAB REINFORCEMENT SECTION  
SCALE: 1/4" = 1'-0"

PURDY MESA FLOWLINE REPLACEMENT  
CITY OF GRAND JUNCTION

BID ALTERNATIVE 3  
TANK AND ROOF SLAB REINFORCEMENT SECTIONS

FILE: 81-18-013 S-101X  
JUB PROJ. #: 81-18-013  
DRAWN BY: JMM  
DESIGN BY: ---  
CHECKED BY: ---

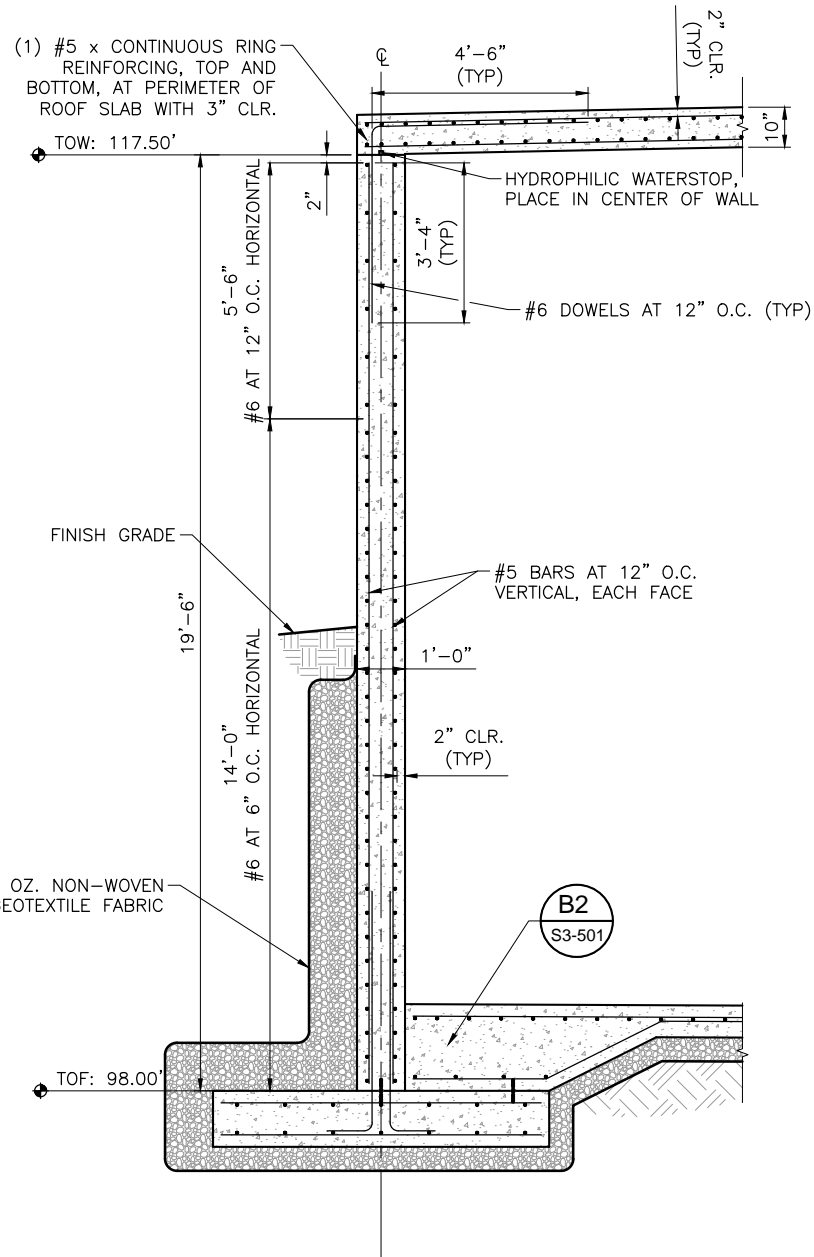
ONE INCH  
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LAST UPDATED: 8/23/2018

SHEET NUMBER:  
**S3-301**

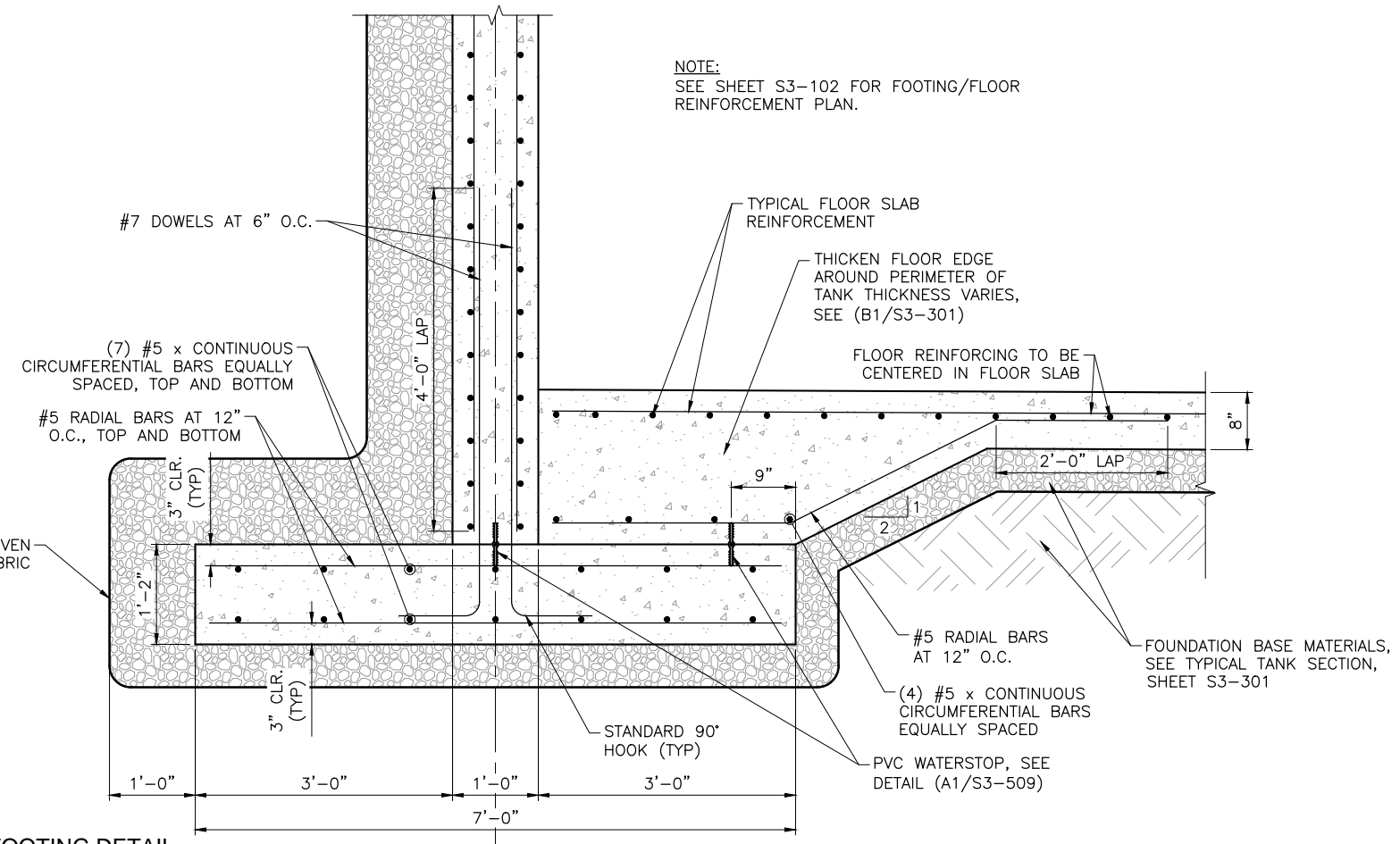
**WALL NOTES:**

1. THE BOTTOM 2 INCHES OF WALL IS TO BE PLACED WITH GROUT DURING WALL PLACEMENT, SEE SPECIFICATIONS.
2. FORM WORK TOLERANCES SHALL CONFORM TO ACI 347, STANDARD PRACTICE FOR CONCRETE WORK. IN NO CASE SHALL THE FINISHED CONCRETE WALL BE OUT OF PLUMB BY MORE THAN  $\pm\frac{3}{8}$ ".
3. COMPACT BACKFILL AROUND TANK AS SPECIFIED. BRING UP THE BACKFILL AROUND THE TANK SYMMETRICALLY AND IN UNIFORM LIFTS.
4. FOR TANK EXCAVATION AND BACKFILL REQUIREMENTS SEE TYPICAL EXCAVATION AND BACKFILL DETAIL (D1/C3-601).
5. FOR WALL SPLICE REQUIREMENTS, SEE TYPICAL SPLICE DETAIL (B3/S3-509).
6. SEE DETAIL (C1/S3-509) FOR FORM TIE THROUGH BOLT SEAL DETAIL.



**D1 TYPICAL TANK WALL SECTION**  
SCALE: NOT TO SCALE

Plot Date: 02/20/2018 10:01 PM Printed By: Erik Chelstman  
 Date Created: 02/20/18 10:01 AM Project: PURDY MESA FLOW LINE CAD SHEET 18-013 S-101X.DWG



**B2 TYPICAL TANK WALL FOOTING DETAIL**  
SCALE: NOT TO SCALE

NOTE:  
SEE SHEET S3-102 FOR FOOTING/FLOOR  
REINFORCEMENT PLAN.



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**PURDY MESA FLOWLINE REPLACEMENT**  
**CITY OF GRAND JUNCTION**  
**BID ALTERNATIVE 3**  
**TANK WALL AND FOOTING DETAILS**

FILE: 81-18-013 S-101X  
 JUB PROJ. #: 81-18-013  
 DRAWN BY: JMM  
 DESIGN BY: ---  
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 AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY  
 LAST UPDATED: 8/23/2018  
**SHEET NUMBER:**  
**S3-501**

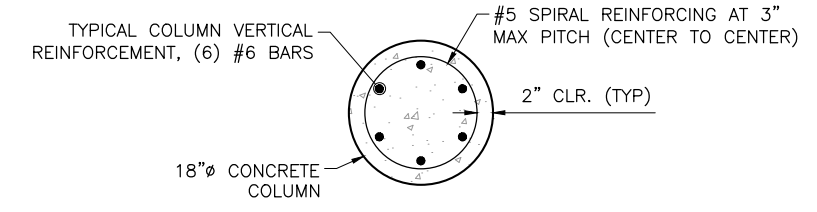


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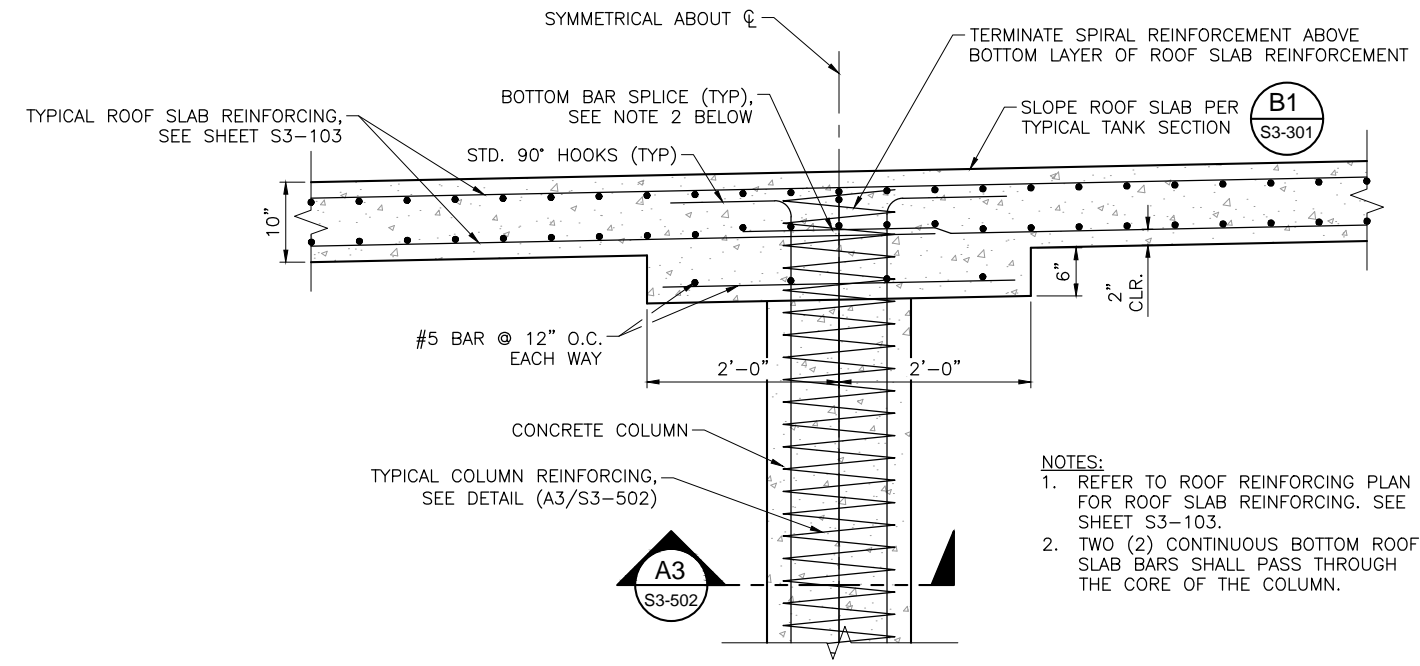
NO.	REVISION	DESCRIPTION	BY	APPR.	DATE

PURDY MESA FLOWLINE REPLACEMENT  
 CITY OF GRAND JUNCTION  
 BID ALTERNATIVE 3  
 TANK COLUMN DETAILS

FILE: 81-18-013 S-101X  
 JUB PROJ. #: 81-18-013  
 DRAWN BY: JMM  
 DESIGN BY: JMM  
 CHECKED BY: ---  
 AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY  
 LAST UPDATED: 8/23/2018  
 SHEET NUMBER:  
**S3-502**

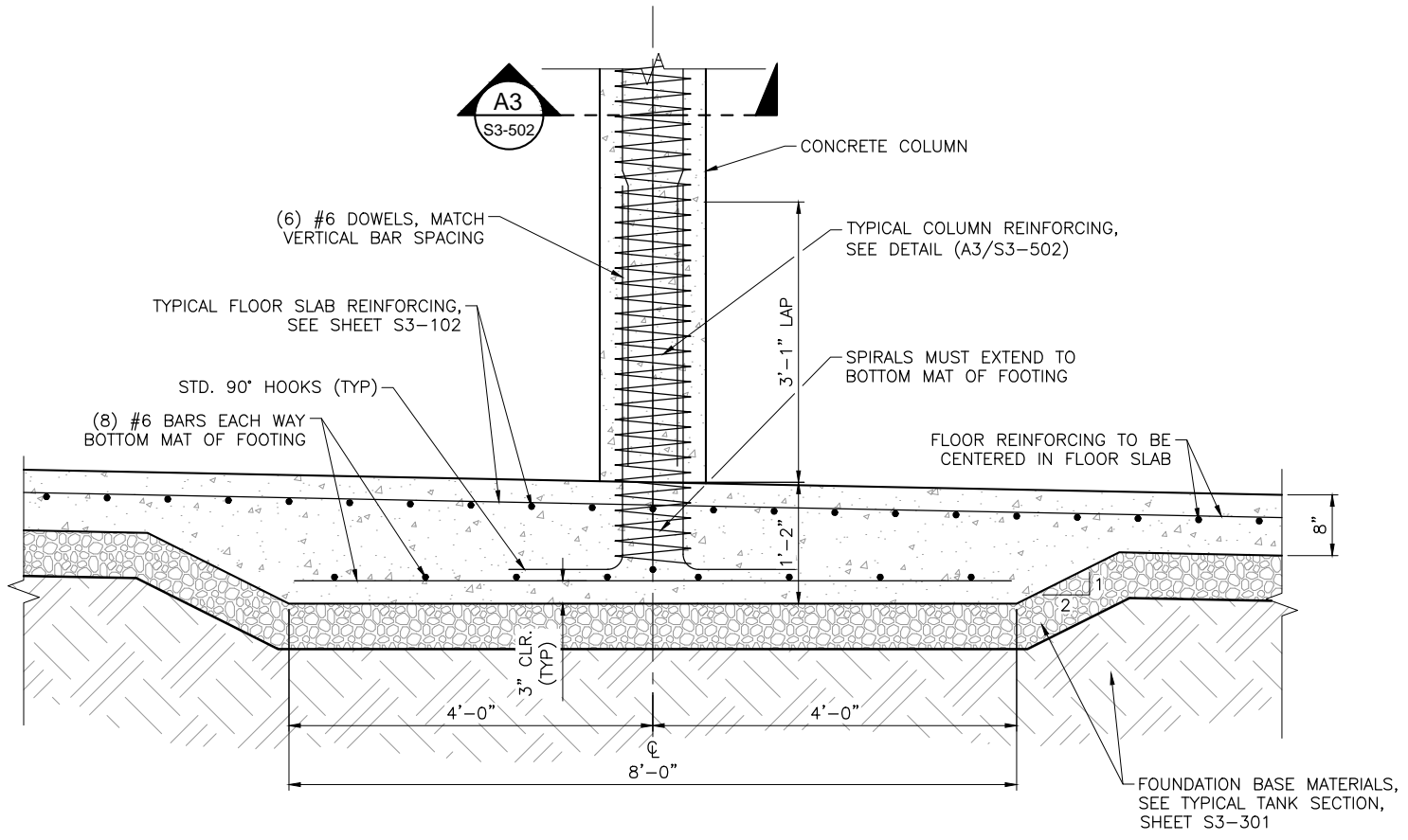


**A3** TYPICAL COLUMN SECTION  
 SCALE: NOT TO SCALE



- NOTES:  
 1. REFER TO ROOF REINFORCING PLAN FOR ROOF SLAB REINFORCING. SEE SHEET S3-103.  
 2. TWO (2) CONTINUOUS BOTTOM ROOF SLAB BARS SHALL PASS THROUGH THE CORE OF THE COLUMN.

