**TECHNICAL SPECIFICATIONS**

# SANTA MARIA SIPHON SUPPORT SYSTEM STABILIZATION PROJECT

## MINERAL COUNTY, COLORADO


*Prepared for*

Santa Maria Reservoir Company
PO Box 288
Monte Vista, CO 81144

June 2012

URS
8181 East Tufts Avenue
Denver, Colorado 80237

Santa Maria Siphon Support System Stabilization Project
**TECHNICAL SPECIFICATIONS**
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**APPENDIX A**

Photographs and Historical Drawings

## TECHNICAL SPECIFICATIONS
## DEFINITIONS

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| Addenda | Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the Contract Documents. |
| Agreement | The written instrument which is evidence of the agreement between OWNER and CONTRACTOR covering the Work. |
| Application for Payment | The form acceptable to ENGINEER which is to be used by CONTRACTOR during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents. |
| Asbestos | Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration. |
| Bid | The offer or proposal of a bidder submitted on the prescribed form setting forth the prices for the Work to be performed. |
| Bidding Documents | The Bidding Requirements and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids). |
| Bidding Requirements | The Advertisement or Invitation to Bid, Instructions to Bidders, Bid security form, if any, and the Bid form with any supplements. |
| Bonds | Performance and payment bonds and other instruments of security. |
| Change Order | A document recommended by ENGINEER which is signed by CONTRACTOR and OWNER and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement. |
| Claim | A demand or assertion by OWNER or CONTRACTOR seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim. |
| Contract | The entire and integrated written agreement between the OWNER and CONTRACTOR concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral. |

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| Contract Documents | The Contract Documents establish the rights and obligations of the parties and include the Agreement, Addenda (which pertain to the Contract Documents), CONTRACTOR's Bid (including documentation accompanying the Bid and any post Bid documentation submitted prior to the Notice of Award) when attached as an exhibit to the Agreement, the Notice to Proceed, the Bonds, these General Conditions, the Supplementary Conditions, the Specifications and the Drawings as the same are more specifically identified in the Agreement, together with all Written Amendments, Change Orders, Work Change Directives, Field Orders, and ENGINEER's written interpretations and clarifications issued on or after the Effective Date of the Agreement. Approved Shop Drawings and the reports and drawings of subsurface and physical conditions are not Contract Documents. Only printed or hard copies of the items listed in this paragraph are Contract Documents. Files in electronic media format of text, data, graphics, and the like that may be furnished by OWNER to CONTRACTOR are not Contract Documents. |
| Contract Price | The moneys payable by OWNER to CONTRACTOR for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of paragraph 11.03 in the case of Unit Price Work). |
| Contract Times | The number of days or the dates stated in the Agreement to: (i) achieve Substantial Completion; and (ii) complete the Work so that it is ready for final payment as evidenced by ENGINEER's written recommendation of final payment. |
| CONTRACTOR | The individual or entity with whom OWNER has entered into the Agreement. |
| Cost of the Work | See paragraph 11.01.A for definition. |
| Drawings | That part of the Contract Documents prepared or approved by ENGINEER which graphically shows the scope, extent, and character of the Work to be performed by CONTRACTOR. Shop Drawings and other CONTRACTOR submittals are not Drawings as so defined. |
| Effective Date of the Agreement | The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver. |
| ENGINEER | The individual or entity named as such in the Agreement. |

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| ENGINEER's Consultant | An individual or entity having a contract with ENGINEER to furnish services as ENGINEER's independent professional associate or consultant with respect to the Project and who is identified as such in the Supplementary Conditions. |
| Field Order | A written order issued by ENGINEER which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times. |
| General Requirements | Sections of Division 1 of the Specifications. The General Requirements pertain to all sections of the Specifications. |
| Hazardous Environmental Condition | The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto in connection with the Work. |
| Hazardous Waste | The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time. |
| Laws and Regulations; Laws or Regulations | Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction. |
| Liens | Charges, security interests, or encumbrances upon Project funds, real property, or personal property. |
| Milestone | A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work. |
| Notice of Award | The written notice by OWNER to the apparent successful bidder stating that upon timely compliance by the apparent successful bidder with the conditions precedent listed therein, OWNER will sign and deliver the Agreement. |
| Notice to Proceed | A written notice given by OWNER to CONTRACTOR fixing the date on which the Contract Times will commence to run and on which CONTRACTOR shall start to perform the Work under the Contract Documents. |
| OWNER | The individual, entity, public body, or authority with whom CONTRACTOR has entered into the Agreement and for whom the Work is to be performed. |

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| Partial Utilization | Use by OWNER of a substantially completed part of the Work for the purpose for which it is intended (or a related purpose) prior to Substantial Completion of all the Work. |
| PCBs | Polychlorinated biphenyls. |
| Petroleum | Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils. |
| Project | The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part as may be indicated elsewhere in the Contract Documents. |
| Project Manual | The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents. |
| Radioactive Material | Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time. |
| Resident Project Representative | The authorized representative of ENGINEER who may be assigned to the Site or any part thereof. |
| Samples | Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged. |
| Shop Drawings | All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for CONTRACTOR and submitted by CONTRACTOR to illustrate some portion of the Work. |
| Site | Lands or areas indicated in the Contract Documents as being furnished by OWNER upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by OWNER which are designated for the use of CONTRACTOR. |
| Specifications | That part of the Contract Documents consisting of written technical descriptions of materials, equipment, systems, standards, and workmanship as applied to the Work and certain administrative details applicable thereto. |

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| Subcontractor | An individual or entity having a direct contract with CONTRACTOR or with any other Subcontractor for the performance of a part of the Work at the Site. |
| Substantial Completion | The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of ENGINEER, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof. |
| Supplementary Conditions | That part of the Contract Documents which amends or supplements these General Conditions. |
| Supplier | A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with CONTRACTOR or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by CONTRACTOR or any Subcontractor. |
| Underground Facilities | All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems. |
| Unit Price Work | Work to be paid for on the basis of unit prices. |
| Work | The entire completed construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents. |
| Work Change Directive | A written statement to CONTRACTOR issued on or after the Effective Date of the Agreement and signed by OWNER and recommended by ENGINEER ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change |

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| | Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times. |
| Written Amendment | A written statement modifying the Contract Documents, signed by OWNER and CONTRACTOR on or after the Effective Date of the Agreement and normally dealing with the nonengineering or nontechnical rather than strictly construction-related aspects of the Contract Documents. |

**SECTION 01110**
**SUMMARY OF WORK**

## PART 1 GENERAL

1.1 SECTION INCLUDES

A. Project description, work summary, and work by Owner.

1.2 BACKGROUND

A. The Santa Maria Siphon is located in Mineral County in southwest Colorado. The siphon is located approximately 10 miles west of the town of Creede, Colorado. The 7-ft diameter siphon conveys water from Continental Reservoir and direct runoff to a canal that discharges into Lakeman Lakes. The upstream portion of the siphon is above ground, then continues below grade to the canal. The siphon is owned and operated by the Santa Maria Reservoir Company.

B. The upstream portion of the siphon was constructed along a glacial till slope. It is supported by concrete thrust blocks, with smaller intermediate supports which bear directly on the slope. The slope has been experiencing active sliding for years, which has shifted some of the smaller intermediate supports downslope several inches to over a foot, resulting in loss of support of the siphon pipe. Shims have been employed in an attempt to maintain support for the pipe.

C. A portion of the siphon pipe when empty spans between thrust blocks, with gaps between the pipe bearing plates and the concrete supports. When the siphon fills with water, the pipe deflects down until it rests on the shims.

D. The concrete supports and thrust blocks have experienced freeze-thaw damage of varying degrees of severity.

E. An access road was installed adjacent to the siphon several years ago. It is adequate for small vehicles, but heavy equipment such as concrete trucks may experience difficulty.

1.3 PROJECT DESCRIPTION

A. Major work items associated with the Santa Maria Siphon Support System Stabilization include:

1. Mobilization, Demobilization, and Preparatory Work
2. Erosion and Sediment Controls
3. Clearing and Grubbing
4. Selective Demolition - Thrust Blocks
5. Selective Demolition - Intermediate Supports
6. Reinforced Concrete Overlays - Thrust Blocks
7. Reinforced Concrete Overlays - Intermediate Supports
8. Fabrication and Installation of Steel Bearing Plates
9. Removal of Loose Rock and Boulders

1.4 OWNER OCCUPANCY

A. The Owner may occupy the premises during the period of construction to conduct normal operations.

B. It is anticipated that the siphon will be empty during construction activities. As such, temporary support of the siphon pipe is not expected to be necessary.

C. Cooperate with Owner to minimize conflicts, and to facilitate Owner operations.

**PART 2 PRODUCTS**

NOT USED.

**PART 3 EXECUTION**

NOT USED.

**END OF SECTION**

**SECTION 01120**
**CONTRACTOR WORK PLAN**

## PART 1 GENERAL

### 1.1 SUMMARY

A. This section covers the Contractor Work Plan.

### 1.2 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

B. Prepare and submit a project-specific Work Plan to the Engineer for approval within 14 days after Award. Include the following topics in the Work Plan:

1. Construction implementation plan to include work approach, equipment to be used for each item of construction, methods, and management.
2. Key personnel names and qualifications, list of subcontractors, including an organizational chart and project directory with contact information.
3. Health and Safety Plan. See Section 01145: Health and Safety.
4. Environmental Protection. See Section 01350: Environmental Protection.
5. Waste Handling and Disposal Procedures. See Section 01575: Disposal of Waste Materials.
6. Spill prevention and control procedures. See Section 01350: Environmental Protection.
7. Fire prevention and protection. See Section 01350: Environmental Protection.
8. Dust control. See Section 01350: Environmental Protection. (BMPs to be used).
9. Construction sequence and schedule. See Section 01320: Construction Progress Schedule.
10. Construction Quality Control Plan (CQCP). See Section 01450: Quality Control.
11. Other applicable items to describe work approach.

### 1.3 WORK PLAN REQUIREMENTS

A. The Work Plan shall be carefully thought out, prepared in accordance with all applicable Federal, state, and local laws and regulations, these specifications, and good engineering and construction practices. The Work Plan shall include a complete discussion of conformance with applicable laws, regulations, guidelines, and other applicable procedures, and shall be approved by the Engineer before beginning field activities.

B. A statement in the Work Plan that “all applicable laws will be followed” is not sufficient detail for the Work Plan submittal. Repetition of specification wording and requirements shall only be used to present the elements of the work plan, not as a substitute for the detail that is expected to present the Contractor’s work approach.

C. The Work Plan shall be developed in accordance with the requirement of the individual specifications indicated and other requirements in this specification.

**PART 2 PRODUCTS**

NOT USED.

**PART 3 EXECUTION**

NOT USED.

**END OF SECTION**

**SECTION 01145**
**HEALTH AND SAFETY**

## PART 1 GENERAL

1.1 REFERENCES

A. Williams - Steiger Occupation Safety and Health Act of 1970 (OSHA).

B. All other applicable Federal, State, and Local Safety and Health requirements.

1.2 CONTRACTOR'S RESPONSIBILITY

A. Provide and implement a Health and Safety Plan (HSP) that conforms to all applicable regulations.

B. The HSP shall include the possibility of encountering hazardous or controlled waste at the site, worker protection, actions to be taken, and responsible parties for managing such waste streams.

1.3 OWNER AND ENGINEER'S RESPONSIBILITY

A. Owner and Engineer will have no responsibility for enforcing the Contractor's Health and Safety program.

1.4 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

B. Prepare and submit the Contractor's Project Health and Safety Plan in accordance with the General Conditions. The plan is for informational purposes only.

## PART 2 PRODUCTS

NOT USED.

## PART 3 EXECUTION

NOT USED.