**B1** TYPICAL TANK COLUMN TO ROOF CONNECTION DETAIL  
 SCALE: NOT TO SCALE



**D1** TYPICAL TANK COLUMN FOOTING DETAIL  
 SCALE: NOT TO SCALE

File Date: 8/23/2018 5:02 PM Printed By: Erik Christensen  
 Date Created: 8/23/18 10:06 AM Project: PURDY MESA FLOWLINE REPLACEMENT SHEET: B1-18-013 S-101X.DWG

**BID SET**



NO.	REVISION	DESCRIPTION	BY	APPROVED	DATE

**PURDY MESA FLOWLINE REPLACEMENT  
 CITY OF GRAND JUNCTION**

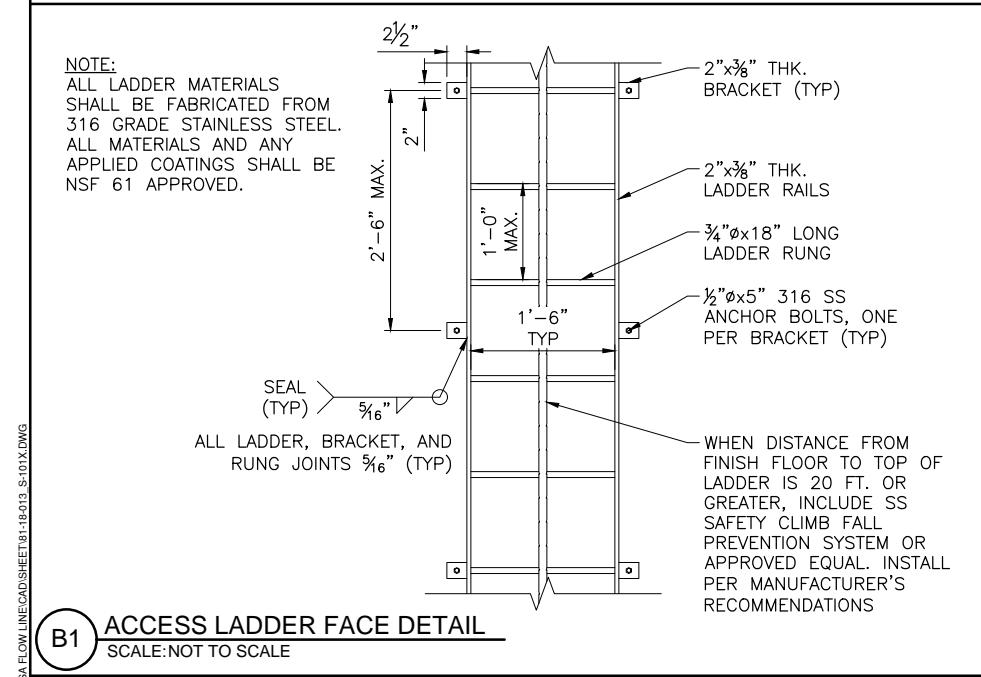
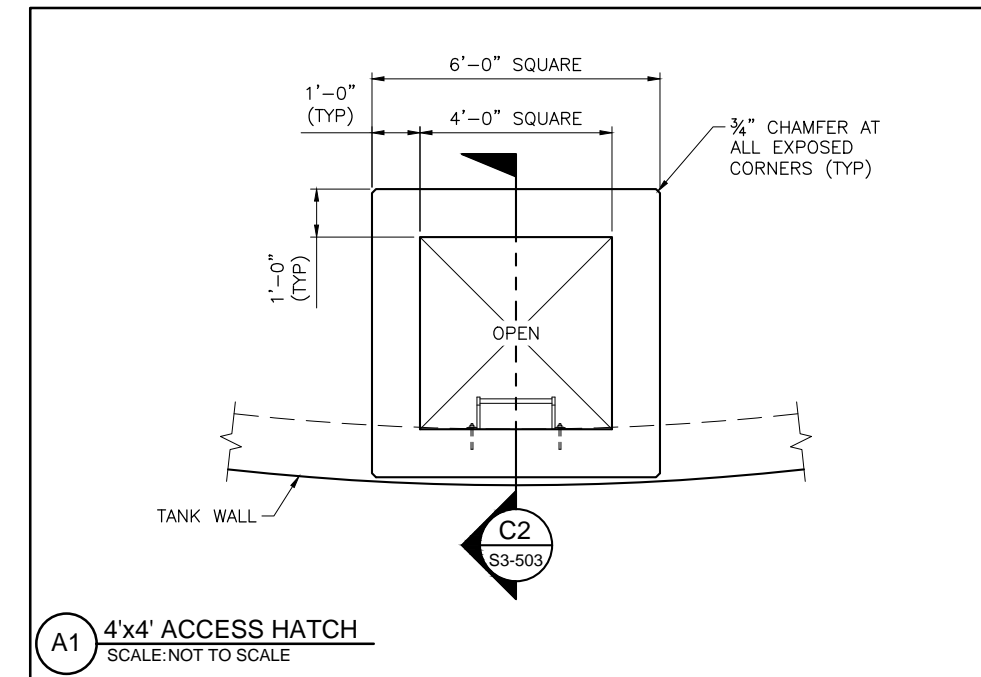
**TANK ACCESS HATCH AND LADDER DETAILS**

FILE: 81-18-013 S-101X  
 JUB PROJ. #: 81-18-013  
 DRAWN BY: JMM  
 DESIGN BY: ---  
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ONE INCH  
 AT FULL SIZE, IF NOT ONE  
 INCH, SCALE ACCORDINGLY  
 LAST UPDATED: 8/23/2018

SHEET NUMBER:

**S3-503**

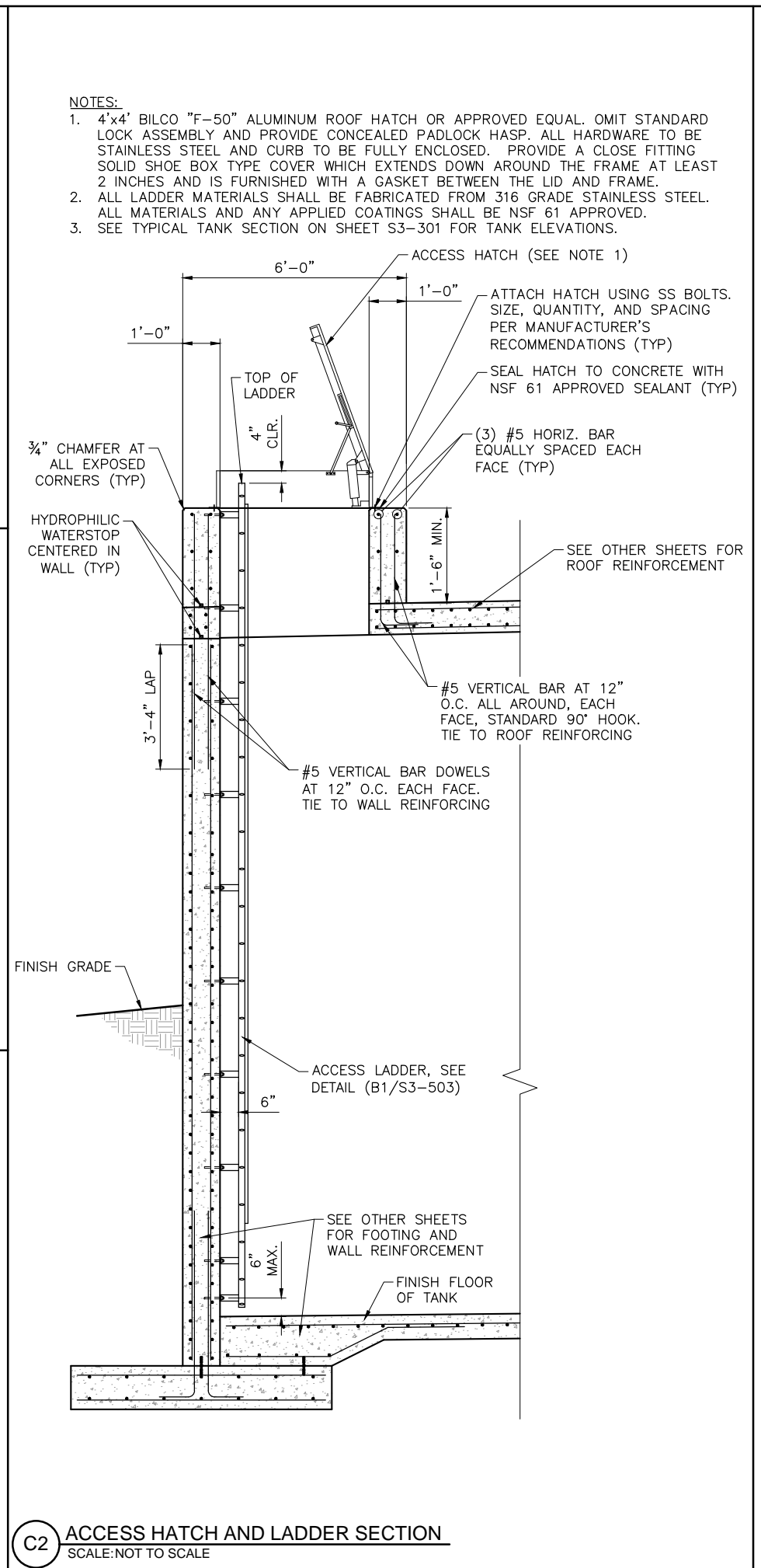


FILE: 81-18-013 S-101X  
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 INCH, SCALE ACCORDINGLY  
 LAST UPDATED: 8/23/2018

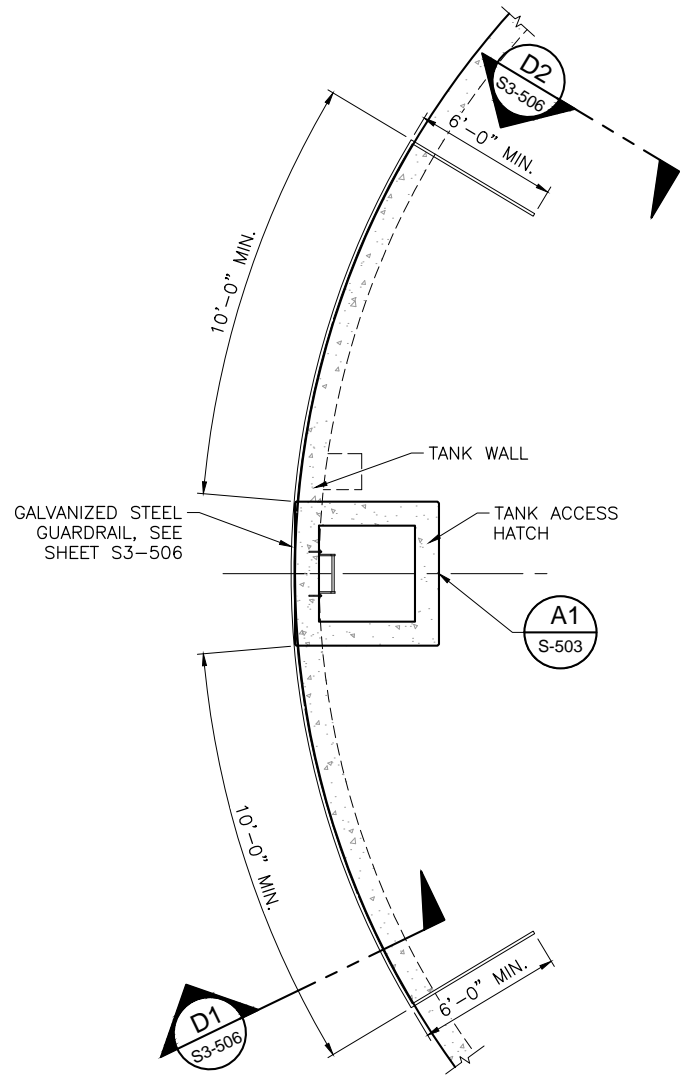
SHEET NUMBER:  
**S3-503**

Plot Date: 8/23/2018 10:02 PM  
 Printed By: Erik Chelstman  
 Date Created: 8/23/18 10:02 AM  
 JUB PROJECT: SUB GRAND JUNCTION 81-18-013  
 CITY OF GRAND JUNCTION  
 PURDY MESA FLOWLINE REPLACEMENT SHEET: S3-503 S-101X.DWG

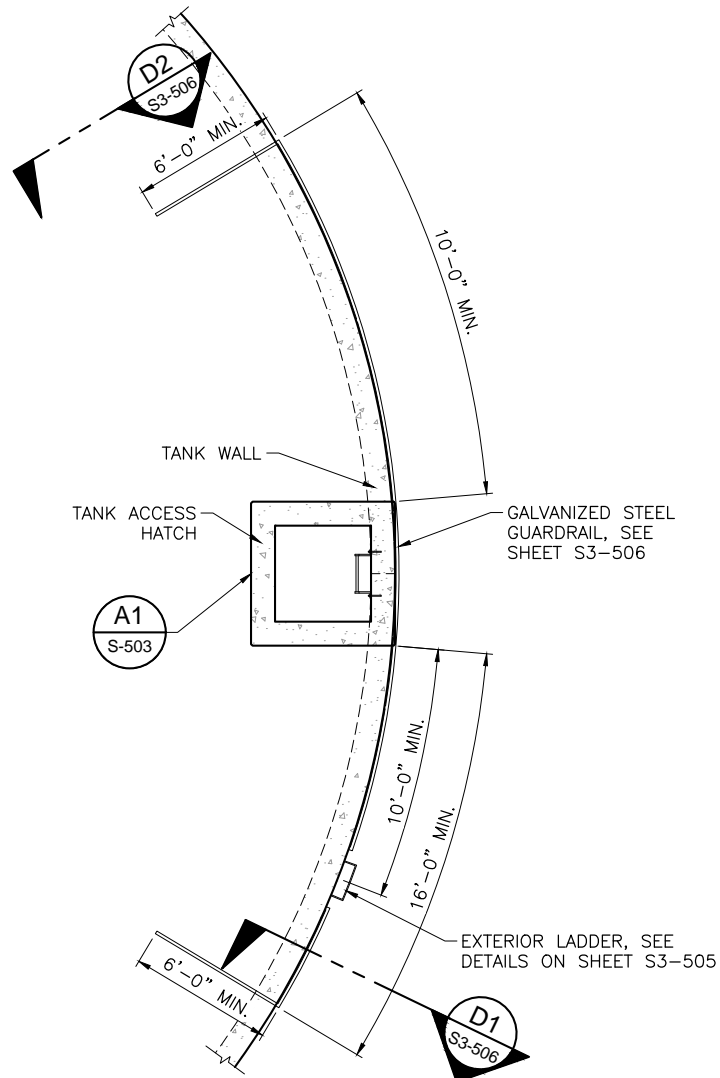


**C2 ACCESS HATCH AND LADDER SECTION  
 SCALE: NOT TO SCALE**

File Date: 8/23/2018 10:03 PM Printed By: Erick Christensen  
 Date Created: 8/23/18 10:06 AM Project: PURDY MESA FLOWLINE REPLACEMENT PROJECT



**D1** SOUTHWEST SIDE TANK GUARDRAIL PLAN  
SCALE: NOT TO SCALE



**D2** NORTHEAST SIDE TANK GUARDRAIL PLAN  
SCALE: NOT TO SCALE



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PURDY MESA FLOWLINE REPLACEMENT  
 CITY OF GRAND JUNCTION  
 BID ALTERNATIVE 3  
 GUARDRAIL PLAN

FILE: 81-18-013 S-101X  
 JUB PROJ. #: 81-18-013  
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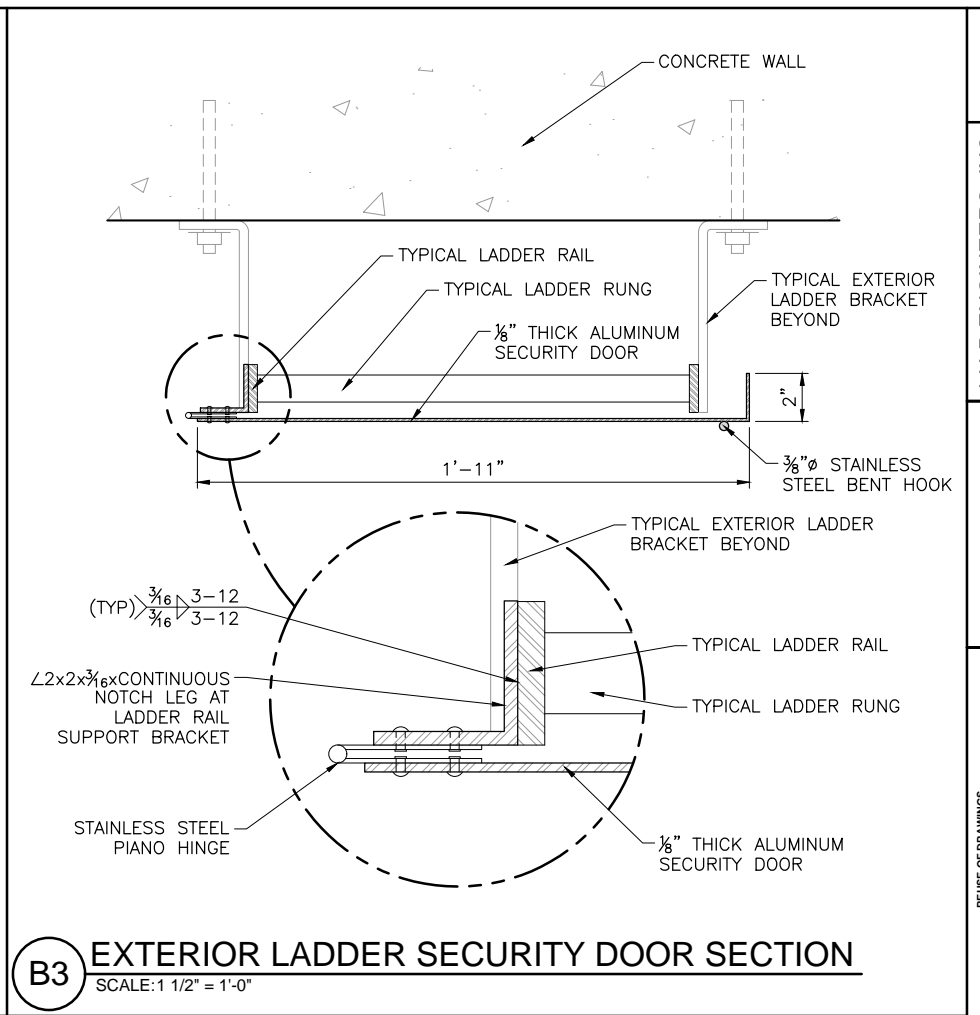
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**S3-504**

BID SET

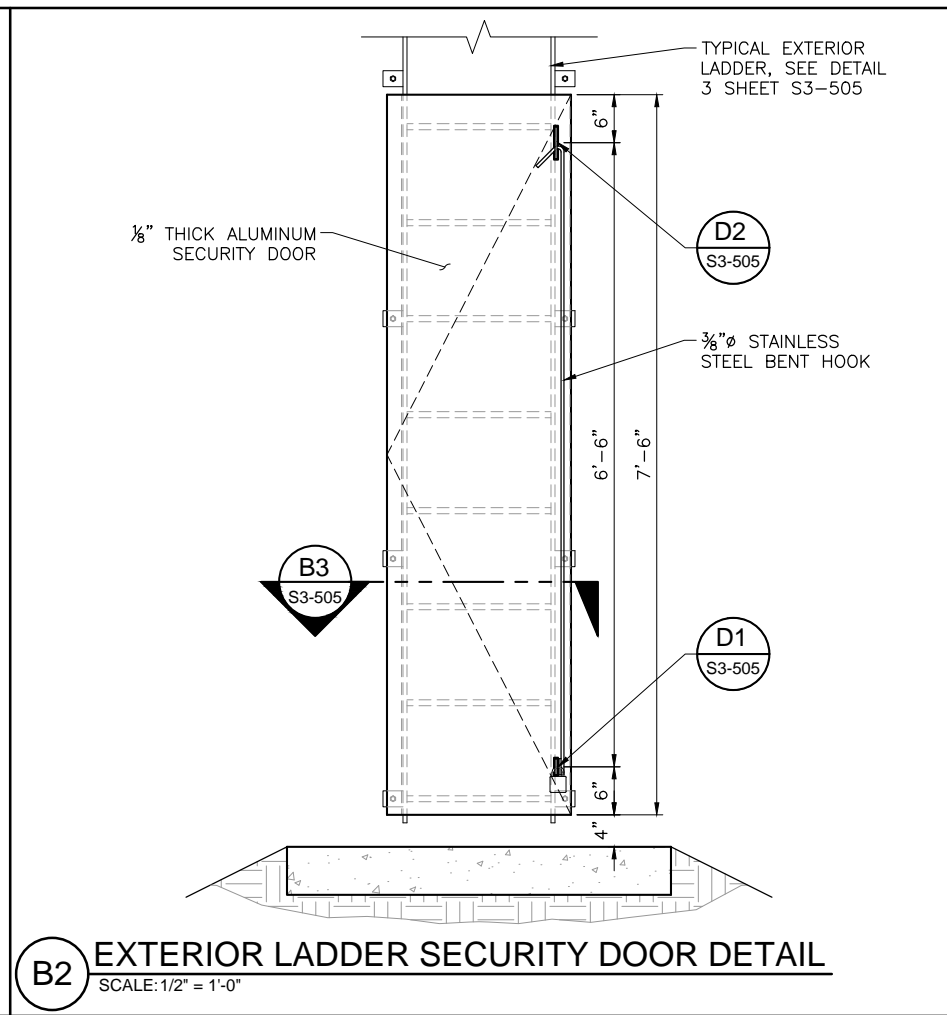


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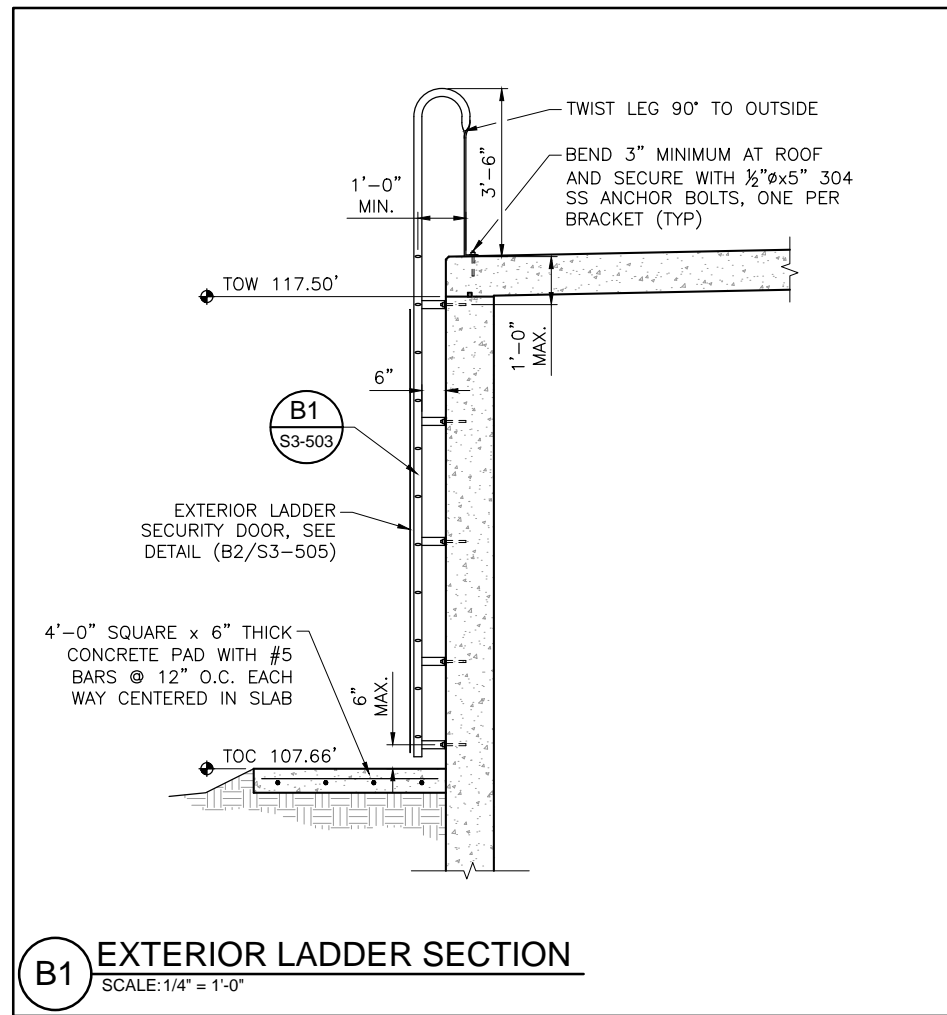
PURDY MESA FLOWLINE REPLACEMENT  
 CITY OF GRAND JUNCTION  
 BID ALTERNATIVE 3  
 EXTERIOR LADDER DETAILS



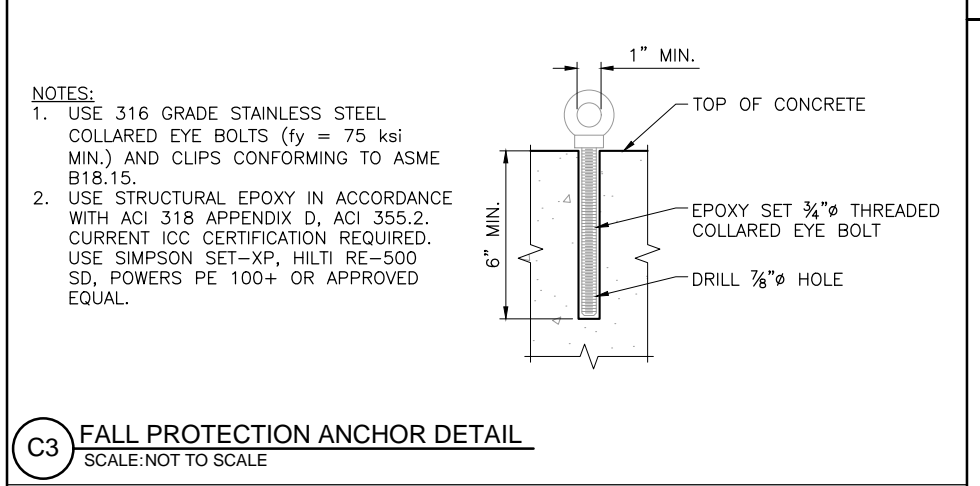
**B3 EXTERIOR LADDER SECURITY DOOR SECTION**  
 SCALE: 1 1/2" = 1'-0"



**B2 EXTERIOR LADDER SECURITY DOOR DETAIL**  
 SCALE: 1/2" = 1'-0"



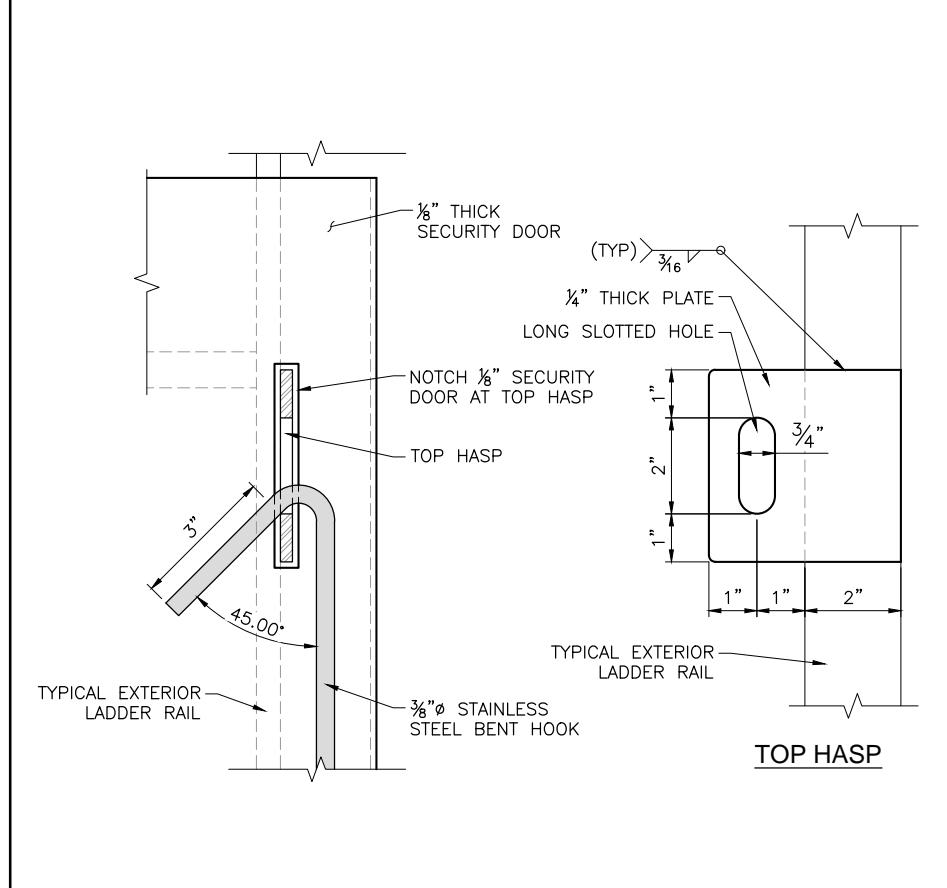
**B1 EXTERIOR LADDER SECTION**  
 SCALE: 1/4" = 1'-0"