**END OF SECTION**

# SECTION 01200
# PRICE AND PAYMENT PROCEDURES

## PART 1 GENERAL

1.1 SECTION INCLUDES

A. Measurement and payment criteria applicable to work performed under a unit price payment method.

B. Measurement and payment criteria applicable to work performed under a lump sum payment method.

C. List of unit price and lump sum pay items.

D. Schedule of value requirements for lump sum pay items.

E. Defect assessment and non-payment for rejected work.

1.2 AUTHORITY

A. Measurement methods delineated in the individual Specification Sections are intended to complement the criteria of this Section. In the event of conflict, the requirements of the individual Specification Section shall govern.

B. Take all measurements and compute quantities for unit price pay items. The Engineer will verify measurements and quantities of work performed by the Contractor for payment purposes.

C. Assist the Engineer in the taking of measurements by providing necessary equipment, workers, and survey personnel as required.

1.3 QUANTITIES OF UNIT PRICE PAY ITEMS

A. Quantities indicated in the Bid Form are for bidding and contract purposes only. Actual quantities and measurements supplied or placed in the work and verified by the Engineer shall determine payment.

1.4 MEASUREMENT OF QUANTITIES FOR UNIT PRICE PAY ITEMS

A. Measurement Devices:

1. Weigh scales: inspected, tested, and certified by the appropriate Colorado Weights and Measures Division within the past year.
2. Platform scales: of sufficient size and capacity to accommodate the conveying vehicle.
3. Metering devices: inspected, tested, and certified by the appropriate Colorado Weights and Measures Division within the past year.

B. Measurement by volume: Measured by cubic dimension using mean length, width, and height or thickness.

C. Excavation quantities will be based on the calculated volume between the baseline survey, as defined in Section 01720: Layout of Work and Surveying and the excavation limits shown on the Drawings or described in these Specifications, or to the most

practicable lines, grades and dimensions as prescribed by the Engineer, and will include only material that is actually removed within the prescribed pay lines.

D. Fill quantities will be based on the calculated volume between the approved excavation limits or the approved base surface and the fill limits shown on the Drawings or described in these Specifications, or to the most practicable lines, grades and dimensions as prescribed by the Engineer, and will include only material that is actually placed within the described pay lines.

E. Compute excavation and fill quantities in accordance with the requirements of Section 01720: Layout of Work and Surveying.

F. Where concrete for structures is to be placed directly upon or against the excavations and the character of the material cut into is such that the material cannot be trimmed efficiently to accurate dimensions by ordinary excavation finishing methods, as determined by the Engineer, measurement for payment thereof will be made to the prescribed average dimension lines. The prescribed average dimension lines shall be considered as 6 inches outside the neat lines of the concrete for the purposes of measurement, for payment.

G. Measurement, for payment, of excavations upon or against which concrete is not required to be placed will be limited to the neat lines shown on the Drawings, to the most practicable lines, grades, and dimensions as established by the Engineer.

H. Measurement by area: Measured by square dimension using mean length and width or radius. Items which are measured by the acre, such as revegetation, shall be measured horizontally.

I. Linear measurement: Measured by linear dimension, at the item centerline or mean chord. Items which are measured by the lineal foot, such as pipes, culverts, underdrains, fence, etc., shall be measured parallel to the base or foundations upon which the items are placed, unless otherwise specified or shown on the Drawings.

J. Stipulated sum/price measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as completed items or units of the Work.

K. Lump sum items will not be measured for payment. However, measurements may be made to monitor work progress.

## 1.5 PAYMENT

A. Payment includes: Full compensation for furnishing all required labor, materials, products, tools, equipment, plant, transportation, services, incidentals; erection, application or installation of an item of the work, and all other costs of whatsoever nature for the items of work complete, will be included in the various bid items; overhead and profit.

B. Contractor shall submit a Schedule of Values for all lump sum bid items listed in the Bid Schedule within 30 days of the Notice to Proceed. The Schedule of Values will be used to help assess the intermediate value of work completed for the purpose of making progress payments

C. Payment for unit price items will be made on the basis of the actual measurements and quantities accepted by the Engineer multiplied by the unit price.

D. Payment for lump sum price items will be made on the basis of the contract lump sum prices in the Bid Form. If the Contractor requests progress payments for lump sum items, such progress payments will be made in accordance with a detailed program of payment apportioning in the schedule of values, prepared by the Contractor and submitted to the Engineer for approval.

1.6 DEFINITION OF BID ITEMS

A. Bid Items:

1. Mobilization, Demobilization, and Preparatory Work and (Lump Sum Item)

a. This item includes the mobilization of personnel, equipment and temporary construction facilities to the project site and their subsequent removal; providing temporary utilities; safety fence; traffic control signage and barricades; and other miscellaneous items required to begin construction and closeout the Contract. The cost of all work specified in Division 1 - General Requirements, unless specifically covered in other bid items, will not be paid separately, but shall be included in the lump sum price bid in the Schedule for Mobilization and Preparatory Work.
b. Measurement: Measurement will be based on the approved Schedule of Values.
c. Payment: Payment will be made at the Contract Lump Sum Price.
d. Mobilization, Preparatory Work and Demobilization is limited to maximum of ten percent (10%) of the total Bid Price.

2. Erosion and Sediment Control (Lump Sum Item)

a. Erosion and Sediment Control includes installation, maintenance, and removal of all sediment control devices required for the Work, including hay bales, silt fence, sedimentation ponds, and associated compliance work required by Federal, State, and County permits in accordance with Section 01570.
b. Measurement: Measurement will be based on the approved Schedule of Values.
c. Payment: Payment will be made at the Contract Lump Sum Price.

3. Clearing and Grubbing (Lump Sum Item)

a. This item includes clearing and grubbing within the limits of site disturbance for required excavations, staging and stockpile areas, and borrow areas. Includes removal, cutting, grubbing, mowing, etc in accordance with Section 02230.
b. Measurement: Measurement will be based on the Approved Schedule of Values.
c. Payment will be made at the Contract Lump Sum Price.

4. Selective Demolition - Thrust Blocks (Lump Sum Item)

a. This item includes all work associated with the demolition, salvage, and disposal of items pertaining to Thrust Blocks 2, 3 and 4, designated on the Drawings as salvage, demolish, remove, or similar terms in accordance with Section 02220.

b. Measurement: Measurement will be based on the approved Schedule of Values.
c. Payment: Payment will be made at the Contract Lump Sum Price.

5. Selective Demolition - Intermediate Supports (Lump Sum Item)

a. This item includes all work associated with the demolition, salvage, and disposal of items pertaining to Intermediate Supports S7 through S13, designated on the Drawings as salvage, demolish, remove, or similar terms in accordance with Section 02220. It also includes provision of temporary supports at the expansion joints as described in the Drawings.
b. Measurement: Measurement will be based on the approved Schedule of Values.
c. Payment: Payment will be made at the Contract Lump Sum Price.

6. Reinforced Concrete Overlays - Thrust Blocks (Unit Price Item)

a. This item includes procuring, batching, transporting, forming, placing, vibrating, finishing, and curing the reinforced concrete for the thrust block overlays (Thrust Blocks 2, 3, and 4) as shown in the Drawings. Also includes procuring transporting, and installing reinforcing steel, accessories, and joint preparation in accordance with Sections 03100 to 03300.
b. Measurement: Concrete encasement will be measured in place by volume (cubic yards) to the limits approved by the Engineer.
c. Payment: Payment will be made at the Contract Unit Price per cubic yard.

7. Reinforced Concrete Overlays - Intermediate Supports (Unit Price Item)

a. This item includes procuring, batching, transporting, forming, placing, vibrating, finishing, and curing the reinforced concrete for reconstructing the intermediate support blocks (S7 through S13) as shown in the Drawings. Also includes procuring transporting, and installing reinforcing steel, accessories, and joint preparation in accordance with Sections 03100 to 03300.
b. Measurement: Concrete encasement will be measured in place by volume (cubic yards) to the limits approved by the Engineer.
c. Payment: Payment will be made at the Contract Unit Price per cubic yard.

8. Fabrication and Installation of Steel Bearing Plates (Unit Price Item)

a. This item includes fabricating, delivering, and installing steel bearing plate assemblies for the intermediate supports as defined in Section 05500.
b. Measurement: Measurement will be by number of bearing plate assemblies installed as shown in the Drawings.
c. Payment: Payment will be made at the Contract Unit Price per each steel bearing plate assembly.

9. Removal of Loose Rock and Boulders (Unit Price Item)

a. This item includes excavation of loose rock materials as defined in Section 02315: Excavation, required for removing material adjacent to portions of the siphon pipe in the areas shown on the Drawings.
b. Measurement: Measurement will be by volume (cubic yards) of rock removal to the neat lines and grades on the Drawings.
c. Payment: Payment will be made at the Contract Unit Price per cubic yard.

1.7 SCHEDULE OF VALUES

A. The Contractor shall submit Schedule of Values for lump sum items listed in this Section within 15 days after date of Notice to Proceed.

B. The Schedule of Values will be used to assess the intermediate value of Work for pay applications.

1.8 DEFECT ASSESSMENT

A. The Contractor shall replace the work, or portions of the work, not conforming to the Drawings or the Specifications.

B. If, in the opinion of the Engineer, it is not practical to remove and replace the work that does not conform to the Drawings or the Specifications, the Owner will direct one of the following remedies:

1. The defective work will remain, but the corresponding unit or lump sum price of the work will be adjusted to a new unit or lump sum price at the discretion of the Owner.
2. The defective Work will be partially repaired at the instruction of the Owner, and the corresponding unit or lump sum price of the work will be adjusted to a new unit or lump sum price at the discretion of the Owner.
3. The individual Specification Sections may modify the options specified in this Section or may identify a specific formula or percentage unit or lump sum price reduction. In the event of conflict, the requirements of the individual Specification Section shall govern.
4. The authority of the Owner to assess the defect and identify payment adjustment is final.

1.9 NON-PAYMENT FOR REJECTED PRODUCTS

A. Payment shall 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 grades of the required Work.
5. Products remaining on hand of the Contractor after completion of the Work.
6. Loading, hauling, and disposing of rejected products.
7. Rejected materials including, but not limited to, overly wet or frozen earth material.
8. Excavation or fill made for the convenience of the Contractor for any purpose or reason.
9. Overexcavation and replacement materials.

**PART 2 PRODUCTS**

NOT USED

**PART 3 EXECUTION**

NOT USED

**END OF SECTION**

**SECTION 01310**
**PROJECT COORDINATION AND MEETINGS**

## PART 1 GENERAL

### 1.1 WORK INCLUDED IN THIS SECTION

A. The work of this section includes, but is not limited to: coordination; preconstruction meeting; progress meetings; and task start-up meetings.

### 1.2 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Specifications to assure efficient and orderly sequence of installation of interdependent construction elements.

B. Coordinate all work with progress meetings to explain unique features of the work to the work forces. The Engineer will attend such meetings. Meet daily with the Engineer to explain work progress, quality control, and any issues affecting successful completion of the work.

C. Coordinate completion and clean up of work of separate sections in preparation for Substantial Completion.

D. After the Owner occupancy of premises, coordinate access to site for correction of defective work and the work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

### 1.3 PRECONSTRUCTION MEETING

A. Within ten days after Notice to Proceed and prior to starting the Work except mobilization, the Contractor, accompanied by a representative from each principal subcontractor, shall meet with the Owner and the Engineer for a Preconstruction Meeting. The Preconstruction Meeting will be scheduled by the Owner. The principal features of work will be reviewed and any questions regarding the Contract and work site will be addressed.

B. Attendance Required: the Owner, the Engineer, and the Contractor Superintendent, the Contractor Safety and Health Officer, principal subcontractors, and other key personnel as requested by the Contractor or Owner.