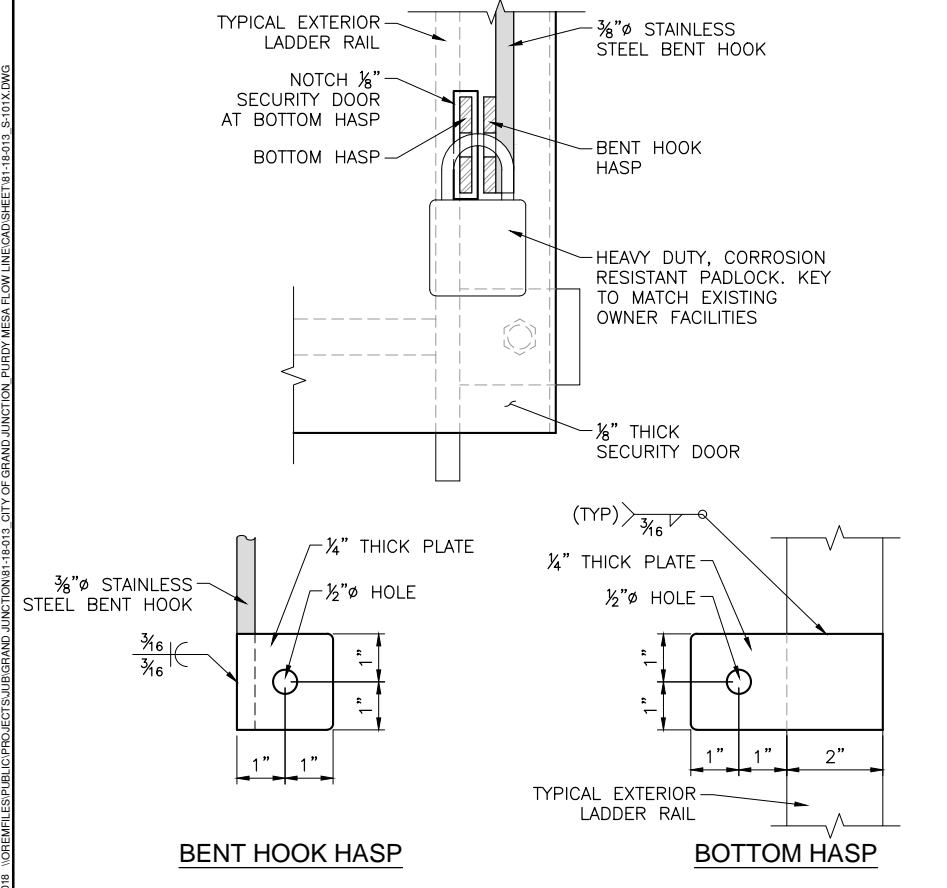
**C3 FALL PROTECTION ANCHOR DETAIL**  
 SCALE: NOT TO SCALE

NOTES:

- USE 316 GRADE STAINLESS STEEL COLLARED EYE BOLTS (fy = 75 ksi MIN.) AND CLIPS CONFORMING TO ASME B18.15.
- USE STRUCTURAL EPOXY IN ACCORDANCE WITH ACI 318 APPENDIX D, ACI 355.2. CURRENT ICC CERTIFICATION REQUIRED. USE SIMPSON SET-XP, HILTI RE-500 SD, POWERS PE 100+ OR APPROVED EQUAL.



**D2 TOP HASP DETAIL**  
 SCALE: 3" = 1'-0"



**D1 BOTTOM HASP DETAIL**  
 SCALE: 3" = 1'-0"

File Date: 8/23/2018 10:05 PM Printed By: Erick Christensen  
 Date Created: 8/23/18 10:05 AM Project: PURDY MESA FLOWLINE REPLACEMENT - BID ALTERNATIVE 3 - CITY OF GRAND JUNCTION - PURDY MESA FLOWLINE REPLACEMENT - BID ALTERNATIVE 3 - S-101X.DWG

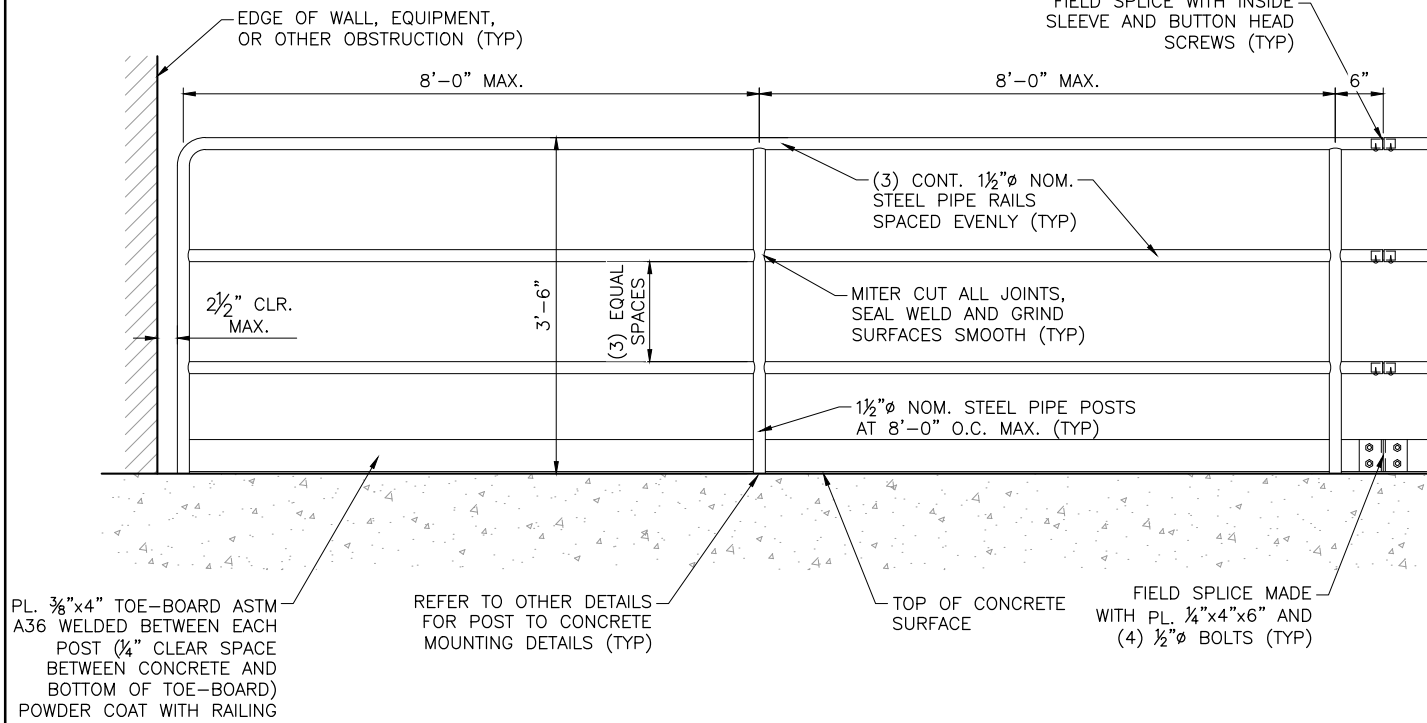
**GENERAL CONSTRUCTION NOTES FOR GALVANIZED STEEL FABRICATIONS**

1. STEEL PIPE TO BE ASTM A53 GRADE B STEEL WITH  $F_y = 35$  KSI
2. STEEL PLATE, CHANNELS, AND ANGLES TO BE ASTM A36 STEEL WITH  $F_y = 36$  KSI
3. ALL WELDING TO CONFORM TO CURRENT AWS D1.1 REQUIREMENTS.
4. COMPLETE ASSEMBLY OR SUB-ASSEMBLIES, BRACKETS, RAILING, AND MISCELLANEOUS STEEL PIECES SHALL BE HOT-DIP GALVANIZED AFTER FABRICATION.
5. STRUCTURAL BOLTS, NUTS & WASHERS SHALL BE HOT-DIP GALVANIZED OR STAINLESS STEEL.
6. EXPANSION ANCHORS TO BE HILTI KWIK-BOLT II OR APPROVED EQUAL. INSTALL EXPANSION ANCHORS PER MANUFACTURER'S WRITTEN INSTRUCTIONS.
7. EXPANSION ANCHOR BOLTS, NUTS & WASHERS SHALL BE STAINLESS STEEL.
8. REFER TO OTHER DETAILS FOR CONCRETE REINFORCING REQUIREMENTS.
9. COORDINATE REBAR PLACEMENT IN CONCRETE TO MISS ANCHOR BOLTS AND INSERTS.
10. FIELD SPLICES SHALL BE MADE UTILIZING GALVANIZED STEEL PIPE SLEEVE INSERTS AND HOT-DIP GALVANIZED OR STAINLESS STEEL BOLTS, NUTS & WASHERS.
11. GALVANIZED AREAS THAT ARE DAMAGED DURING CONSTRUCTION SHALL BE REPAIRED WITH AN APPROVED COLD-GALVANIZING COMPOUND.
12. EPOXY SET ANCHORS SHALL UTILIZE HILTI HIT HY 150 CONSTRUCTION ADHESIVE AND HAS GALVANIZED OR STAINLESS STEEL THREAD RODS.
13. CROSS REFERENCE ASSOCIATED STANDARD DETAILS AS NECESSARY FOR STEEL FABRICATIONS.

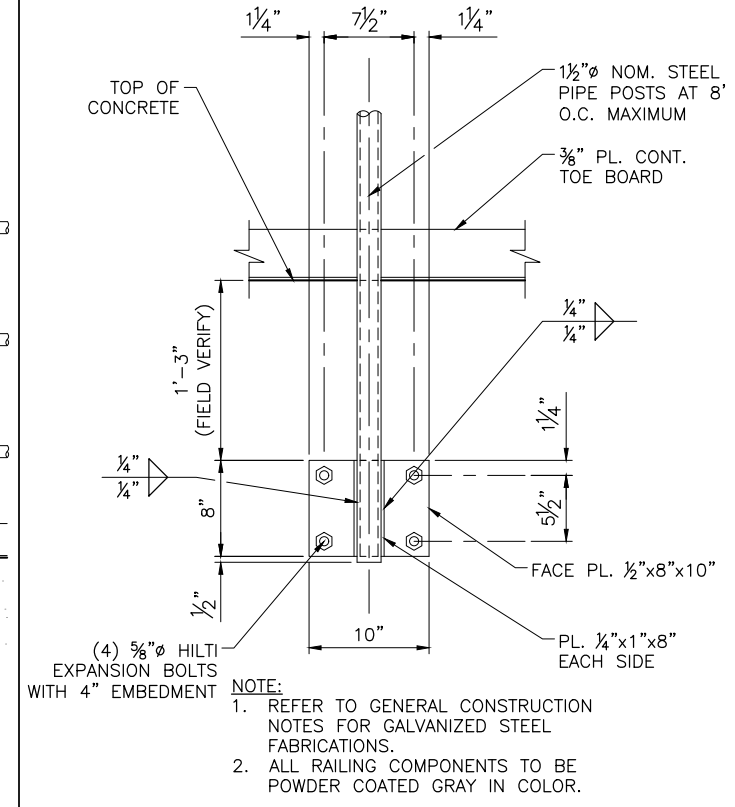
**B1 GENERAL NOTES FOR GALVANIZED STEEL FABRICATIONS**  
SCALE: NOT TO SCALE

**NOTE:**

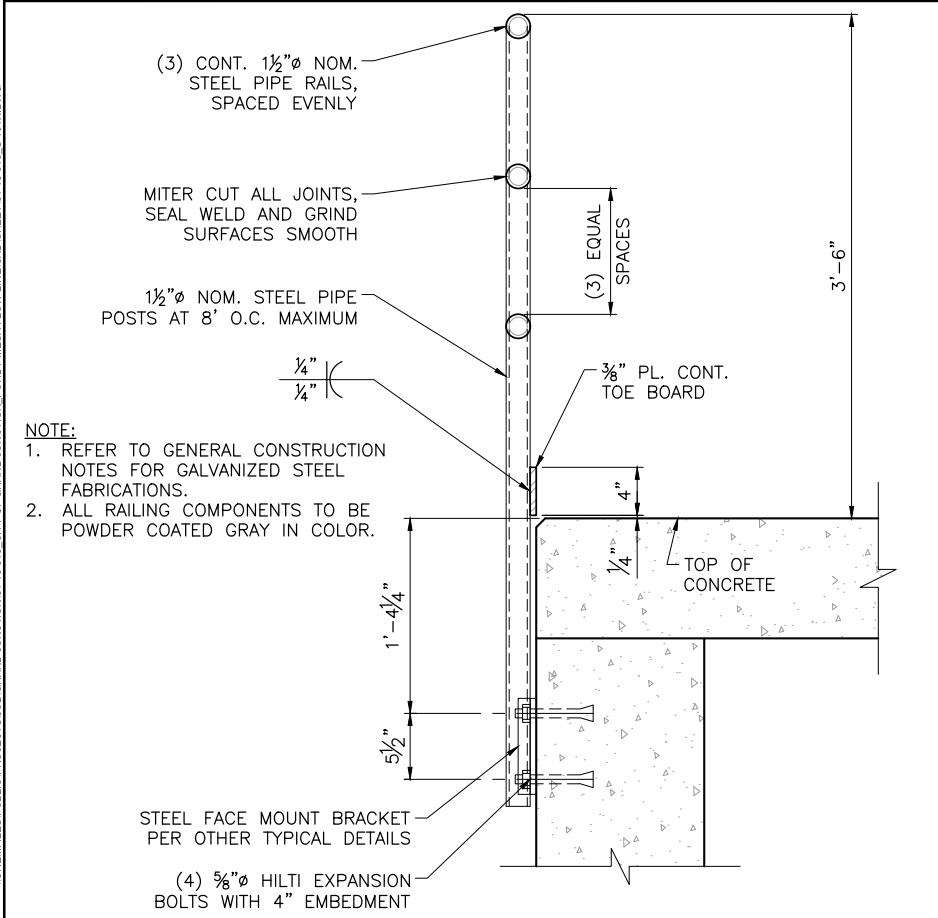
1. REFER TO GENERAL CONSTRUCTION NOTES FOR GALVANIZED STEEL FABRICATIONS.
2. ALL RAILING COMPONENTS TO BE POWDER COATED GRAY IN COLOR.