C. Unless previously submitted to the Owner, the Contractor shall bring to the conference a schedule for each of the following:

1. Preliminary Progress Schedule.
2. Procurement schedule.
3. Shop Drawings and other submittals schedule.
4. Schedule of Values

D. The purpose of the conference is to designate responsible personnel and establish a working relationship. Matters requiring coordination will be discussed and procedures for handling such matters established. The agenda will include:

1. Distribution of Contract Documents, including Contractor executed bond, certificate of insurance, and Contract.
2. Submission of list of Subcontractors, list of Products, schedule of values, and preliminary progress schedule.
3. Designation of personnel representing the parties in the Contract, and the Engineer.
4. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
5. Contractor schedules.
6. Critical Work sequencing.
7. Processing Applications for Payment.
8. Field decisions and Change Orders.
9. Use of premises by the Owner, the Engineer and the Contractor.
10. Owner's requirements.
11. Construction facilities and controls provided by the Owner.
12. Use of premises, office and storage areas, security, housekeeping, and Owner needs.
13. Survey and layout.
14. Security and housekeeping procedures.
15. Contractor assignments for safety and first aid.
16. Quality Control and Inspection Program.
17. Procedures for maintaining record documents.
18. Major equipment deliveries and priorities.
19. Requirements for start-up of equipment.
20. Inspection and acceptance of equipment put into service during construction period.
21. Record drawings.

E. The Engineer will preside at the conference and will arrange for keeping the minutes and distributing the minutes to all persons in attendance.

1.4 PROGRESS MEETINGS

A. The Engineer will schedule and hold regular progress meetings at least weekly and at other times as requested by the Owner or required by progress of the Work. The purpose of the meetings will be to review the progress of the Work, maintain coordination of efforts, discuss changes in scheduling, and resolve other problems which may develop.

B. Additional meetings may be called by the Owner, the Engineer, or the Contractor during any stage of the project when it is deemed necessary to raise any significant questions, establish new guidelines, introduce a new aspect to the project, or any other items that will affect the progress of work.

C. Meetings may take place at the project site or some other location that is satisfactory to the Owner, the Engineer and the Contractor.

D. The Engineer will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

E. Attendance Required: The Contractor and all Subcontractors active on the site shall be represented. The Contractor may at its discretion request attendance by representatives of its Suppliers, manufacturers, and other Subcontractors.

F. All expenses associated with attending the meetings that are incurred by other than the Owner and the Engineer shall be born by the Contractor.

G. Proposed Agenda:

1. Review and approval of minutes of previous meetings.
2. Review of Work progress of minutes of previous meeting.
3. Field observations, problems, conflicts, and decisions.
4. Identification of problems which impede the schedule and proposed corrective actions.
5. Review of submittals schedule and status of submittals; expedite as required.
6. Requests for information status.
7. Review of off-site fabrication and delivery schedules.
8. Revisions to project schedule.
9. Maintenance of progress schedule.
10. Corrective measures and procedures to regain projected schedules.
11. Planned progress during succeeding Work period.
12. Coordination of project schedules and projected progress. Review of three week look-ahead schedule provided by Contractor to ensure proper coordination with Owner, Engineer, and subcontractors.
13. Maintenance of quality, and Safety and Work standards.
14. Pending changes and substitutions.
15. Effect of proposed changes on progress schedule and coordination, and effect on other contracts of the project.
16. Other business relating to Work.

H. The Engineer shall record minutes; include significant proceedings and decisions and distribute copies after meeting to participants and those affected by decisions made.

1.5 TASK START-UP MEETING

A. Before the start of any significant site activity, as determined by the Engineer, conduct a start-up meeting to discuss procedures, quality control, inspections, and related activities. Attendance at the meeting should include the Contractor project manager, site supervisor, representatives of key Subcontractors, and the Engineer and his designated representatives. Notify Engineer at least 72 hours in advance of meeting to allow the Engineer to invite necessary offsite personnel.

## PART 2 PRODUCTS

NOT USED

## PART 3 EXECUTION

NOT USED

**END OF SECTION**

**SECTION 01320**
**CONSTRUCTION PROGRESS SCHEDULES**

## PART 1 GENERAL

### 1.1 SUMMARY

A. Construction Progress Schedules developed in accordance with this Section and the General Conditions.

### 1.2 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

B. With each Progress Schedule submission provide the following:

1. Contractor certification that progress schedule submission is the actual schedule being utilized for execution of the Work and certification by all Subcontractors with 10 percent or more of Work that they concur with Contractor progress schedule submission.
2. Five legible copies of the progress schedule.

C. Preliminary Progress Schedule:

1. Within 10 days following the effective date of the Agreement, the Contractor shall prepare and submit a preliminary Critical Path Method (CPM) Gantt progress schedule covering all Work to be done on the Project. The schedule shall include the major construction activities and their durations and start/finish dates.
2. The Gantt schedule and subsequent revisions shall be submitted to the Owner and shall reflect the actual progress of the Project to within 5 days prior to submittal.
3. If the schedule or any subsequent revision is not acceptable to Owner, the schedule shall be revised and resubmitted as many times as necessary until the schedule is acceptable. Acceptance of the schedule will not be unreasonably withheld.
4. The initial progress schedule, when accepted by the Owner, will be the project baseline schedule.

D. Shop Drawings and Engineering Data Schedule.

1. At the time the preliminary Gantt progress schedule is submitted, a schedule shall be submitted of the items of materials, equipment, qualifications, plans, and data for which Shop Drawings and/or engineering data are required by the Specifications. For each required submittal item, the date shall be given for intended submission of the item to Engineer for review and the date required for its return to avoid delay in any activity beyond the scheduled start date. Sufficient time shall be allowed for initial review, correction and resubmission, and final review of all submittals.

E. Bi-weekly Progress Reports:

1. At the end of each two week period, the activities that have been completed, with their actual start and completion dates, and a list of the activities on which Work

is currently in progress and the number of working days required to complete each, shall be submitted to Owner.

F. Submit adjusted schedule or confirm validity of current schedule with each monthly Application for Payment in accordance with this Section and the General Conditions, and at such other times as necessary to reflect the following:

1. Progress of Work to within 5 days prior to submission.
2. Changes in Work scope and activities modified since submission.
3. Delays in Submittals or resubmittals, deliveries, or Work.
4. Adjusted or modified sequences of Work.
5. Other identifiable changes.
6. Revised projections of progress and completion.

G. Narrative Progress Report: Submit with each monthly submission of progress schedule.

1.3 PROGRESS OF THE WORK

A. If Contractor fails to complete activity by its latest scheduled completion date and this failure may extend Contract Times (and/or Milestones), Contractor shall, within 7 days of such failure, submit a written statement as to how Contractor intends to correct nonperformance and return to the acceptable current progress schedule. Actions by Contractor to complete Work within Contract Times (or Milestones) will not be justification for adjustment to Contract Price or Contract Times.

B. Engineer may request a schedule recovery or mitigation plan if Contractor fails to: (i) complete a critical scheduled activity by its latest Milestone completion date, or (ii) satisfactorily execute Work as necessary to prevent delay to the overall completion of the Work.

C. Owner may require Contractor, at Contractor expense, to add to its plant, equipment, or construction forces, as well as increase the working hours, if operations fall behind schedule.

1.4 PRELIMINARY PROGRESS SCHEDULE

A. As a minimum, submit two computer generated CPM schedules as follows:

1. The Gantt schedule shall be sufficiently detailed to indicate such activities as shop drawing submittal and review, equipment manufacture and delivery, installation of equipment, earthwork, demolition activities, concrete placements, and subcontractor’s items of work. Construction activities of less than 1 day's duration or more than 5 days' duration shall be kept to a minimum. Each activity on the diagram shall be labeled with the following information: description, duration, start date, and finish date

B. Planned durations and start dates shall be indicated for each Work item subdivision. Work item durations for any activity shall not exceed thirty (30) working days. Each major component and subdivision component shall be accurately plotted on time scale sheets 11 inches by 17 inches or 24 inches by 36 inches in size. Not more than four sheets shall be employed to represent this overview information.

1.5 PROGRESS SCHEDULE

A. General:

1. Schedule(s) shall reflect Work logic sequences, restraints, delivery windows, review times, Contract Times, and Milestones set forth in the Agreement, and shall begin with the date of Notice to Proceed and conclude with the date of Final Completion.
2. The schedule requirement herein is the minimum required. Contractor may prepare a more sophisticated schedule if such will aid Contractor in execution and timely completion of Work.
3. Submit assumptions for base schedule describing work week duration, numbers of shifts, hours per shift, holidays, assumed weather days, assumed productivity, crew size, etc.
4. Adjust or confirm schedules in accordance with this Section and the General Conditions on a monthly basis.
5. The update of the Project Schedule shall be an integral part of the estimate upon which progress payments will be made. If, in the judgment of the Owner, the Contractor fails or refuses to provide information required to accomplish a complete Project Schedule Update or revision as specified hereafter, the Contractor shall be deemed to have not provided the required estimate upon which progress payments may be made, and shall not be entitled to progress payments until it has furnished the information necessary for a complete schedule update to the satisfaction of the Owner.
6. Float time is a Project resource available to both parties to meet contract Milestones and Contract Times.
7. Use of float suppression techniques such as preferential sequencing or logic, special lead/lag logic restraints, and extended activity times are prohibited, and use of float time disclosed or implied by use of alternate float-suppression techniques shall be shared to proportionate benefit of Owner and Contractor.
8. Pursuant to above float-sharing requirement, no time extensions will be granted nor delay damages paid until a delay occurs which (i) impacts Project's critical path, (ii) consumes available float or contingency time, and (iii) extends Work beyond contract completion date.
9. If Contractor provides an accepted schedule with an early completion date, The Owner reserves the right to reduce Contract Times to match the early completion date by issuing a deductive Change Order at no change in Contract Price.

B. Format:

1. Computer generated baseline schedule, on maximum 11-inch by 17-inch or 24-inch by 36-inch sheet size to include at least:

    a. Identification and listing in chronological order of those activities reasonably required to complete Work, including, but not limited to, subcontract work, fabrication, and delivery dates including required lead times, move-in and other preliminary activities, Project closeout and cleanup, and specified Work sequences, constraints, and Milestones, including Substantial Completion date(s). Listings to be identified by Specification section number.
    b. Identify: (i) horizontal time frame by year, month, and week, (ii) duration, early-start, and completion for each activity and subactivity,

and (iii) critical activities and Project float, (iv) assumed weather allowances, (v) planned holidays, (vi) production rates and (vii) assumed work hours per day and number of work days per week.

c. Subschedules to further define critical portions of the Work.

d. Monthly Schedule Submissions: Show overall percent complete, projected and actual, and completion progress by listed activity and subactivity.

1.6 NARRATIVE PROGRESS REPORT

A. Include, as a minimum:

1. Summary of Work completed during the past period between Narrative Progress Reports.
2. Work planned during the next period.
3. Explanation of differences between summary of Work completed and Work planned in previously submitted Narrative Progress Report.
4. Current and anticipated delaying factors and their estimated impact on other activities and completion Milestones.
5. Corrective action taken or proposed.

1.7 CLAIMS FOR ADJUSTMENT OF CONTRACT TIMES

A. Reference the General Conditions.

B. Where Engineer and Owner has not yet rendered formal decision on Contractor claim for adjustment of Contract Times, and parties are unable to agree as to amount of adjustment to be reflected in progress schedule, Contractor shall reflect that amount of time adjustment in progress schedule as Engineer and Owner may accept as appropriate for the interim. It is understood and agreed that such interim acceptance by Engineer and Owner will not be binding and will be made only for purpose of continuing to schedule Work, until such time as formal decision as to an adjustment, if any, of the Contract Times acceptable to the Engineer and Owner has been rendered. Contractor shall revise progress schedule prepared thereafter in accordance with Engineer and Owner formal decision.

**PART 2 PRODUCTS**

NOT USED.

**PART 3 EXECUTION**

NOT USED.

**END OF SECTION**

**SECTION 01330**
**SUBMITTALS**

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Submittal requirements. Submittals shall be in accordance with this Section and the General Conditions.