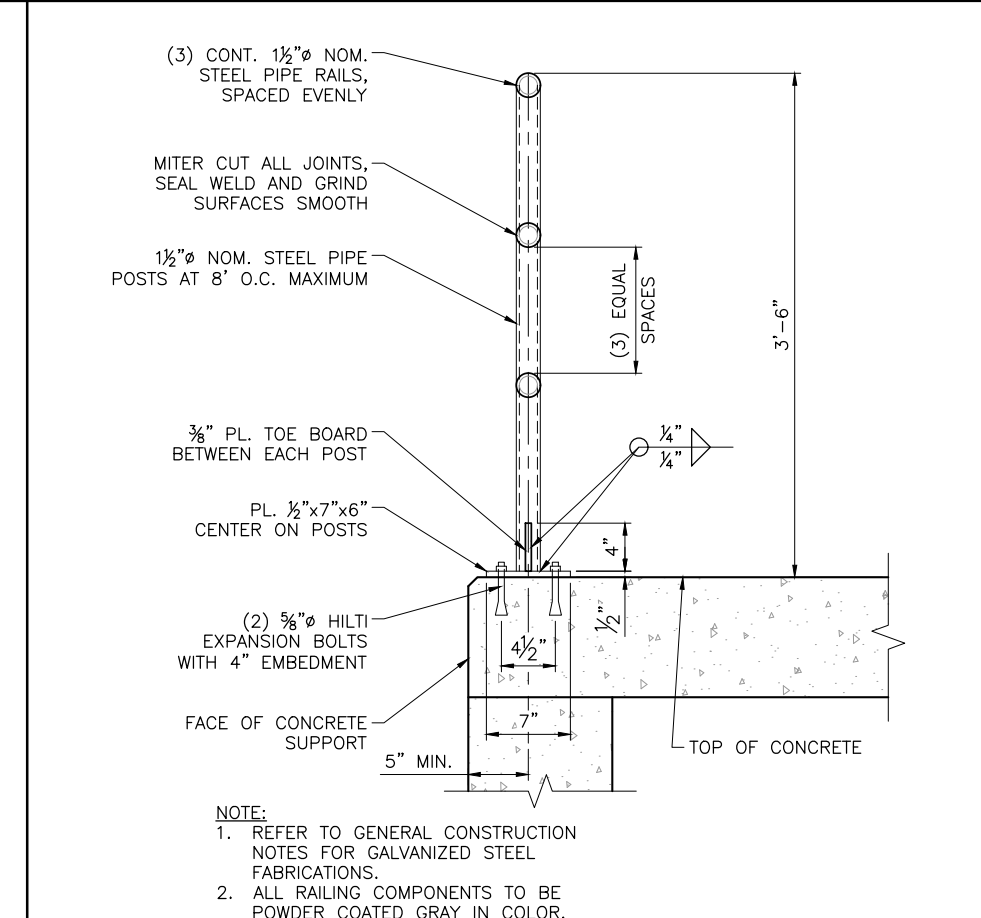
**B2 TYPICAL GALVANIZED STEEL GUARDRAIL**  
SCALE: NOT TO SCALE



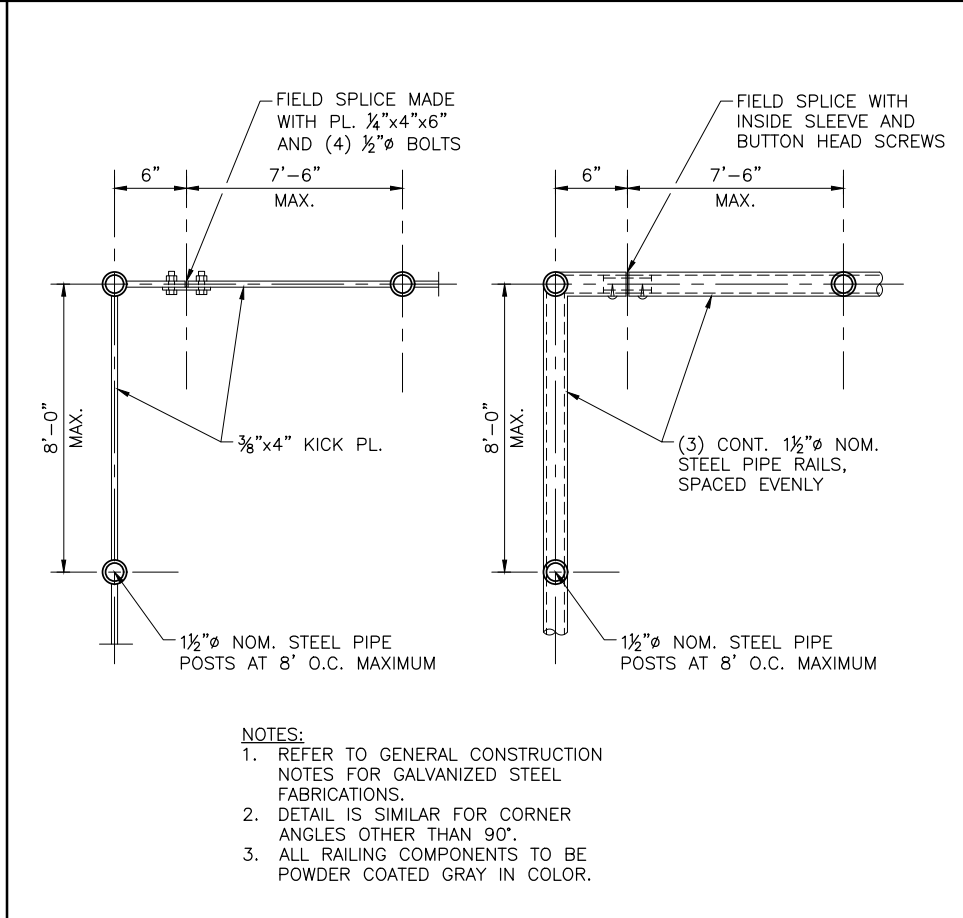
**B4 TYPICAL WALL BRACKET FOR VERTICAL SURFACE RAIL MOUNTING DETAIL**  
SCALE: NOT TO SCALE



**D1 TYPICAL VERTICAL SURFACE MOUNT STEEL RAILING DETAIL**  
SCALE: NOT TO SCALE



**D2 TYPICAL HORIZONTAL SURFACE MOUNT STEEL RAILING DETAIL**  
SCALE: NOT TO SCALE



**D3 TYPICAL GALVANIZED STEEL PIPE RAILING CORNER DETAILS**  
SCALE: NOT TO SCALE



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**PURDY MESA FLOWLINE REPLACEMENT  
CITY OF GRAND JUNCTION  
BID ALTERNATIVE 3  
TYPICAL RAILING DETAILS**

FILE: 81-18-013 S-101X  
JUB PROJ. #: 81-18-013  
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LAST UPDATED: 8/23/2018  
SHEET NUMBER:  
**S3-506**

Purdy Mesa Flowline Replacement - City of Grand Junction - Bid Alternative 3 - Typical Railing Details - S-101X.DWG  
 Date: 8/23/2018 10:08 PM  
 Printed By: Erick Christensen  
 Drawn By: JMM

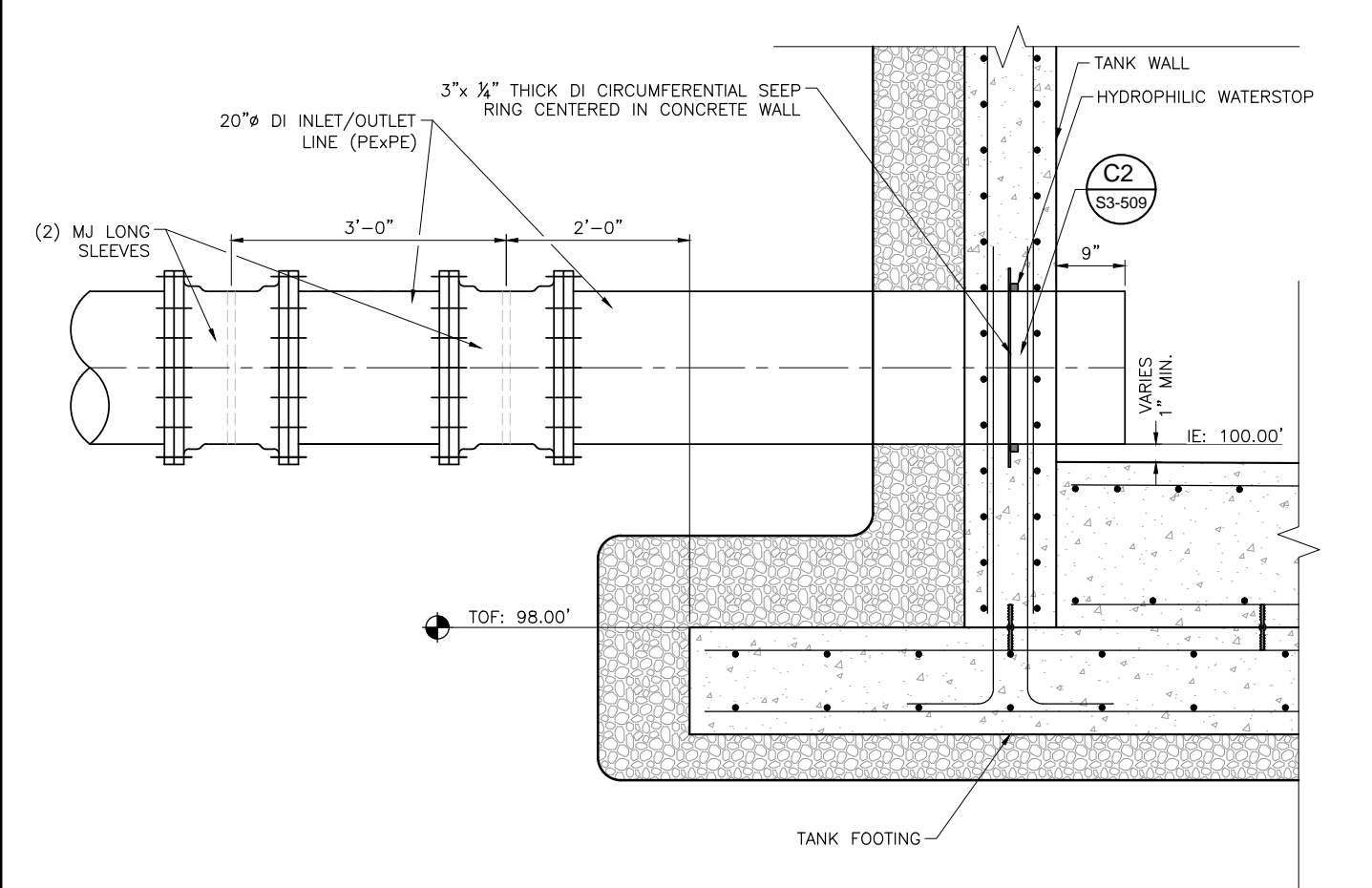




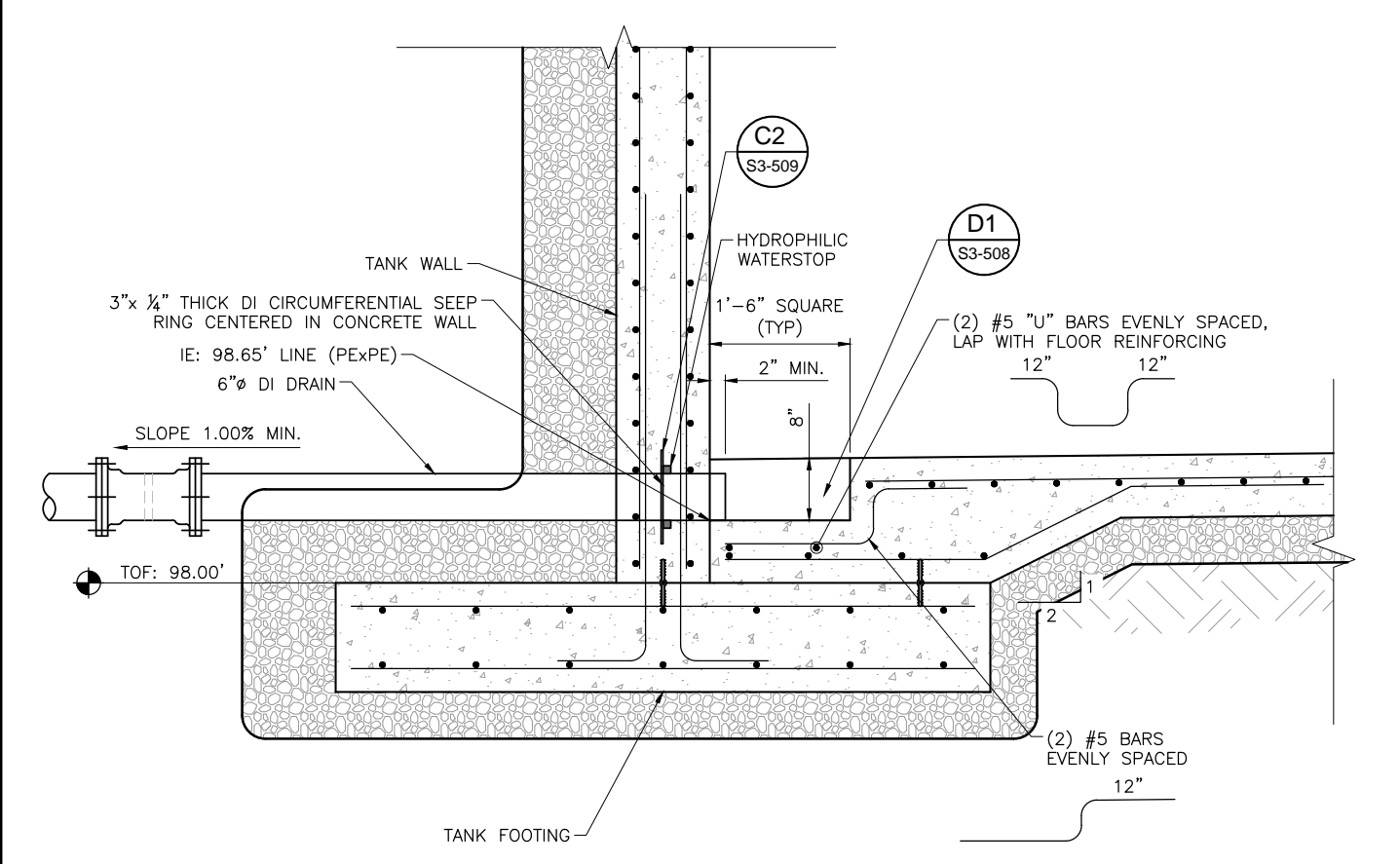
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PURDY MESA FLOWLINE REPLACEMENT  
 CITY OF GRAND JUNCTION  
 BID ALTERNATIVE 3  
 TANK PIPING DETAILS

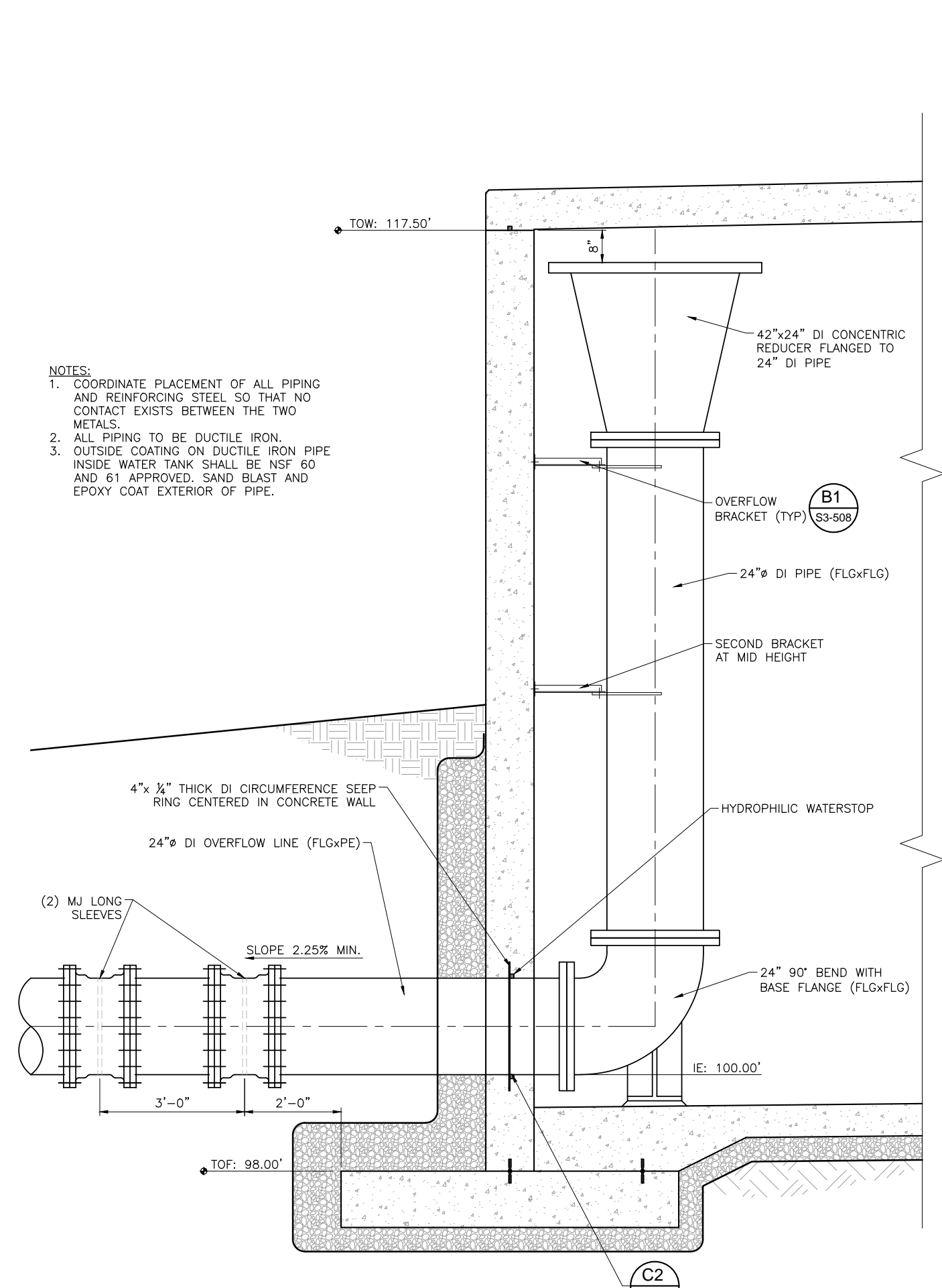
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 LAST UPDATED: 8/23/2018  
 SHEET NUMBER:  
**S3-507**



**B3 TANK INLET/OUTLET DETAIL**  
 SCALE: NOT TO SCALE



**D3 TANK DRAIN DETAIL**  
 SCALE: NOT TO SCALE



**D1 TANK OVERFLOW DETAIL**  
 SCALE: NOT TO SCALE

- NOTES:**
- COORDINATE PLACEMENT OF ALL PIPING AND REINFORCING STEEL SO THAT NO CONTACT EXISTS BETWEEN THE TWO METALS.
  - ALL PIPING TO BE DUCTILE IRON.
  - OUTSIDE COATING ON DUCTILE IRON PIPE INSIDE WATER TANK SHALL BE NSF 60 AND 61 APPROVED. SAND BLAST AND EPOXY COAT EXTERIOR OF PIPE.