### 1.2 DEFINITIONS

A. Work-related submittals of this Section are categorized for convenience as follows:

1. Product Data: Product Data includes standard printed information on materials, products and systems not specifically prepared for the Work, other than designation of selections from among available choices printed therein.
2. Shop Drawings: Shop Drawings include specially prepared technical data for the Work, including drawings, diagrams, performance curves, data sheets, schedules, templates, patterns, reports, calculations, instructions, measurements and similar information not in standard printed form for general application to other contracts.
3. Samples: Samples include both fabricated and unfabricated physical examples of materials, products and units of Work; both as complete units and as smaller portions of units of Work; either for limited visual inspection or (where indicated) for more detailed testing and analysis.
4. Miscellaneous Submittals: Miscellaneous Submittals related directly to the Work (non-administrative) include construction permits, Stormwater Pollution Prevention Plan (SWPPP) requirements, Spill Prevention Control and Countermeasures Plan (SPCC), Work Plan, Health and Safety Plan, warranties, maintenance agreements, workmanship bonds, project photographs, survey data and reports, physical Work records, quality testing and certifying reports, copies of industry standards, records, drawings, field measurement data, operation and maintenance materials, overrun stock; and similar information, devices and materials applicable to the Work and not processed as Product Data, Shop Drawings or Samples.

### 1.3 QUALITY ASSURANCE

A. Submittals shall verify compliance with the Contract Documents, and shall include drawings and descriptive information in sufficient detail to show the kind, size, arrangement, and operation of component materials and devices; the external connections, anchorages, and supports required; performance characteristics; and dimensions needed for installation and correlation with other materials and equipment. When an item consists of components from several sources, Contractor shall submit a complete initial submittal including all components.

### 1.4 SUBMITTAL SEQUENCING AND SCHEDULING

A. Coordinate preparation and processing of submittals with performance of the Work so that Work will not be delayed by submittal review process.

B. Coordinate and sequence different categories of submittals for the same Work, and for interfacing units of Work, so that one will not be delayed for coordination with another.

C. The Contractor shall make all submittals far enough in advance of scheduled installation dates to provide all time required for reviews, for possible revisions and resubmittals, and for placing orders and securing delivery. Submittals shall be received at least 21 calendar days prior to any scheduled work for the activity covered by the submittal unless otherwise noted in individual specification Sections or agreed to in writing by the Engineer.

D. Timing of submittals shall allow for review time by the Engineer.

E. Contractor scheduling shall include preparation of a submittal schedule to be coordinated with the Contractor construction sequencing and scheduling, including allowance for Engineer review time.

## PART 2 PRODUCTS

NOT USED

## PART 3 EXECUTION

### 3.1 SUBMITTAL PROCEDURES

A. All submittals, regardless of origin, shall be stamped with the approval of Contractor and identified with the name and number of this Contract, Contractor name, and references to applicable specification paragraphs and Contract Drawings. Each submittal shall indicate the intended use of the item in the Work. When catalog pages are submitted, applicable items shall be clearly identified and inapplicable data crossed out. The current revision, issue number, and date shall be indicated on all drawings and other descriptive data. The forms shall be sequentially numbered.

B. The Contractor shall certify by signing the submittal that review, verification of products required, field dimensions and coordination of information is in accordance with the Work as specified in the Contract Documents.

C. Process submittals in accordance with this section.

D. Identify specific variations from the Contract Documents and Product or system limitations which conflict or may be detrimental to successful performance of the completed Work.

E. Provide space for the Contractor and Engineer review stamps. Submittals shall contain Contractor's executed review and approval marking. Submittals which are received from sources other than through Contractor or do not contain the Contractor approval marking will be returned without action.

F. Revise and submit resubmittal as required and identify all changes made since the previous submittal. Submission of resubmittals shall be performed in a similar manner as that of the submittals described in Paragraph 3.1 of this section.

G. Distribution:

1. Six copies of each drawing and necessary data shall be submitted. Engineer will return two marked copies to Contractor. Engineer will not accept submittals from anyone but Contractor. Submittals shall be consecutively numbered in direct sequence of submittal and without division by subcontracts or trades.
2. Distribute copies of reviewed submittals to all subcontractors whose work will interface with the subject of the submittal.
3. Provide additional distribution of submittals (not included in other copy submittal requirements specified in this Section) to subcontractors, suppliers, fabricators, installers, governing authorities and others as necessary for performance of the Work.
4. Include such additional copies in transmittal to Engineer where required for status before final distribution, and show such distribution on transmittal form.

H. The Engineer will review submittals only for general conformance with the Contract Documents. Such review by the Engineer shall not relieve the Contractor or any subcontractor of responsibility for full compliance with Contract requirements; for correctness of dimensions, clearances and material quantities; for proper designing of details; for proper fabrication and construction techniques; for proper coordination with other trades; and for providing all devices required for safe and satisfactory construction and operation.

I. Submittals reviewed by the Engineer and returned to the Contractor will be marked with one of the following designations:

1. No Exceptions Taken
2. Furnish As Noted
3. Revise and Resubmit

J. Processing of Revise and Resubmit Submittals

1. When the drawings and data are returned marked “Revise and Resubmit” Contractor shall not proceed with manufacture and the corrections shall be made as noted thereon and as instructed by Engineer and six corrected copies resubmitted.
2. Resubmissions will be handled in the same manner as first submissions. Direct specific attention, in writing or on the resubmittal, to revisions other than the corrections requested by the Engineer on previous submittals using the notation specified in this Section.

K. Processing of Furnish As Noted Submittals

1. When the drawings and data are returned marked "Furnish As Noted”, Contractor may proceed with manufacture at its own risk on the basis of incorporating all comments noted on the returned drawings and data, and six corrected copies submitted.
2. Resubmissions will be handled in the same manner as first submissions. Direct specific attention, in writing or on the resubmittal, to revisions other than the corrections requested by the Engineer on previous submittals using the notation specified in this Section.

L. Processing of No Exceptions Taken Submittals:

1. Each copy of the submittal so designated by the Engineer will be identified accordingly by being so stamped and dated.
2. Construction shall be carried out in accordance therewith and no further changes made therein except upon written instructions from the Engineer. Final drawings (paper, mylar, or electronic) and/or microfilms shall be submitted to the Engineer.

3.2 RESUBMITTAL OF DRAWINGS AND DATA

A. Contractor shall accept full responsibility for the completeness of each resubmittal. Contractor shall verify that all corrected data and additional information previously requested by Engineer are provided on the resubmittal.

B. Promptly notify the Engineer, if any correction or notation indicated on submittals constitutes a change of the Contract requirements.

C. Requirements specified for initial submittals shall also apply to resubmittals. Resubmittals shall bear the number of the first submittal followed by a letter (A, B, etc.) to indicate the sequence of the resubmittal.

D. Resubmittals shall be made within 7 days of the date of the letter returning the material to be modified or corrected.

E. Any need for more than one resubmission, or any other delay in obtaining Engineer review of submittals, will not entitle Contractor to extension of the Contract Times unless delay of the Work is directly caused by a change in the Work authorized by a Change Order or by failure of Engineer to review any submittal within the submittal review period specified herein and to return the submittal to Contractor.

3.3 PROPOSED PRODUCT LIST

A. Within 30 days from execution of the Agreement between Owner and Contractor, submit complete list of major products proposed for use, with name of manufacturer, trade name, and model number of each product, and the lead time for procurement, fabrication and delivery of all products with a lead time of more than 30 days.

B. For products specified only by reference standards, give manufacturer, trade names, model or catalog number, and reference standard.

3.4 PRODUCT DATA, SHOP DRAWINGS, AND SAMPLES

A. Product Data:

1. Collect required data into one submittal for each unit of Work or system; and mark each copy to show which choices and options are applicable to the Work. Include manufacturer's standard printed recommendations for application of labels and seals, notation of field measurements which have been checked, and special coordination requirements.
2. Maintain one set of Product Data (for each submittal) at project site, available for reference by Engineer and others.
3. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide all information unique to this Project.

4. After review, distribute in accordance with paragraph 3.1 of this section.

B. Shop Drawings:

1. Reproduce and distribute in accordance with Paragraph 3.1 of this section and for Record documents described in Section 01770: Contract Closeout.

C. Samples:

1. Provide units identical with final condition of proposed materials or products for the Work.
2. Include "range" samples (not less than three units) where unavoidable variations must be expected, and describe or identify variations that must be expected, and describe or identify variations between units of each set.
3. Provide full set of optional samples where Owner selection is required. Prepare samples to match Owner sample where so indicated.
4. Include information with each sample where so indicated. Include information with each sample to show generic description, source or product name and manufacturer, limitations, and compliance with standards. Samples are submitted for review and confirmation of color, pattern, texture, and "kind" by Owner.
5. Engineer will not "test" samples (except as otherwise indicated) for compliance with other requirements. Conformance with the Contract Documents is the exclusive responsibility of the Contractor.

## 3.5 MISCELLANEOUS SUBMITTALS

A. Construction Permits:

1. Acquire, maintain, and submit copies of all construction permits that are required by agencies to execute the Work.

B. Manufacturers' Instructions:

1. When specified in individual specification Sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting and finishing in quantities specified herein.
2. Identify any conflicts between manufacturers' instructions and Specifications

C. Manufacturers' Certificates:

1. When specified in individual specification Sections, submit manufacturers' certificates to Engineer, in quantities specified herein.
2. Indicate that a material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
3. Certificates may be recent or previous test results on material or Product, but must be acceptable to Engineer. If these are outdated and/or not acceptable to Engineer, the Contractor shall submit to the Engineer the new certificates and test results on materials or product.

D. Tests and Test Reports:

1. Classify each as either "project related" or Product Data, depending upon whether report is uniquely prepared for project or a standard publication of workmanship control testing at point of production, and process accordingly.

2. All test equipment used shall be verified to be in calibration at the time of each test and test reports shall so indicate. No test shall be made without such verification.

E. Standards:

1. Where copy submittal is indicated, and except where specified integrally with Product Data submittal, submit a single copy for Engineer's use.
2. Where workmanship at project site and elsewhere is governed by standards, furnish additional copies to fabricators, installers and others involved in performance of the work.

**END OF SECTION**

**SECTION 01350**
**ENVIRONMENTAL PROTECTION**

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Landscape preservation; prevention of water pollution; abatement of air pollution; abatement of noise; and temporary drainage provisions.

### 1.2 LANDSCAPE PRESERVATION

A. Exercise care to preserve the existing landscape outside of specified limits of areas of site disturbance. Conduct construction operations to prevent any unnecessary destruction, scarring, or defacing of the natural or man-made surroundings in the vicinity of the work.

B. Shape irregularly the edges of clearings and cuts through trees, shrubbery, and vegetation to soften the undesirable visual impact of straight lines. Perform movement of crews and equipment within the right-of-way, within easements, and over routes provided for access to the work in a manner to prevent damage to vegetation and property.

C. Destruction, scarring, damage, or defacing of the landscape resulting from the Contractor's operations shall be repaired, replanted, reseeded, or otherwise corrected as directed by the Owner and at the Contractor's expense.

D. The locations, alignments, and grades of construction roads are subject to approval of the Owner. Site clearing shall be conducted in accordance with Section 02230: Clearing and Grubbing. When no longer required by the Contractor, areas of construction roads and staging, stockpiling/disposal and storage areas shall be restored to the original topographic contours except as otherwise specified for excess excavation materials. All areas disturbed by construction shall be reclaimed in accordance with Section 02920: Reclamation. All contouring and reclamation work completed in disturbed areas shall be conducted in such a manner as to provide for proper drainage and to prevent erosion.

E. Except where clearing is required for permanent works or excavation operations, all trees, shrubbery, vegetation, and wetlands shall be preserved and protected from damage by the Contractor's construction operations and equipment.

F. Exercise special care where trees or shrubs are exposed to injuries by construction equipment, excavating, dumping, chemical damage, or other operations. Adequately protect such trees by use of protective barriers or other methods approved by the Owner. Removal of trees and shrubs shall be permitted only after approval by the Owner.