File Date: 8/23/2018 3:07 PM Printed By: Erik Christensen  
 Date Created: 8/23/18 10:06 AM Project: PURDY MESA FLOWLINE REPLACEMENT SHEET: S3-507.DWG

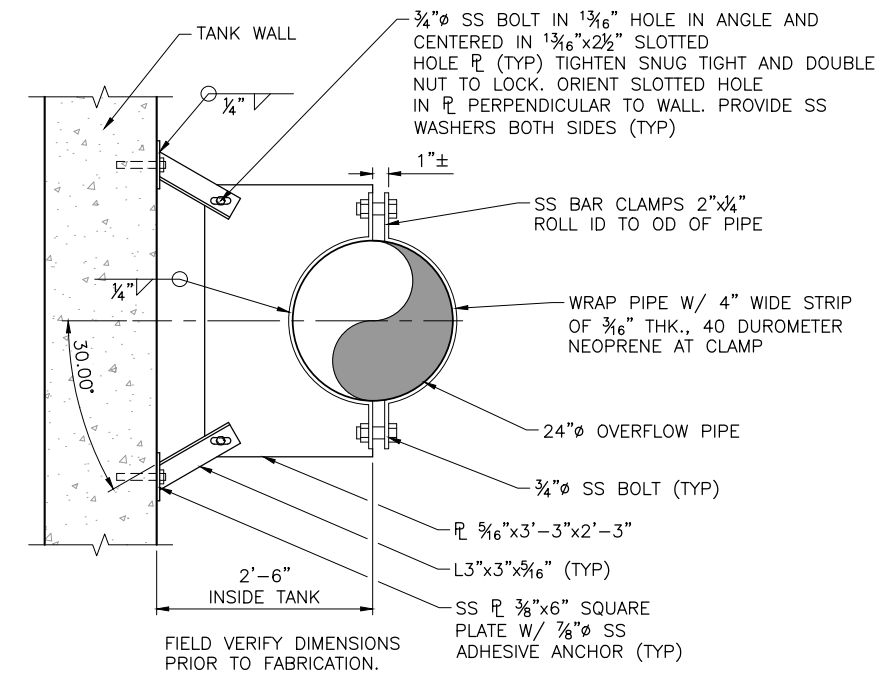
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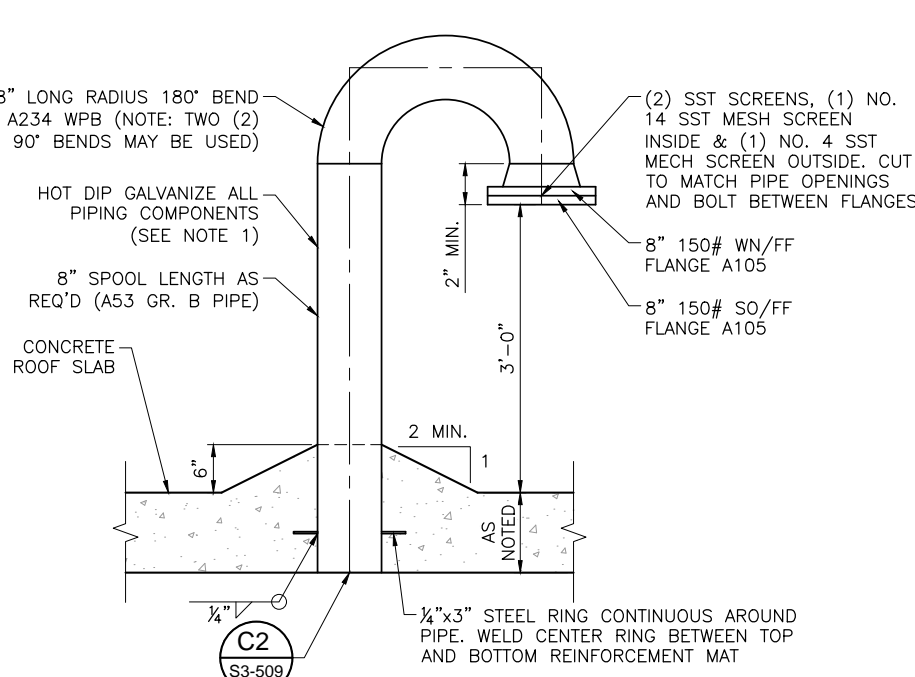
PURDY MESA FLOWLINE REPLACEMENT  
 CITY OF GRAND JUNCTION

BID ALTERNATIVE 3  
 TANK PIPING DETAILS



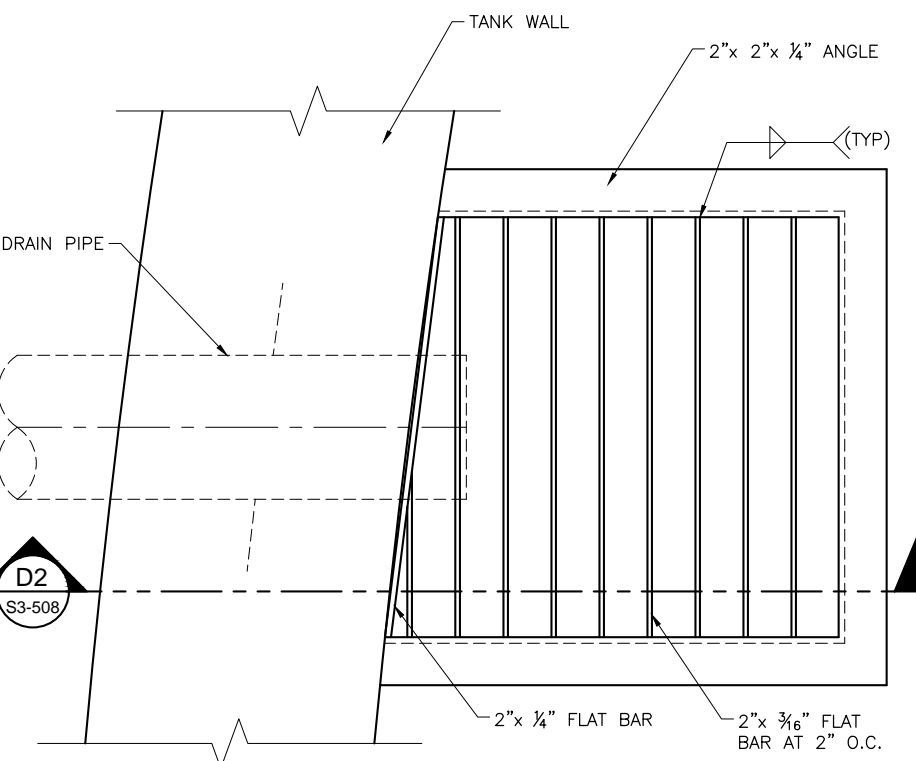
- NOTES:**
- LOCATE BRACES TO BE CLEAR OF OPENING ABOVE. ADJUST OVERFLOW LOCATION IF NECESSARY.
  - FIELD LOCATE ANCHOR TO MISS REINFORCING BY 3" MIN (TYP EACH SIDE).
  - ALL BRACKET MATERIALS SHALL BE FABRICATED FROM 316 GRADE STAINLESS STEEL. ALL MATERIALS AND ANY APPLIED COATINGS SHALL BE NSF 61 APPROVED.

**B1** OVERFLOW BRACKET DETAIL  
 SCALE: NOT TO SCALE



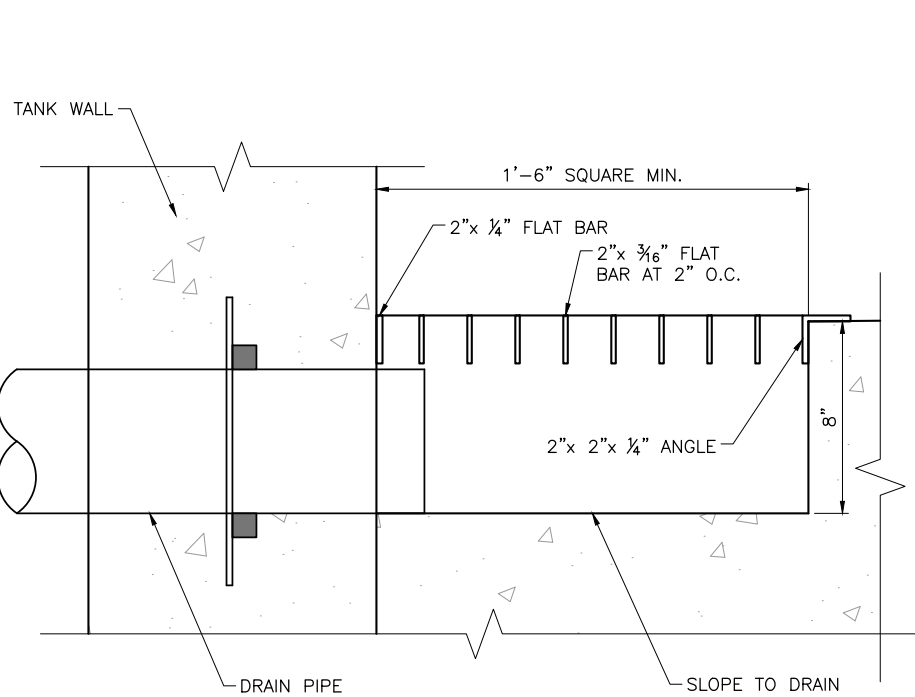
- NOTES:**
- VENT PIPING SHALL BE HOT DIPPED GALVANIZED (INTERIOR AND EXTERIOR) TOUCH UP AFTER INSTALLATION USING NSF 61 APPROVED GALVANIC PAINT.
  - SLAB REINFORCEMENT NOT SHOWN FOR CLARITY, REFER TO OTHER DETAILS FOR REINFORCEMENT REQUIREMENTS.
  - REFER TO ROOF PLAN FOR VENT LOCATIONS.
  - STEEL PIPE SHALL BE MINIMUM STANDARD SCHEDULE 40 PIPE.
  - FLANGES SHALL BE WELD NECK AND SLIP-ON FLANGES RATED TO 150 LB. AS SHOWN ON DETAIL. USE SST BOLTS A182 TP304.

**B2** AIR VENT DETAIL  
 SCALE: NOT TO SCALE



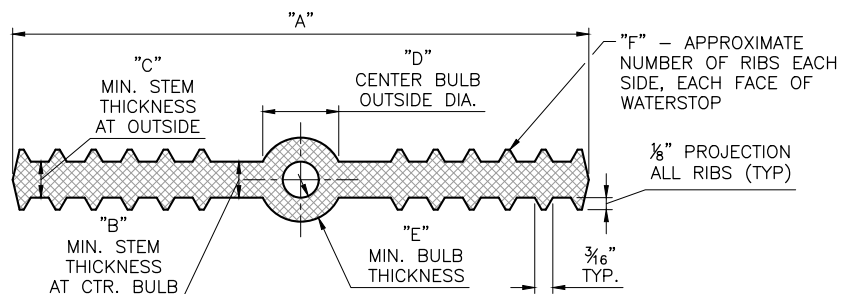
- NOTES:**
- CONTRACTOR TO VERIFY DIMENSIONS PRIOR TO FABRICATION.
  - ALL SCREEN MATERIALS SHALL BE FABRICATED FROM 316 GRADE STAINLESS STEEL. ALL MATERIALS AND ANY APPLIED COATINGS SHALL BE NSF 61 APPROVED.

**D1** SUMP SCREEN PLAN  
 SCALE: NOT TO SCALE



**D2** SUMP SCREEN SECTION  
 SCALE: NOT TO SCALE

File: D:\Users\jmm\OneDrive\Documents\81-18-013 - PURDY MESA FLOWLINE REPLACEMENT\PROJECTS\JUB\GRAND JUNCTION\81-18-013 - S-101X.DWG  
 Date: 8/23/2018 10:07 AM  
 Plotted By: Erick Christensen  
 Date: 8/23/2018 10:07 AM  
 Project: PURDY MESA FLOWLINE REPLACEMENT

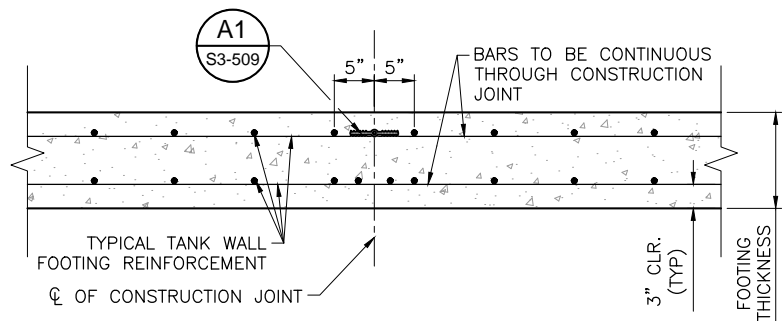


SIZE	A	B	C	D	E	F
6" x 3/8"	6"	3/8"	3/8"	7/8"	1/4"	6

NOTE:  
SEE SECTION 03 15 16 OF THE SPECIFICATIONS FOR WATERSTOP REQUIREMENTS

- NOTES:
1. PROVIDE PREFABRICATED INTERSECTION PIECES AND FULLY WELD ALL WATERSTOP PIECES TOGETHER AT INTERSECTIONS PER MANUFACTURER'S REQUIREMENTS.
  2. INSTALL WATERSTOP PER MANUFACTURER'S RECOMMENDATIONS. WATERSTOP SHALL BE ENVELOPED WITH CONCRETE FREE OF AIR POCKETS AND DEBRIS. PRIOR TO CONSTRUCTION, THE CONTRACTOR WILL DEMONSTRATE THE METHOD OF PLACEMENT OF THE CONCRETE AROUND THE WATERSTOP TO THE ENGINEER.

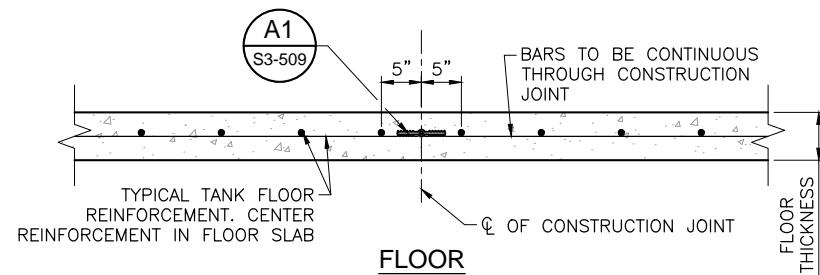
**A1** PVC WATERSTOP DETAIL  
SCALE: NOT TO SCALE



**WALL FOOTING**

- NOTES:
1. MODIFICATIONS TO FLOOR SLAB CONSTRUCTION JOINT LOCATIONS MUST BE APPROVED BY THE ENGINEER PRIOR TO CONSTRUCTION.

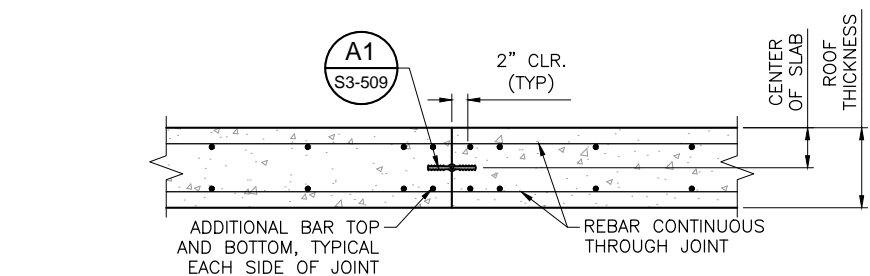
**A2** TANK WALL FOOTING AND FLOOR SLAB CONSTRUCTION JOINT DETAIL  
SCALE: NOT TO SCALE



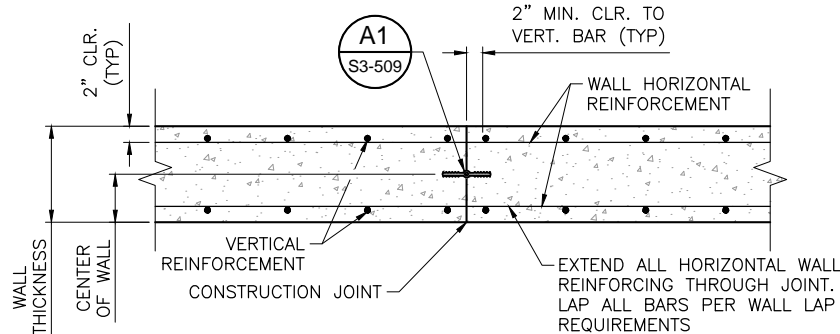
**TYPICAL TANK FLOOR REINFORCEMENT. CENTER REINFORCEMENT IN FLOOR SLAB**

**FLOOR**

**FLOOR THICKNESS**

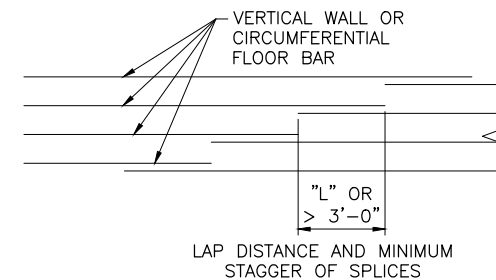


**B1** TYPICAL ROOF SLAB CONSTRUCTION JOINT DETAIL  
SCALE: NOT TO SCALE

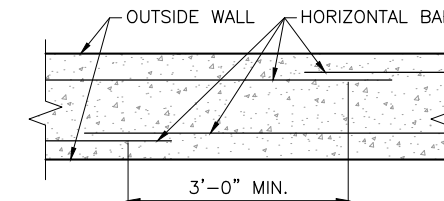


**B2** TYPICAL TANK WALL VERTICAL CONSTRUCTION JOINT DETAIL  
SCALE: NOT TO SCALE

- NOTES:
1. USE SPLICE LENGTH ON DETAIL (B1/S3-510), UNLESS A SPECIFIC SPLICE LENGTH IS CALLED OUT ELSEWHERE ON THE PLANS.
  2. SPLICES IN HORIZONTAL WALL REINFORCEMENT SHALL BE STAGGERED HORIZONTALLY (CENTER OF LAP BELOW TO CENTER OF LAP ABOVE) BY NO LESS THAN ONE LAP LENGTH NOR 3'-0" AND SHALL NOT COINCIDE IN VERTICAL ARRAYS MORE FREQUENTLY THAN EVERY THIRD BAR.
  3. HORIZONTAL WALL SPLICES ON EACH FACE IN THE SAME HORIZONTAL PLANE SHALL BE SEPARATED HORIZONTALLY BY NOT LESS THAN ONE LAP LENGTH NOR 3'-0" FROM CENTER TO CENTER



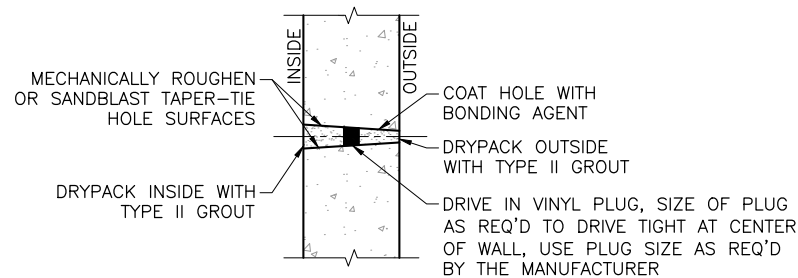
**PROFILE VIEW**



**PLAN VIEW**

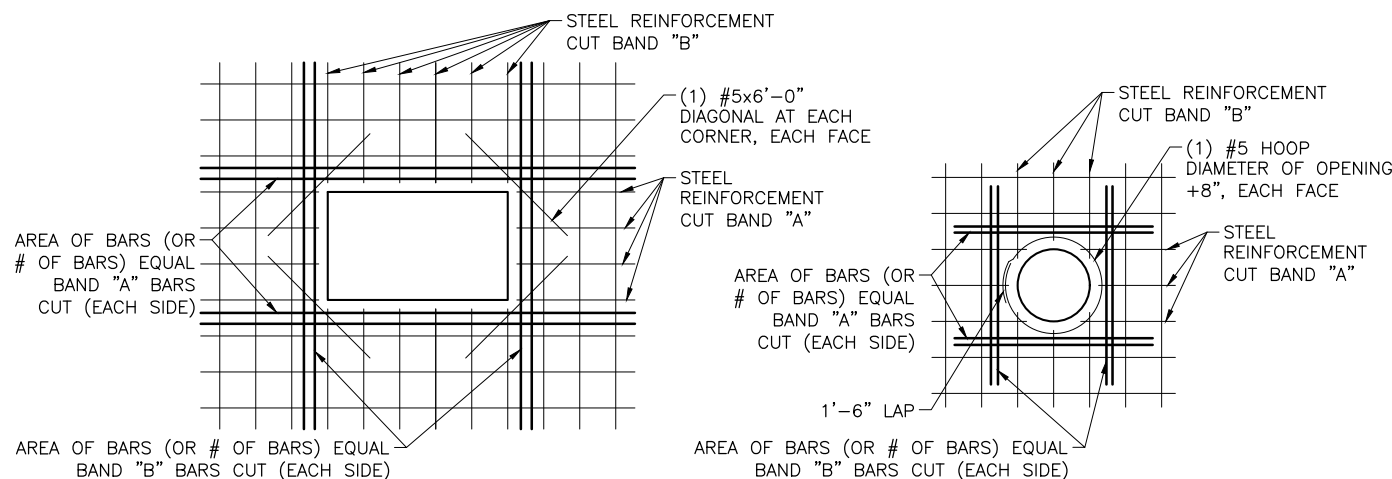
**B3** TYPICAL SPLICE DETAIL  
SCALE: NOT TO SCALE

- CONSTRUCTION STEPS:
1. SANDBLAST OR MECHANICALLY ROUGHEN WITH ELECTRIC EQUIPMENT.
  2. DRIVE IN VINYL PLUG.
  3. COAT INSIDE AND WHILE BONDING AGENT IS TACKY, DRYPACK INSIDE.
  4. COAT OUTSIDE AND WHILE BONDING AGENT IS TACKY, DRYPACK OUTSIDE.



NOTE:  
MINIMUM DIAMETER AT OUTSIDE = 1" TAPER HOLE SO THAT MINIMUM INSIDE DIAMETER = 1 1/4"

**C1** FORM TIE THROUGH BOLT SEAL DETAIL  
SCALE: NOT TO SCALE



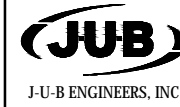
**SQUARE/RECTANGULAR OPENINGS**

**CIRCULAR OPENINGS**

**C2** OPENING REINFORCING DETAIL  
SCALE: NOT TO SCALE

- GENERAL NOTES:
1. TYPICAL FOR ALL OPENINGS IN CONCRETE WALLS AND SLABS UNLESS INDICATED OTHERWISE ON PLANS.
  2. DO NOT WELD REINFORCEMENT TO PIPE SLEEVES, INSERTS OR EMBEDMENTS.
  3. PROVIDE A MINIMUM OF TWO (2) "A" BARS AND TWO (2) "B" BARS EACH SIDE OF OPENING (1 EACH FACE).
  4. SPACE BARS AT 3 BAR DIAMETERS (OR 3" MIN) ON CENTER.
  5. IF OPENING REINFORCING TERMINATES AT THE EDGE OF THE SLAB PROVIDE A STANDARD HOOK ON THE "EDGE" SIDE OF THE REINFORCING.
  6. EXTEND BARS REQUIRED SPLICE LAP LENGTH BEYOND EDGE OF OPENING, SEE TABLE ON DETAIL (B1/S3-510).
  7. AT CIRCULAR OPENING PIPE PENETRATIONS, CONTRACTOR SHALL CAST PIPE IN SEEP RING.

NOTE:  
COORDINATE PLACEMENT OF ALL PIPING AND REINFORCING STEEL SO THAT NO CONTACT EXISTS BETWEEN THE TWO METALS.



J-U-B ENGINEERS, INC.

J-U-B ENGINEERS, INC.  
305 Main Street  
Palisade, CO 81526  
Phone: 970.208.8508  
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BID SET



NO.	DESCRIPTION	BY	APPR.	DATE

PURDY MESA FLOWLINE REPLACEMENT  
CITY OF GRAND JUNCTION

BID ALTERNATIVE 3  
TYPICAL CONCRETE DETAILS

FILE: 81-18-013 S-101X  
JUB PROJ. #: 81-18-013  
DRAWN BY: JMM  
DESIGN BY: ---  
CHECKED BY: ---  
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY  
LAST UPDATED: 8/23/2018  
SHEET NUMBER:

S3-509

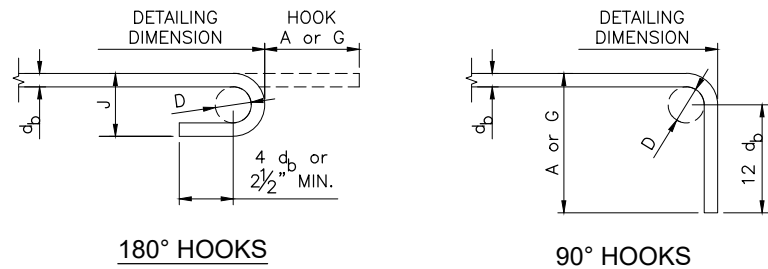
**TYPICAL LAP SPLICE LENGTHS IN INCHES, PER ACI 318 / 350**

BAR SIZE	LAP CLASS	f'c=3,000 psi		f'c=4,000 psi		f'c=4,500 psi		f'c=5,000 psi	
		CAT. 1	CAT. 2	CAT. 1	CAT. 2	CAT. 1	CAT. 2	CAT. 1	CAT. 2
#4	A	22	33	19	28	18	27	17	25
	B	28	43	25	37	24	35	22	33
#5	A	27	41	24	36	23	34	21	32
	B	36	53	31	46	30	44	28	41
#6	A	33	49	28	43	27	41	25	38
	B	43	64	37	55	36	53	33	50
#7	A	48	72	42	62	40	59	37	56
	B	62	93	54	81	51	77	48	72
#8	A	55	82	47	71	45	68	42	64
	B	71	106	61	92	58	88	55	83
#9	A	62	92	53	80	51	76	48	72
	B	80	120	69	104	66	99	62	93

**NOTES:**

- FOR GRADE 60 REINFORCING STEEL BARS.
- ALL LAP SPLICES SHALL BE CLASS B, UNLESS NOTED OTHERWISE.
- CATEGORY 1: CLEAR COVER  $\geq d_b$  AND CLEAR SPACING  $\geq d_b$ , AND STIRRUPS OR TIES THROUGHOUT  $L_d$  ARE PROVIDED.  
CATEGORY 1: CLEAR COVER  $\geq d_b$  AND CLEAR SPACING  $\geq 2d_b$ .  
CATEGORY 2: CLEAR COVER  $< d_b$  OR CLEAR SPACING  $< 2d_b$ .
- FOR TOP BARS, MULTIPLY LAP LENGTH LISTED BY 1.30. TOP BARS ARE HORIZONTAL BARS WITH MORE THAN 12" OF CONCRETE CAST BELOW THE BARS.
- FOR EPOXY COATED BARS, LAP LENGTHS SHALL BE MULTIPLIED BY 1.20.

**B1 TYPICAL REBAR LAP SPLICE SCHEDULE FOR CONCRETE**  
SCALE: NOT TO SCALE



**180° HOOKS**                      **90° HOOKS**

**TYPICAL HOOK DIMENSIONS**

BAR SIZE	D	180° HOOKS		90° HOOKS
		A or G	J	A or G
#3	2 1/4"	5"	3"	6"
#4	3"	6"	4"	8"
#5	3 3/4"	7"	5"	10"
#6	4 1/2"	8"	6"	1'-0"
#7	5 1/4"	10"	7"	1'-2"
#8	6"	11"	8"	1'-4"
#9	9 1/2"	1'-3"	11 3/4"	1'-7"
#10	10 3/4"	1'-5"	1'-1 1/4"	1'-10"
#11	12"	1'-7"	1'-2 3/4"	2'-0"

- NOTES:**  
 $d_b$  = NOMINAL BAR DIAMETER.  
 D = FINISHED INSIDE BEND DIAMETER.  
 MINIMUM D = 6  $d_b$  FOR #3 TO #8 BARS.  
 MINIMUM D = 8  $d_b$  FOR #9 TO #11 BARS.  
 MINIMUM D = 10  $d_b$  FOR #14 AND #18 BARS.