G. The layout of the Contractor construction facilities such as shops, trailers, storage areas, and parking areas; location of access and haul routes; and operations in the stockpile areas shall be planned and conducted in such a manner that all trees and shrubbery not approved for removal by the Owner shall be preserved and adequately protected from either direct or indirect damage by the Contractor operations.

H. No equipment shall be allowed to operate within the dripline of any tree to be protected.

I. Trees shall not be used for anchorages.

J. The Contractor shall be responsible for injuries to trees and shrubs caused by their operations. The term injury shall include, without limitation, bruising, scarring, tearing, and breaking of roots, trunks, or branches. All injured trees and shrubs shall be repaired or treated without delay, at the Contractor's expense. If injury occurs, the Owner shall determine the repair method or treatment to be used for injured trees and shrubs as recommended by an experienced horticulturist or a licensed tree surgeon provided by and at the expense of the Contractor. All repairs or treatment of injured trees shall be performed under the direction of an experienced horticulturist or a licensed tree surgeon provided by and at the expense of the Contractor.

K. Injured trees or shrubs that, in the opinion of the Owner, are beyond saving shall be removed and replaced early in the next planting season. The replacements shall be the same species, or other approved species, and of the maximum size that is practicable to plant and sustain growth in the particular environment. Replacement trees and shrubs shall be guyed, watered, and maintained for a period of one month. Any replacement tree or shrub that dies shall be removed and replaced, as directed by the Owner, with such replacements being maintained for a period of one month from the replacement date. Replacement of injured trees and shrubs not required to be cleared or removed for construction shall be at the Contractor's expenses.

1.3 SPILL PREVENTION AND CONTROL

A. Prepare and provide spill prevention and control procedures in the Work Plan submittal, See Section 01120: Contractor Work Plan. Prepare and implement spill prevention and control procedures and appropriate containment and diversionary structures, materials, and equipment to prevent and control the maximum spillage of any specific item within the scope of work. This includes the materials and equipment used in connection with this project. The procedures shall ensure that sufficient inspections and tests are performed on a continuing basis. All qualified personnel, appropriate facilities, instruments, equipment, and testing devices necessary for quality spill prevention and control shall be furnished. The spill prevention and control procedures shall be carefully thought out and prepared in accordance with all applicable Federal, State, and local laws and regulations, and good engineering practices. The necessary resources for procedures, methods, and equipment operations shall also be addressed.

B. Provide spill prevention and control procedures in the Work Plan as appropriate for the material being handled and hauled by the Contractor. Design, construct, operate and maintain preparedness and prevention facilities to minimize the possibility of a fire, explosion, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to the air or surface water which could threaten human health or the environment.

C. Implement special measures to prevent chemicals, fuels, oils, greases, bituminous materials, waste washings, herbicides, insecticides, harmful materials, biological materials, and concrete materials from entering the air, waters of the State, utilities, and storage areas.

D. Laws and Regulations: Do not pollute any area with any manmade or natural harmful materials. It is the sole responsibility of the Contractor to investigate and comply with all applicable Federal, State, county, and municipal laws and regulations concerning spill prevention and control procedures.

E. Communications: Provide internal communications or an alarm system to provide immediate emergency instruction to facility personnel if necessary. Provide a device, such as a telephone immediately available at the scene of operations, capable of summoning emergency assistance from local police departments, fire departments, State or local emergency response teams. A project telephone directory shall be included in the Work Plan.

F. Dispose of all materials off site in accordance with applicable Federal, State, and local laws and regulations. See Section 01575: Disposal of Waste Materials for additional requirements.

G. Required inspections and documentation shall be in accordance with written procedures developed by the Contractor. These written procedures shall be part of the Work Plan. A record of the inspections, signed by the appropriate supervisor or inspector, shall be maintained during the project and submitted to the Engineer for final close-out.

H. If materials are released provide a written description of the event, corrective action taken, and plans for preventing recurrence, as well as a written document of manpower, equipment, and materials required to expedite control and removal of any harmful quantity of materials released.

I. The Contractor is responsible for properly instructing Contractor personnel regarding applicable pollution control laws, rules, and regulations and in the operation and maintenance of equipment and BMPs to prevent the discharge of materials. Schedule and conduct spill prevention briefings for its operating personnel at intervals frequent enough to assure adequate understanding of spill prevention and control procedures for this project. Such briefings shall highlight and describe known spill events or failures, malfunctioning components, and recently developed precautionary measures.

J. Designate a person who is responsible for environmental protection to include but not limited to material spill prevention, BMPs maintenance, recordkeeping, permit condition compliance and who reports to management.

K. All facility communication systems and spill control equipment, shall be maintained by the Contractor as necessary to assure proper operation in time of emergency.

1.4 PREVENTION OF WATER POLLUTION

A. Comply with all project permit requirements, and all other applicable federal, state, and local laws, orders, regulations, permits, and water quality standards concerning the control and abatement of water pollution.

B. Perform construction activities by methods that shall prevent entrance or accidental spillage of solid matter, contaminants, debris, and other pollutants and wastes into streams, flowing or dry water courses, rivers, lakes, and underground water sources.

C. Such pollutants and wastes include, but are not restricted to, refuse, garbage, sediment from erosion of construction areas, concrete wash-out, sanitary waste, industrial waste, radioactive substances, oil and other petroleum products, aggregate processing tailings, mineral salts, and thermal pollution.

D. Do not allow wastewater from construction operations to enter streams, water courses, wetlands, or lakes without passing through suitable sedimentation ponds or treatment facilities approved by the Engineer.

E. Where the location of a construction site is such that oil or gas from an accidental spillage could reasonably be expected to enter into or upon the navigable waters of the United States or adjoining shorelines, and the aggregate storage of oil or gas at the site is over 1,320 gallons, or a single container has a capacity in excess of 660 gallons, prepare a Spill Prevention Control and Counter Measure Plan (SPCC) reviewed and certified by a registered professional engineer in accordance with 40 CFR, Par 112, as required by Public Law 92-500 as amended by Public Law 95-217 and Public Law 95-576.

F. Submit to the Engineer a certified statement that the SPCC, if required, was reviewed and certified by a professional engineer registered in the State of Colorado.

1.5 ABATEMENT OF AIR POLLUTION

A. Comply with applicable federal and state laws and County ordinances and regulations concerning the prevention and control of air pollution.

B. In conducting construction activities and operation of equipment, utilize such practicable methods and devices as are reasonably available to control, prevent, and otherwise minimize atmospheric emissions or discharges of air contaminants.

C. The emission of dust into the atmosphere shall be minimized during handling and storage of construction materials, and use such methods and equipment as are necessary to minimize or prevent dust during these operations. Earth surfaces subject to dusting shall be kept moist with water or by application of a chemical dust suppressant. When practicable, dusty materials in piles or in transit shall be covered to prevent blowing dust.

D. Do not operate equipment and vehicles that are found to have emissions of exhaust gases or particulates that exceed applicable limits established by federal, state, or local laws or authorities until corrective repairs or adjustments are made. If required by the Engineer, the Contractor shall provide acceptable evidence that equipment and vehicles have been tested for exhaust emissions and have been found to be in compliance with applicable limits.

E. Carry out proper and efficient measures wherever and as often as necessary to reduce the dust nuisance, and to prevent dust from damaging crops, orchards, cultivated fields, and dwellings, or causing a nuisance to persons. The Contractor will be held liable for any damage resulting from dust originating from his operations under these Specifications.

1.6 ABATEMENT OF NOISE

A. Comply with applicable federal and state laws and County ordinances, orders, and regulations concerning the prevention, control, and abatement of excessive noise.

B. Take reasonable measures to avoid unnecessary noise. Such measures shall be appropriate for the normal ambient sound levels in the area during working hours. All construction machinery and vehicles shall be equipped with practical sound-muffling devices, and operated in a manner to cause the least noise consistent with efficient performance of the Work.

1.7 TEMPORARY DRAINAGE PROVISIONS

A. Provide for the drainage of storm water, and such water as may be applied or discharged on the site in performance of the Work. Drainage facilities shall be adequate to prevent damage to the Work, the site, and adjacent property.

B. See also Section 01570: Sediment and Erosion Control.

**PART 2 PRODUCTS**

NOT USED

**PART 3 EXECUTION**

NOT USED

**END OF SECTION**

**SECTION 01410**
**REGULATORY REQUIREMENTS**

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Responsibilities for obtaining permits in accordance with federal, state, and local agencies.

### 1.2 GENERAL PERMIT REQUIREMENTS

A. Comply with the conditions and requirements of all permits required by federal, state, county, and local governing agencies in the performance of this Contract. If the Contractor fails to comply with the conditions and requirements of any permit and such failure to comply results in fines, penalties, and/or suspension of Work by a regulatory agency, all liability for such fines, penalties and delays are the sole responsibility of the Contractor.

B. The Contractor is responsible for obtaining all permits necessary to complete the Work. The Contractor is also responsible for all monitoring, testing, and corrective measures necessary to maintain the permits throughout the duration of the Project, including modification of or renewal of the permits as necessary. Applicable permits may include, but are not limited to, the following:

1. Colorado Department of Health and Environment (CDPHE), Water Quality Control Division (WQCD) Construction Stormwater General Permit (includes preparation of a Stormwater Management Plan [SWMP] and a Storm Water Pollution Prevention Plan [SWPPP].
2. CDPHE, WQCD Construction Stormwater Dewatering Permit.
3. CDPHE, Air Pollution Control Division (APCD), Construction Permit (regulates fugitive dust).
6. Haul permits.

### 1.3 OWNER OBTAINED PERMITS

A. The Owner is responsible for obtaining certain permits that pertain to the Work.

B. The Contractor shall be responsible for implementing and coordinating the terms and requirements of all environmental permits obtained by the Owner.

C. A copy of the permits obtained by the Owner will be provided with the Bid Documents

### 1.4 RESPONSIBILITY AND COORDINATION

A. Accept full responsibility for contacting all Federal, State, and local agencies to obtain permitting requirements for construction related activities on lands under jurisdiction by those agencies, and be fully responsible to research and become familiar with regulatory requirements that must be met for the performance of the Contract work.

B. Perform all coordination and documentation, and engineering to obtain the required permits including providing a registered professional engineer for engineering to obtain permits where required.

C. Be fully responsible and solely accountable for meeting the requirements of all permits.

D. Unless otherwise specified by an agency, the Contractor shall be the sole permittee for all contractor-obtained permits.

1.5 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

B. Contractor-Obtained Permits: Copies of all permits obtained by the Contractor.

## PART 2 PRODUCTS

NOT USED.

## PART 3 EXECUTION

NOT USED.

**END OF SECTION**

**SECTION 01450**
**QUALITY CONTROL**

## PART 1 GENERAL

### 1.1 SUMMARY

A. Contractor quality control requirements.

### 1.2 QUALITY ASSURANCE/CONTROL

A. Provide a quality control system to perform inspections, tests, and retesting in the event of failure of items of work, including that of subcontractors, to ensure compliance with the Contract provisions. Quality control will be established for all work.

B. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.

C. Comply fully with manufacturers' instructions, including each step in sequence.

D. Should manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

E. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

F. Perform work by persons qualified to produce workmanship of specified quality.

G. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

H. For Products or workmanship specified by association, trades, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

I. Obtain copies of standards when required by Contract Documents.

J. Should specified reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.

K. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

### 1.3 INSPECTION PROCEDURES

A. Preparatory inspection shall be performed by the Contractor before beginning any work, and, in addition, before beginning each segment of work. Preparatory inspection shall include a review of the Contract requirements, the review of shop drawings and other submittal data, a check to ensure that required control testing will be provided, a physical examination to ensure that materials and equipment conform to approved shop drawings and submittal data, and a check to ensure that required preliminary work has been completed.

B. An initial inspection shall be performed as soon as a representative segment of the particular item of work has been accomplished. Initial inspection shall include performance of scheduled tests, examination of the quality of workmanship, a review for omissions or dimensional errors, and approval or rejection of the initial segment of the work.

C. Follow-up inspections shall be performed as necessary, and shall include continued testing and examinations to ensure continued compliance with the Contract requirements.