**B2 TYPICAL REBAR HOOK DETAILS FOR CONCRETE**  
SCALE: NOT TO SCALE



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NO.	REVISION	DESCRIPTION	BY	DATE

**PURDY MESA FLOWLINE REPLACEMENT**  
**CITY OF GRAND JUNCTION**  
 BID ALTERNATIVE 3  
 TYPICAL CONCRETE DETAILS

FILE: 81-18-013 S-101X  
 JUB PROJ. #: 81-18-013  
 DRAWN BY: JMM  
 DESIGN BY: JMM  
 CHECKED BY: ---

ONE INCH  
 AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY  
 LAST UPDATED: 8/23/2018

SHEET NUMBER:  
**S3-510**

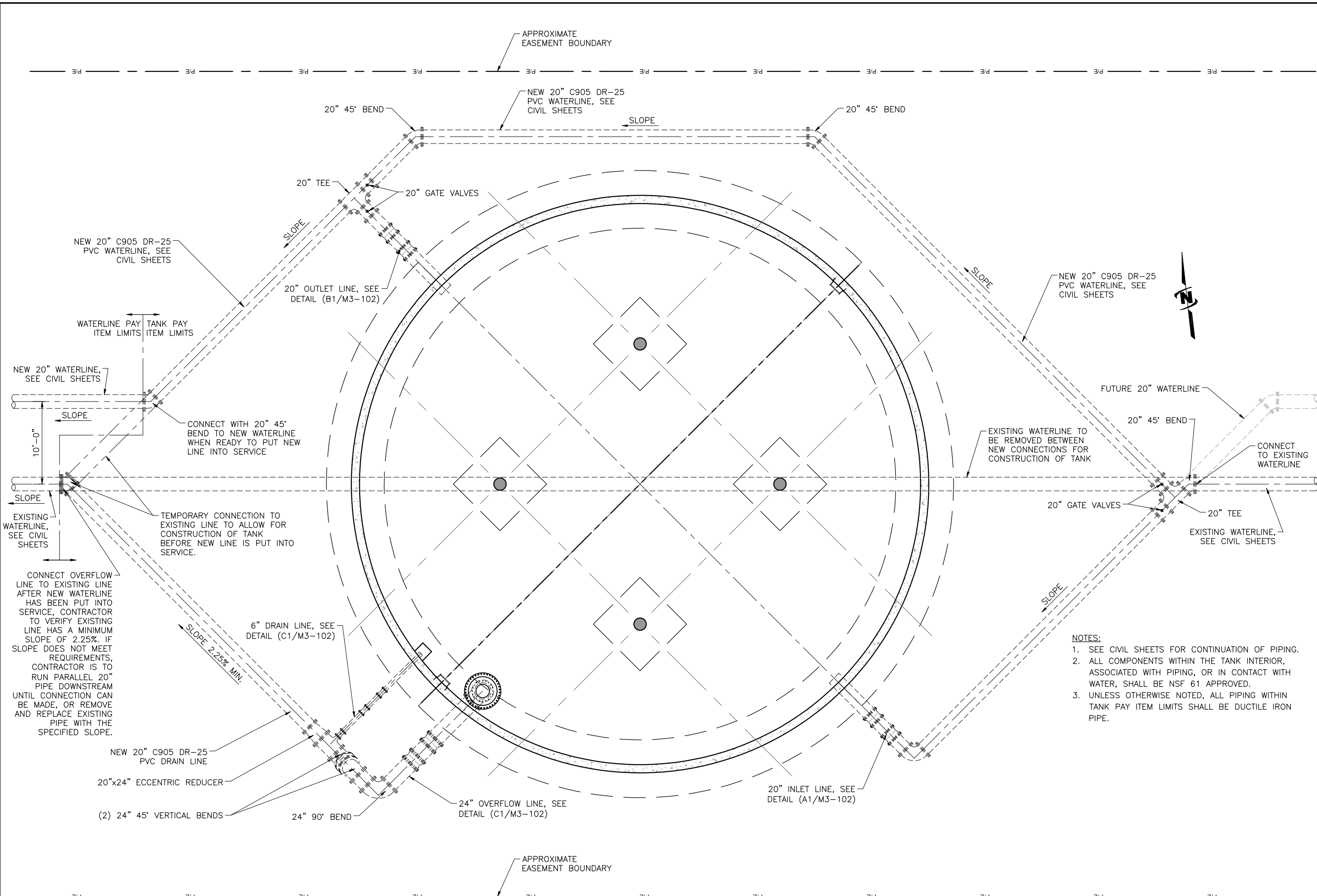
BID SET

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**PURDY MESA FLOWLINE REPLACEMENT  
CITY OF GRAND JUNCTION**  
BID ALTERNATIVE 3  
FLOW CONTROL TANK MECHANICAL PIPING PLAN

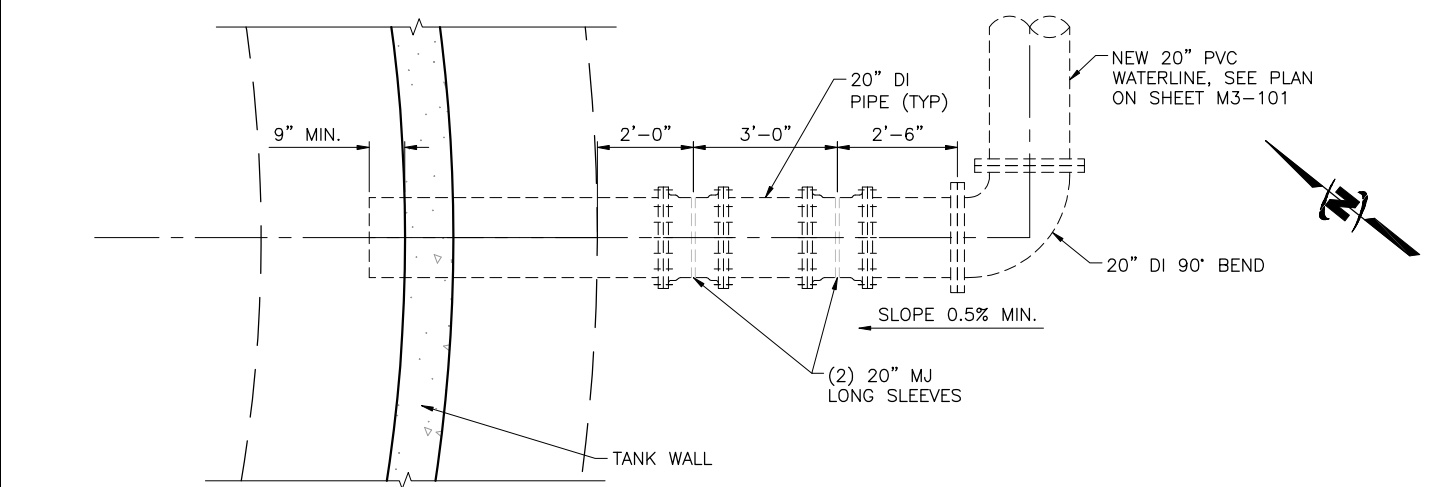
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JUB PROJ. #: 81-18-013  
DRAWN BY: JMM  
DESIGN BY: ---  
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LAST UPDATED: 8/16/2018  
SHEET NUMBER:  
**M3-101**



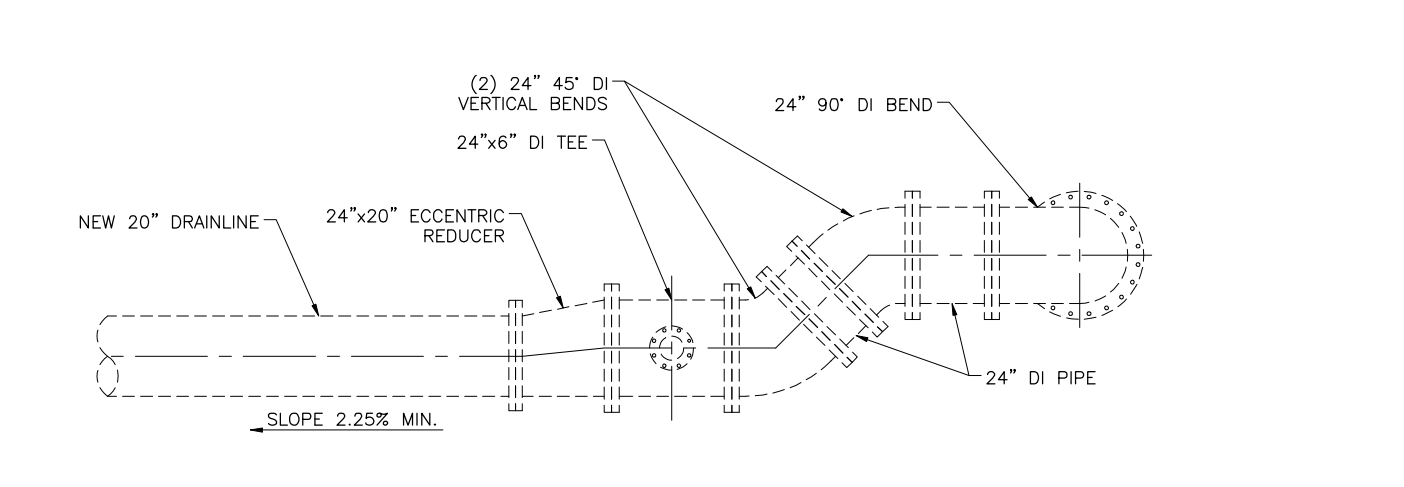
- NOTES:**
- SEE CIVIL SHEETS FOR CONTINUATION OF PIPING.
  - ALL COMPONENTS WITHIN THE TANK INTERIOR, ASSOCIATED WITH PIPING, OR IN CONTACT WITH WATER, SHALL BE NSF 61 APPROVED.
  - UNLESS OTHERWISE NOTED, ALL PIPING WITHIN TANK PAY ITEM LIMITS SHALL BE DUCTILE IRON PIPE.

**TANK MECHANICAL PIPING PLAN**  
SCALE: 3/16" = 1'-0"

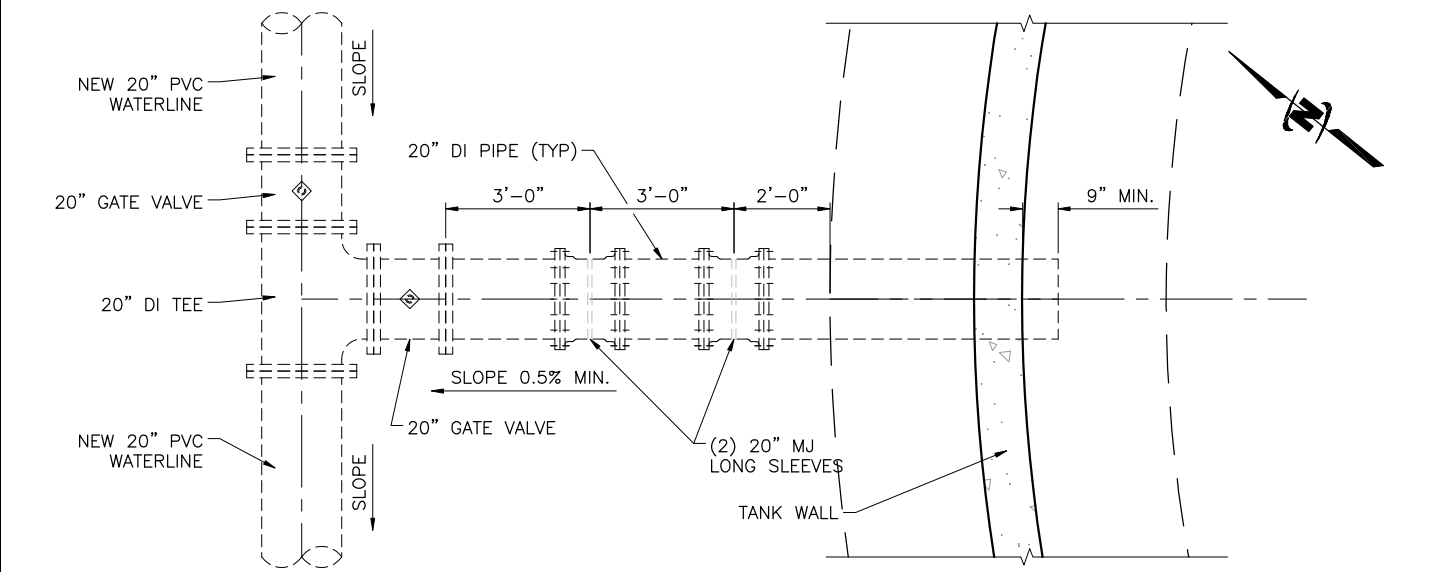
Plot Date: 8/20/2018 8:24 AM, Plotted By: Jabin Myers  
 Date Created: 8/16/2018 10:06 AM, Project: PURDY MESA FLOWLINE CAD SHEET 18-013 M-101X.DWG



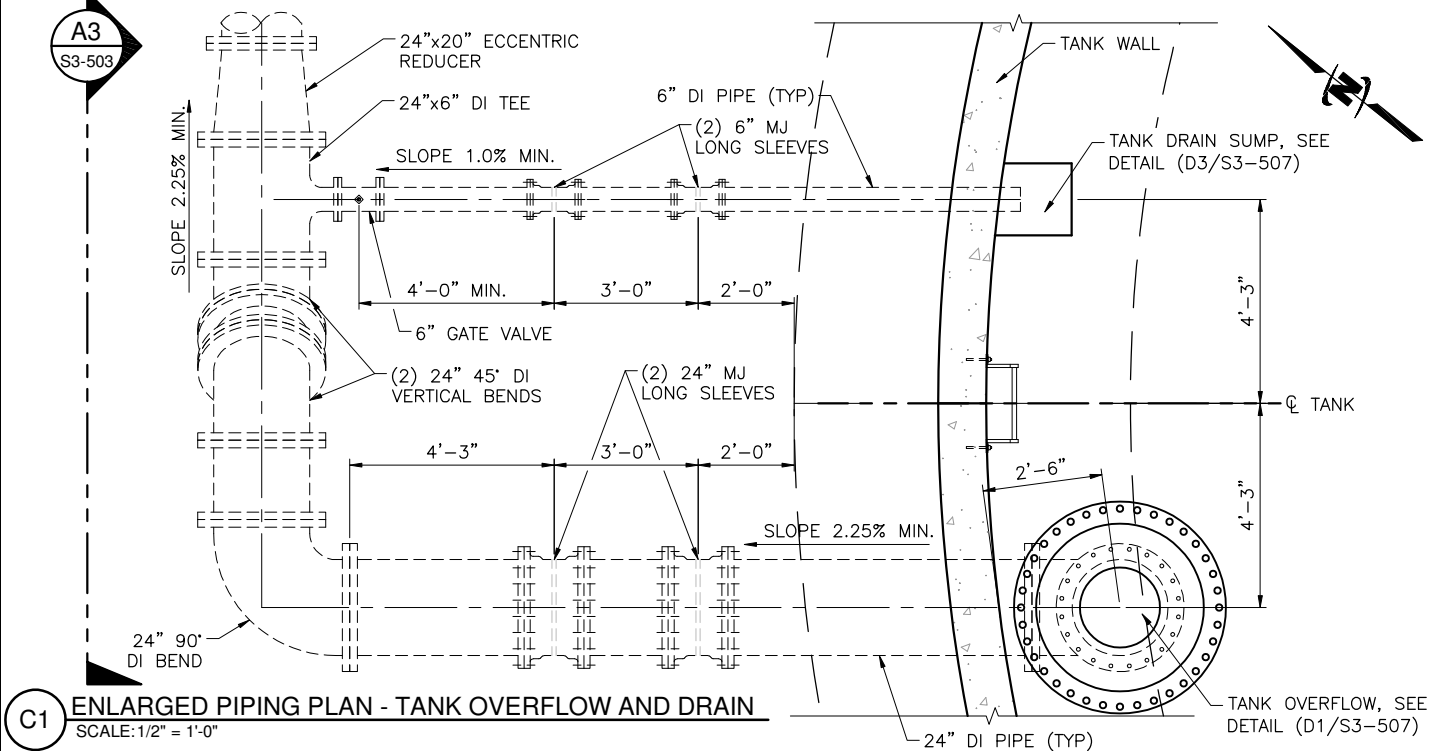
**A1** ENLARGED PIPING PLAN - TANK INLET  
 SCALE: 1/2" = 1'-0"



**A3** ENLARGED PIPING PLAN - TANK OVERFLOW AND DRAIN PROFILE  
 SCALE: 1/2" = 1'-0"



**B1** ENLARGED PIPING PLAN - TANK OUTLET  
 SCALE: 1/2" = 1'-0"



**C1** ENLARGED PIPING PLAN - TANK OVERFLOW AND DRAIN  
 SCALE: 1/2" = 1'-0"

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NO.	REVISION	DESCRIPTION	BY	DATE

**PURDY MESA FLOWLINE REPLACEMENT**  
 CITY OF GRAND JUNCTION  
 BID ALTERNATIVE 3  
 ENLARGED MECHANICAL PIPING PLANS

FILE: 81-18-013 M-101X  
 JUB PROJ. #: 81-18-013  
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 LAST UPDATED: 8/16/2018

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- NOTES:**
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 Date Created: 8/16/2018 10:06 AM File Path: C:\PROJECTS\JUB\GRAND JUNCTION\81-18-013\CITY OF GRAND JUNCTION\PROJECTS\JUB\CAD\DWG\81-18-013 M-101X.DWG