D. Test results provided shall cite the Contract requirements, the test or analysis procedures used, and the actual test results, and shall include a statement that the item tested or analyzed conforms or fails to conform to the specification requirements. Each report shall be conspicuously noted in large letters "CONFORMS" or "DOES NOT CONFORM" to the specification requirements as the case may be. Test reports shall be signed by a testing laboratory representative authorized to sign certified test reports. The Contractor shall arrange for immediate delivery of the signed original of all test reports, certifications, and other documentation to the Engineer.

1.4 INDEPENDENT INSPECTION AND TESTING LABORATORY SERVICES

A. Conduct quality control testing for each item of Work to confirm work is in accordance with the contract documents.

B. Retain an independent geotechnical inspection and testing firm to perform the Contractor's specified quality monitoring and testing. Submit the name of the independent testing firm and laboratory and a statement of its qualifications. The firm shall have at least 5 years of experience in soil, and concrete inspection and testing, and shall be equipped to perform all field and laboratory tests specified that are the Contractor’s responsibility.

C. Submit names and resumes of the laboratory's key personnel and field testing personnel. Field personnel shall have at least 3 years experience in soil and concrete testing, and cannot be changed without prior approval of the Engineer.

D. Make available written results of all completed tests and inspections performed by the Contractor’s independent testing firm to the Engineer by the end of the next working day following completion of the tests. Provide verbal results to the Engineer upon test completion. Results of all completed tests shall be submitted to the Engineer.

E. Reports will indicate observations and results of tests and indicate compliance or non-compliance with Contract Documents.

F. Retesting required because of non-conformance to specified requirements is the Contractor’s responsibility and shall be performed by the Contractor’s approved testing agency.

1.5 ENGINEER TESTING

A. Engineer may perform and pay for quality assurance inspection and testing at their discretion, independent of testing and inspections performed by Contractor.

B. Cooperate with Engineer; furnish samples of materials, equipment, tools, storage, access, and assistance as requested.

C. Notify Engineer 24 hours prior to QC testing or sampling.

D. Engineer may obtain samples of material for testing. Contractor shall provide Engineer access and assistance in obtaining samples.

E. Engineer may inspect Contractor off-site producers of materials and products. Contractor shall provide access to these off-site facilities to the Engineer at all times during the Work.

1.6 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

B. Quality Control Plan. Prepare and submit a Construction Quality Control Plan (CQCP) within 30 calendar days after receipt of the Notice of Award. The CQCP shall identify personnel, procedures, controls, instructions, tests, records, reports and forms to be used. Describe quality control for each work element. Submit as part of the Work Plan specified in Section 01120: Contractor Work Plan. Unless specifically authorized by the Engineer in writing, construction shall not be started and no requests for payment will be processed until the CQCP is approved. This plan shall include, as a minimum:

1. Names and qualifications of personnel responsible for quality control on the Contract.
2. Area of responsibility and authority of each individual in the quality control system.
3. A description of the services the Contractor will have provided by outside organizations such as testing laboratories, manufacture representatives architects, and consulting engineers.
4. Procedures for reviewing shop drawings, samples, certificates, or other submittals for contract compliance, including the name of the person(s) authorized to sign the submittals for the Contractor, as complying with the Contract.
5. A test and inspection schedule, keyed to the construction schedule and following the order of the specification technical sections, indicating inspections and tests, the names of persons responsible for the inspection and testing for each segment of work, and the time schedule for each inspection and test.
6. The procedures for documenting quality control operation, inspection, and testing, with a copy of forms and reports to be used for this purpose. The Contractor shall also include a submittal status log listing submittals required by the specifications and drawings and stating the action required by the Contractor or the Engineer.

C. Independent Laboratory Qualifications. Name of the independent laboratory, a statement of qualifications (SOQ), the most recent certification by state/federal or other appropriate independent testing services, and names, resumes, and experience of the laboratory and field key personnel. Include a statement indicating the laboratory and field key personnel meet the requirements of this specification.

D. Daily Quality Control Reports.

E. Results of all completed testing.

**PART 2 PRODUCTS**

NOT USED

**PART 3 EXECUTION**

NOT USED

**END OF SECTION**

**SECTION 01500**
**CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS**

## PART 1 GENERAL

1.1 SECTION INCLUDES

A. Temporary Utilities: Electricity, lighting, heating ventilation and air conditioning (HVAC), telephone service, water, and sanitary facilities.

B. Temporary Controls: Barriers, enclosures and fencing, protection of the Work, project signage, and water control.

C. Construction Facilities: Access roads, parking, field offices.

1.2 TEMPORARY ELECTRICITY

A. Provide all power for HVAC, lighting, operation of Contractor's plant or equipment, or for any other use by Contractor.

B. Provide and pay for power service from utility sources as required.

C. Provide temporary electric feeder and electrical service as required.

D. Provide separate metering for cost of energy used as required.

1.3 TEMPORARY LIGHTING

A. Provide and maintain lighting for construction operations.

1.4 TEMPORARY HEAT

A. Provide HVAC devices and heat or cool as required to maintain specified conditions for construction operations.

1.5 TEMPORARY TELEPHONE AND INTERNET SERVICE

A. Make all necessary arrangements and pay all installation and monthly service charges for telephone and internet connection lines in engineer’s field offices at the site and provide all telephone instruments and modems.

1.6 TEMPORARY WATER SERVICE

A. Provide, maintain and pay for suitable quality water service required for construction operations.

1.7 TEMPORARY SANITARY FACILITIES

A. Furnish temporary sanitary facilities at the site, as provided herein, for the needs of all construction workers and others performing work or furnishing services on the Project.

B. Sanitary facilities shall be of reasonable capacity, properly maintained throughout the construction period, and obscured from public view to the greatest practical extent. If toilets of the chemically treated type are used, at least one toilet will be furnished for each

20 persons. Contractor shall enforce the use of such sanitary facilities by all personnel at the site.

## 1.8 CONSTRUCTION AIDS

A. Furnish, install, maintain, and operate all construction aids required by Contractor and its Subcontractors in the performance of the Work. Such construction aids shall include, but not be limited to, the following:

1. Cranes and hoists
2. Temporary enclosures
3. Scaffolding
4. Temporary stairs
5. Drainage provisions

## 1.9 PROTECTION OF PUBLIC AND PRIVATE PROPERTY

A. Protect, shore, brace, support, and maintain all underground pipes, conduits, drains, and other underground construction uncovered or otherwise affected by his construction operations. All pavement, surfacing, driveways, curbs, walks, buildings, utility poles, guy wires, fences, and other surface structures affected by construction operations, shall be restored to their original condition. All replacements shall be made with new materials.

B. Contractor is responsible for all damage to streets, roads, highways, shoulders, ditches, embankments, culverts, bridges, and other public or private property, regardless of location or character, which may be caused by transporting equipment, materials, or workers to or from the Work or any part or site thereof, whether by him or his Subcontractors. Contractor shall make satisfactory and acceptable arrangements with the Owner of, or the agency or authority having jurisdiction over, the damaged property concerning its repair or replacement or payment of costs incurred in connection with the damage.

## 1.10 DAMAGE TO EXISTING PROPERTY

A. Contractor will be held responsible for any damage to existing structures, Work, materials, or equipment because of his operations and shall repair or replace any damaged structures, Work, materials, or equipment to the satisfaction of, and at no additional cost to, the Owner.

B. Protect all existing structures and property from damage. Provide bracing, shoring, or other work necessary for such protection.

## 1.11 BARRIERS AND FENCING

A. Provide barriers or fencing to protect adjacent properties from damage from construction operations and demolition.

B. Provide barriers around all excavations or obstructions to prevent accidents and protect Work, apparatus, equipment, and material from theft and accidental or other damages, and make good any damages thus occurring at no cost to the Owner.

C. Protect non-owned vehicular traffic, stored materials, site and structures from damage.

D. Provide measures to protect Owner’s personnel and public from Work activities including, but not limited to, safety fence surrounding the work and staging, storage and stockpile areas.

1.12 WATER CONTROL

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

B. Protect site from puddling or running water. Provide water barriers, as required, to protect site from soil erosion.

1.13 DUST CONTROL

A. Provide all labor, equipment, machinery and other means to control dust emissions throughout the site for the duration of the project.

B. Abate dust nuisance by cleaning, sprinkling with water or other means as necessary.

C. The use of water, in amounts which result in ponding, is not acceptable as a substitute for other methods.

1.14 PROTECTION OF INSTALLED WORK

A. Protect installed Work and provide special protection where specified in individual specification Sections.

B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to minimize damage.

C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

1.15 SECURITY

A. Provide security and facilities to protect Work and Owner's operations from unauthorized entry, vandalism, or theft.

B. Contractor is responsible for protection of the site, and all Work, materials, equipment, and existing facilities thereon, against vandals and other unauthorized persons.

C. No claim shall be made against the Owner by reason of any act of an employee or trespasser, and Contractor shall make good all damage to Owner's property resulting from his failure to provide security measures as specified.

D. Security measures shall be at least equal to those usually provided by the Owner to protect the existing facilities during normal operation, but shall also include such additional security fencing, barricades, lighting, and other measures as required to protect the site and the public.

E. Keep all watershed access gates locked except during the time when they are attended. Key privileges will be defined in the Preconstruction meeting.

1.16 ACCESS ROADS

A. Conduct work to interfere as little as possible with public travel, whether vehicular or pedestrian. Whenever it is necessary to cross, obstruct, or close roads, driveways, and

walks, whether public or private, provide and maintain suitable and safe detours, or other temporary expedients for the accommodation of public and private travel.

B. As approved and based on the site location, construct and maintain temporary roads accessing public thoroughfares to serve construction area. Locations and methods of construction proposed for temporary access roads must be submitted for approval in the Contractor’s work plan.

C. Extend and relocate as Work progress requires. Provide detours necessary for unimpeded traffic flow.

D. Provide means of removing mud from vehicle wheels before entering streets.

1.17 PARKING

A. Provide and maintain suitable parking areas for the use of all construction workers and others performing work or furnishing services in connection with the Project, as required to avoid any need for parking personal vehicles where they may interfere with public traffic, Owner's operations, or construction activities. The location of the Contractor's parking areas shall be as acceptable to, and approved by, the Owner

1.18 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition. Brush clean or wash roadway near construction entrance(s) regularly.

B. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

C. Remove waste materials, debris, and rubbish from site and dispose off-site.

D. Maintain all construction areas and adjacent sites in a dust free condition.

E. Do not allow any condition to exist during construction which creates a nuisance; a fire hazard; an environment injurious to water quality, air quality, health or safety; or an attraction for children, animals, birds, rodents, etc.

F. Failure to comply with this provision after due and proper notice has been given by the Owner or representative will be sufficient grounds for the Owner to proceed to clean up such material and debris, make repairs and charge same to the Contractor.

1.19 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary above grade or buried utilities, equipment, facilities, materials, prior to Final Application for Payment inspection.

B. Clean and repair damage caused by installation or use of temporary work.

C. Restore existing facilities used during construction to original condition as specified in the Specifications. Restore permanent facilities used during construction to specified condition.

1.20 PROJECT CONTROLS

A. Provide signs along access roads to direct subcontractors, vendors etc to the construction site along approved access roads.

1.21 CONTRACTOR’S FIELD OFFICE

A. During the performance of this Contract, maintain a suitable office at or near the site of the Work which shall be the headquarters of its representative authorized to receive drawings, instructions, or other communication or articles. Any communication given to the said representative or delivered at the Contractor's office at the site of the Work in its absence shall be deemed to have been delivered to Contractor.

B. Copies of the Drawings, Specifications, and other Contract Documents shall be kept at the Contractor's office at the site of the Work and available for use at all times.

1.22 TEMPORARY FACILITIES

A. The Contractor shall remove temporary facilities as approved by the Engineer when no longer required.

## PART 2 PRODUCTS

NOT USED.

## PART 3 EXECUTION

NOT USED.

**END OF SECTION**

**SECTION 01515**
**SIPHON CONTROL**

## PART 1 GENERAL

1.1 SECTION INCLUDES

A. Control of siphon discharges by Owner.

1.2 COORDINATION

A. The Owner will be responsible for coordinating operation of the siphon.

1.3 LEVEL OF RESPONSIBILITY

A. Construction shall be protected from stormwater runoff by methods proposed by the Contractor and approved by the Engineer. The Contractor is responsible for diversion and any costs and delays associated with damage from inadequate protection from stormwater.

## PART 2 PRODUCTS

NOT USED.

## PART 3 EXECUTION

3.1 SIPHON CONTROL

A. Under existing conditions, the siphon is primarily supplied from upstream inflows from Continental Dam and is controlled by an upstream gate.

B. Work on the siphon shall occur while the siphon is empty. Nominal flow due to upstream gate leakage and similar minor inflows shall constitute a nominally empty pipe.

C. The Owner will control the flow into the siphon during construction. The Contractor is responsible for coordinating construction with the Owner.

**END OF SECTION**

**SECTION 01550**
**CONSTRUCTION ACCESS ROADS AND PARKING AREAS**

## PART 1 GENERAL

1.1 SECTION INCLUDES

A. Requirements for construction access roads and parking areas.

1.2 GENERAL

A. Access the construction area using only established roads.

B. Contractor is responsible for all snow removal on roads when required for access to the Work and shall furnish all required equipment and labor necessary to remove snow. Owner will only remove snow if and when necessary for Owner operations.

C. All construction traffic shall stay on approved access roads.

D. Dust mitigation measures shall include at a minimum, control of vehicle speed on roads, and furnishing a water truck and operator for road dust control when required. Other dust mitigation measures such as palliatives may be considered and will require submittal approval.

E. Obtain any applicable federal, state, or Local County permits for hauling on state, county, or local roads.

1.3 PROTECTION OF EXISTING ROADS

A. When legal load limits are exceeded, the Contractor may be fined by the Federal Government, County or State at no additional cost to the Owner. Repair damage to County or State roads caused by construction activity to meet the applicable roadway standards.

B. Before using any existing roads for moving construction equipment or hauling materials and supplies to the site, the Contractor, Owner and Engineer will jointly perform a condition survey of roads in the vicinity of the project. Notify the Engineer at least 10 days in advance of hauling any equipment or materials to the site. A representative of the County may also be present for the condition survey.

C. Contractor is responsible for maintaining access roads in their preconstruction condition until all construction activities are complete. Roads degraded by Contractor operations shall be repaired/regraded in a timely manner.

1.4 CONSTRUCTION ACCESS ROADS

A. Existing access roads provide access to the work areas, and no additional construction access roads are expected to be required. The access road adjacent to the exposed portion of the siphon is constructed of loose material on a slope, which may present difficulties for certain types of construction equipment and vehicles. Any damage to existing or access road will be repaired by the Contractor and no cost to the Owner.

B. Maintain public roadways free of mud and other construction debris. Install gravel tracking pad or other means to prevent tracking debris or mud onto public roads.

1.5 PARKING

A. Provide temporary gravel surface parking areas at Contractor use areas to accommodate construction personnel, as approved by the Engineer.

## PART 2 PRODUCTS

NOT USED.

## PART 3 EXECUTION

NOT USED.

**END OF SECTION**

**SECTION 01555**
**STAGING AND STOCKPILE AREAS**

## PART 1 GENERAL

1.1 STAGING AND STOCKPILE AREAS

A. Establish field offices in the staging and stockpile areas in areas shown on the Drawings or approved by the Owner.

B. Any clearing, grubbing, or grading in the staging and stockpile areas performed by the Contractor for setting up and maintaining this area requires the approval of the Engineer.

C. Stockpiling of materials outside the limits of the designated areas requires the approval of the Engineer.

1.2 SECURITY OF STAGING AND STOCKPILE AREAS

A. The Contractor is responsible for securing the staging and stockpile areas. Provide any security measures Contractor deems necessary to protect these work areas. All security fences and gates, if used by the Contractor, shall be removed by the Contractor at the end of construction.

## PART 2 PRODUCTS

NOT USED.

## PART 3 EXECUTION

NOT USED.

**END OF SECTION**

**SECTION 01570**
**SEDIMENT AND EROSION CONTROL**

## PART 1 GENERAL

1.1 SECTION INCLUDES

A. Furnishing all labor, materials, equipment, and incidentals necessary to perform all installation, maintenance, removal, and cleanup related to erosion and sedimentation control work as specified herein and as required by local authorities and permit to prevent erosion and/or transport of silt or sediment outside the limits of disturbance.

B. The work includes, but is not necessarily limited to, installation of temporary access ways and staging areas, silt fences and sediment barriers, sediment removal and disposal, device maintenance, removal of temporary devices, temporary stabilization, best management practices (BMPs), and final cleanup.

1.2 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

B. Technical product literature for all commercial products to be used for sedimentation and erosion control.

C. Contractors Sedimentation and Erosion Control Plan: (BMPs) in accordance with Local, State and federal regulations.

1.3 QUALITY ASSURANCE

A. The Contractor is responsible for the timely installation, maintenance, and removal of all sedimentation control devices necessary to prevent the movement of slurry or sediment from the construction site to offsite areas or into the stream or wetland system or preservation/ conservation areas via surface runoff or underground drainage systems. Measures, in addition to those shown on the Drawings, necessary to prevent the movement of sediment outside the limits of construction shall be installed, maintained, removed, and cleaned up at the expense of the Contractor. No additional charges to the Owner will be considered for the Work under this Section.

B. Sedimentation and erosion control products shall conform to the Drawings, this Section, County requirements, or CDOT standards as applicable.

C. The Contractor’s means and methods for excavations and soil disturbing activities shall be conducted to minimize the risk of sediment transport downstream. Sediment control measures will be required to meet strict project and permit standards.

## PART 2 PRODUCTS

2.1 MATERIALS

A. Silt Fence:

1. Posts: 2” x 2” wood, min. 4’-6” length as approved by the Project Manager.

2. Silt fence fabric shall be a woven, polypropylene, ultraviolet resistant material such as Mirafi 100X as manufactured by Mirafi, Inc.
3. Prefabricated commercial silt fence may be substituted for built-in-field fence. Pre-fabricated silt fence shall be "Envirofence" as manufactured by Mirafi Inc.

B. Erosion Bales:

1. Consisting of Certified Weed Free hay or straw certified under the Colorado Department of Agriculture Weed Free Forage Certification Program and inspected as regulated by the Weed Free Forage Act, Title 35, Article 27.5., CRS. Each certified weed free erosion bale shall be identified by one of the following:

a. One of the ties binding the bales shall consist of blue and orange twine, or
b. One of the ties binding the bale shall consist of specially produced shiny
c. galvanized wire, or
d. The bale shall have a regional Forage Certification Program tag indicating the
e. Regional Forage Certification Program Number.

2. Erosion bales shall be inspected for and Regionally Certified as weed free based on the Regionally Designated Noxious Weed and Undesirable Plant List for Colorado, Wyoming, Montana, Nebraska, Utah, Idaho, Kansas, and South Dakota. The Contractor shall not unload certified weed free erosion bales or remove their identifying twine, wire or tags until the Engineer has inspected and accepted them. The Contractor shall provide a certificate of compliance showing the transit certificate number or a copy of the transit certificate as supplied from the forage producer.

C. Erosion Logs: Curled aspen wood excelsior with a consistent width of fibers evenly distributed throughout the log and a seamless casing comprised of a photodegradable tube netting. The curled aspen wood excelsior shall be fungus free, resin free and shall be free of growth or germination inhibiting substances. Furnish logs with the minimum diameter and length shown on the Drawings.

## PART 3 EXECUTION

### 3.1 LOCATION OF SEDIMENT/EROSION CONTROL DEVICES

A. Provide sediment/erosion control barriers as needed to control the transport of silt and sediments outside of the limits of construction.

B. Install around the base of all soil stockpile areas. All nonworking faces of soil stockpiles, which will be in place longer than three months, shall be seeded and mulched or otherwise stabilized as acceptable to the Engineer.

### 3.2 INSTALLATION

A. Silt Fence Installation:

1. Positioned as necessary to prevent movement of sediment produced by construction activities outside of the limits of construction or as approved.

2. Install pre-fabricated silt fence according to Manufacturer's instructions and Drawing details.

B. Hay bale Barrier:

1. Bales shall be either wire-bound or string-tied with the bindings oriented around the sides rather than over and under the bales.
2. Bales shall be placed lengthwise in a single row with the ends of adjacent bales tightly abutting one another.
3. The barrier shall be entrenched and backfilled. A trench shall be excavated the width of a bale and the length of the proposed barrier to a minimum depth of 4-inches. After bales are staked and chinked, the excavated soil shall be backfilled against the barrier. Backfilled material shall conform to the ground level on the downhill side and shall be built up to 2 inches against the uphill side.
4. Each bale shall be securely anchored by at least two stakes or rebars driven through the bale. The first stake shall be driven toward the previously laid bale to force the bales together. Stakes shall be driven deep enough into the ground to securely anchor the bales.
5. The gaps between each bale shall be chinked (filled by wedging) with straw to prevent water from escaping between the bales.

## 3.3 MAINTENANCE AND INSPECTIONS

A. Inspections:

1. Contractor shall make a visual inspection of all devices at least once every 14 days and promptly after every rainstorm. If such inspection reveals that additional measures are needed to prevent erosion and/or movement of sediment to areas outside the limits of construction, Contractor shall promptly install additional devices as needed. Controls in need of maintenance shall be repaired promptly.
2. Contractor shall keep a log of all inspections indicating the following:

    a. Date and time of inspection
    b. Construction Project Inspector
    c. Amount of rainfall
    d. Erosion and sediment control devices inspected
    e. Condition of sediment and erosion control devices
    f. Repairs needed
    g. Date repair is completed

B. Minimum Device Maintenance:

1. Silt Fences:

    a. Remove accumulated sediment once it builds up to one-half of the height of the fabric.
    b. Replace damaged fabric, or patch with a 2-foot minimum overlap.
    c. Make other repairs as necessary to ensure that the fence is filtering all runoff directed to the fence.

2. Hay bale Barriers:

a. Remove accumulated sediment once it builds up to one-half of the height of the hay bales.
b. Replace damaged hay bales.
c. Make other repairs as necessary to ensure that the hay bales are filtering all runoff directed to the barrier.

## 3.4 REMOVAL AND FINAL CLEANUP

A. Once the Site has been fully stabilized against erosion as approved by the Engineer, remove sediment control devices and all accumulated sediment. Dispose of sediment and waste materials in proper manner. Regrade all areas disturbed during this process and stabilize against erosion with surfacing materials as indicated on the Drawings or specified herein.

**END OF SECTION**

**SECTION 01575**
**DISPOSAL OF WASTE MATERIALS**

## PART 1 GENERAL

### 1.1 SUMMARY

A. Section Includes

1. Classification of Waste Materials.
2. Disposal of Waste Materials.

### 1.2 CLASSIFICATION OF WASTE MATERIALS

A. Waste materials to be disposed of are classified in three categories: 1) excavated waste materials, 2) cleared vegetation, and, 3) other waste materials

1. Excavated waste materials include only those materials which are excavated from the designated excavations at the site which are not suitable for use in construction as determined by the Engineer, or in excess of that needed for construction. Rock and gravel removed from areas adjacent to the siphon pipe is classified under this category.
2. Cleared vegetation includes vegetation cleared from within the limits of site disturbance including excavation areas, borrow and disposal areas, staging and stockpile areas, and temporary construction roads.
3. Other waste materials include, but are not limited to demolished concrete and other demolished materials, sediment from sediment and erosion control devices reinforcing steel, pipe, miscellaneous metalwork etc., concrete truck wash water, oil and other petroleum products, solvents, paints and stains, refuse, garbage, debris, sanitary waste, crank case oil, grease, paint thinner, cleaning solvents or any other materials used in maintenance or operation of construction equipment.

### 1.3 DISPOSAL OF MATERIALS

A. The following materials shall be disposed of at an off-site disposal facility:

1. Other waste materials described in this Section.

B. The following materials may be disposed on-site:

1. Cleared vegetation.
2. Excavated waste materials described in this Section.

## PART 2 PRODUCTS

NOT USED.

## PART 3 EXECUTION

### 3.1 OFF-SITE DISPOSAL OF WASTE MATERIALS

A. Remove waste materials from the construction area prior to the completion of the work by the Contractor. Dispose of waste materials in an approved solid-waste facility or other approved facilities.

B. It is the responsibility of the Contractor to make any necessary arrangements with private parties and with County officials pertinent to locations and regulations of area landfills. Any fees or charges required to be paid for disposal of materials shall be paid by the Contractor.

C. In the event that certain materials cannot be disposed of in the local waste disposal facility, the Contractor shall identify a suitable alternative approved waste disposal facility and shall dispose of the material at such facility at no additional cost to the Owner.

### 3.2 ON-SITE DISPOSAL OF EXCAVATED WASTE MATERIALS

A. Onsite disposal area must be approved by the Owner.

B. Clear, grub, and strip approved onsite spoils disposal area in accordance with Section 02230: Clearing and Grubbing, and Section 02235: Stripping and Stockpiling Topsoil.

C. Excavated waste materials may be disposed of in approved spoils disposal areas provided placement methods comply with the provisions specified herein.

D. Reduce excavated waste rock material with an average dimension greater than 3 feet in diameter to a maximum average dimension of 3 feet in diameter.

E. Spread excavated rock material evenly over the disposal area in approximately 3 foot lifts and in a manner that does not create nesting rocks or void areas that would cause post construction settlement as approved by the Engineer.

F. Grade and shape the placement area to match surrounding grade and such that existing drainage patterns are maintained and there are no areas that would pond water.

**END OF SECTION**

**SECTION 01720**
**LAYOUT OF WORK**

## PART 1 GENERAL

1.1 SECTION INCLUDES

A. This section covers layout requirements.

1.2 GENERAL

A. The Work is to be executed in relation to the existing structures as shown on the Drawings.

B. Contractor shall keep neat and legible notes of measurements and calculations made in connection with the layout of the Work and measurement and payment. Copies of such data shall be furnished to the Engineer for use in checking Contractor's layout and measurement and payment.

1.3 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

B. Submit measurements and field notes to the Engineer. If electronic data (drawings in AutoCAD-compatible .DWG format and data in ASCII format) are generated, they also shall be submitted.

## PART 2 PRODUCTS

NOT USED.

## PART 3 EXECUTION

3.1 REQUIRED MEASUREMENTS

A. As-constructed measurements of new construction, including, but not limited to:

1. Thrust block overlay dimensions;
2. Intermediate support overlay dimensions and bearing height changes.

**END OF SECTION**

**SECTION 01770**
**CONTRACT CLOSEOUT**

## PART 1 GENERAL

### 1.1 SUMMARY

A. This section covers contract closeout items including closeout procedures, final cleaning, and project record documents.

### 1.2 CLOSEOUT PROCEDURES

A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Engineer's and Owner’s review.

B. Provide submittals to Engineer that are required by the Contract Documents, and governing or other authorities.

C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

### 1.3 FINAL CLEANING

A. Execute final cleaning prior to final inspection.

B. Clean debris from the site.

C. Sweep paved areas, rake clean landscaped surfaces.

D. Disconnect all temporary utilities to the site, and temporary site facilities and utilities.

E. Remove all Contractor-constructed staging/parking areas.

F. Clear, grade, and seed as required.

G. Remove waste and surplus construction materials, rubbish, wood, bituminous concrete, concrete debris, demolished materials, other foreign material, and construction facilities from the site.

### 1.4 PROJECT RECORD DOCUMENTS

A. Maintain on site, one set of the following record documents; record actual revisions to the Work:

1. Contract Drawings.
2. Specifications.
3. Addenda.
4. Change Orders and other Modifications to the Contract.
5. Reviewed submittals including shop drawings, product data, and samples.
6. Requests for information, field directives and project correspondence.

B. Store Record Documents separate from documents used for construction.

C. Record information concurrent with construction progress.

D. Specifications: Legibly mark and record at each Product section description of actual Products installed, including the following:

1. Manufacturer's name and product model and number.
2. Product substitutions or alternates utilized.
3. Changes made by Addenda and Modifications.

E. Record Documents and Shop Drawings: Legibly mark each item to record actual construction including:

1. Measured depths of foundations in relation to completed construction and the project datum.
2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements or benchmarks.
3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
4. Field changes of dimension and detail.
5. Details not on original Contract Drawings.

F. Submit closeout documents to Engineer with request for final Application for Payment.

## PART 2 PRODUCTS

NOT USED.

## PART 3 EXECUTION

NOT USED.

**END OF SECTION**

**SECTION 02220**
**SELECTIVE DEMOLITION AND SALVAGE**

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Selective demolition and salvage of existing features and items designated for removal and disposal.

B. Protection of existing items and features not identified for demolition, removal or dismantling.

### 1.2 DEFINITIONS

A. Demolish, Demolition, or Remove: Remove and dispose of designated existing equipment, materials, and ancillary features and components.

B. Remove and Salvage: Remove and deliver existing equipment, materials, and ancillary features and components to Owner at location as directed.

C. Remove and Relocate: Remove and relocate equipment, materials, and ancillary features and components.

D. Reinstall: Make service connections, and provide functional equipment at designated new location.

E. Retain or Protect: Leave designated existing equipment, materials, and ancillary features and components in place and protect from damage.

### 1.3 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

B. Demolition Plan including:

1. Schedule of demolition, including removals, salvage and replacement in conjunction with Progress Schedule.
2. Proposed methods of demolition including removals, salvage and replacement and equipment to be used.

C. Permits: Copies of current valid permits required by state and local regulations all State and local licenses and permits necessary to carry out the work.

D. After demolition is complete, if requested by the Engineer, submit reports describing quantities and type of demolition materials, and the locations, quantity, and method of disposal.

### 1.4 EXISTING CONDITIONS

A. Information contained in Contract Documents indicating the general scope of demolition is based on available historic drawings, which are provided in Appendix A. The Design Drawings show major features and not details for each item.

B. The Demolition Schedule included in this Section is a general summary solely for convenience of Contractor; inspect facilities and verify nature and location of work.

## PART 2 PRODUCTS

2.1 NOT USED.

## PART 3 EXECUTION

3.1 PREPARATION

A. The extent of demolition work shown on the Drawings is based on site observations. The specific extent of demolition for the various items will be determined by the Engineer in the field.

B. Notify Owner and Engineer minimum 7 days prior to beginning demolition work.

C. Protect existing vegetation, facilities, equipment, and fixtures to remain, including the siphon pipe and embedded anchor bolts.

D. Provide temporary barricades and other protection as required.

E. Erect and maintain dustproof and weatherproof partitions and closures as required.

F. Provide required shoring, bracing, and supports.

G. Equipment and Materials Designated for Salvage:

1. Do not remove and salvage features and materials without approval of Engineer.
2. Store and maintain salvaged equipment and materials in same condition as when removed.

H. Contractor and Engineer will document and record the condition of features and materials prior to removal.

3.2 DEMOLITION

A. Conduct demolition operations in a manner ensuring minimum interference with roads, structures, and other adjacent features and facilities.

B. Drawings define extent of demolition. Immediately notify the Engineer of damage to structures and features not identified for demolition or beyond the limits of demolition as shown or as determined by the Engineer.

C. Damage beyond the limits of demolition will be repaired or replaced using materials and methods appropriate for the particular location, as determined by the Engineer.

D. Remove materials to conform to new elevations, profiles, and sizes. Comply with specified tolerances and finishes.

E. Saw cut or otherwise isolate materials to be removed to minimize damage to adjacent surfaces.

F. Protect materials and equipment designated for reuse.

G. Remove items to be demolished to limits noted on Drawings.

H. Protect existing structures and surfaces from damage.

I. Use water sprinkling, temporary enclosures, and other methods to limit dust.

J. Comply with provisions of Section 01575: Disposal of Waste Materials for disposal of removed items, demolished materials, and debris.

K. Blasting is not allowed for demolition.

L. Where demolished surfaces will receive new concrete, surfaces shall be roughened to a minimum 1/4 inch amplitude.

3.3 SALVAGE

A. Transport the following items identified for salvage to a location acceptable to Owner:

1. Demolished concrete shall be broken into pieces not greater than 12-inches in any dimension, reinforcement trimmed off and disposed of at the direction of the Owner.

3.4 DEMOLITION SCHEDULE

A. Existing Concrete Thrust Blocks: Demolish only the deteriorated exposed concrete on the existing thrust blocks as indicated on the Drawings unless otherwise directed by the Engineer. Protect adjacent siphon pipe and thrust rings. Expose intact, undeteriorated concrete as determined by the Engineer. Except for rebar used as ladder access, reinforcing bars shall not be cut without approval from the Engineer.

B. Existing Concrete Intermediate Supports: Demolish only the deteriorated exposed concrete on the existing intermediate supports as indicated on the Drawings unless otherwise directed by the Engineer. Protect adjacent siphon pipe and footing concrete. Expose intact, undeteriorated concrete as determined by the Engineer. Fully-exposed reinforcing bars (completely exposed on all sides) may be cut where necessary. Remove existing bearing plate assemblies. The bearing plates at intermediate supports S12 and S13 shall be salvaged and reused as described in the Drawings.

**END OF SECTION**

**SECTION 02230**
**CLEARING AND GRUBBING**

## PART 1 GENERAL

1.1 SECTION INCLUDES

A. Removal of all surface debris, grass, trees, and shrubs within limits of disturbance as required to perform the work.

B. The general work areas which require site clearing include, but are not limited to:

1. Contractor staging/parking and stockpile areas.
2. Excavation areas.
3. Spoils disposal area.
4. Access roads.

1.2 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

B. Clearing and Grubbing Plan:

1. Describe method for vegetation removal and disposal.
2. Describe temporary barriers and methods to protect existing structures and property, existing plant life and features designated to remain, and areas beyond limits of disturbance.

## PART 2 PRODUCTS

NOT USED.

## PART 3 EXECUTION

3.1 PROTECTION

A. Verify the area to be cleared and existing plant life and features designated to remain with the Engineer before initiating any clearing operations in that area. Unauthorized clearing will not be approved for payment, and the Contractor is responsible for replacement of damaged existing plant life and features designated to remain.

B. Flag barricade and clearly mark existing plant life and features designated to remain.

C. Protect any trees, plant growth, and site features not designated for removal or designated for protection. Remove only those trees and plant growth required for the Work.

D. Do not disturb trees or shrubbery in public right-of-way or on property outside of the limits of disturbance.

3.2 CLEARING AND GRUBBING

A. Remove all trees, shrubs, undergrowth, deadwood, and other surface debris as required to perform the Work, within the limits of disturbance shown on the Drawings, except for those trees and shrubs designated to be protected.

B. Remove all trees, stumps, branches, brush and other material from clearing and grubbing activities. Cut tree trunks and branches into 10-foot maximum lengths and stockpile in staging and stockpile areas designated by the Owner.

C. Do not leave logs, stumps, rocks, etc., lying in the public right-of-way or on adjacent property without written approval by the Engineer.

3.3 DAMAGED VEGETATION

A. Contractor is responsible for injuries to vegetation caused by Contractor operations, personnel, or equipment. Remove and replace damaged vegetation designated for protection with vegetation of same type and size at no additional cost to the Owner.

3.4 PLACEMENT AND DISPOSAL

A. Dispose of excess vegetative materials and debris materials in accordance with all applicable rules and laws and in accordance with the requirements of Section 01575: Disposal of Waste Materials.

3.5 MAINTENANCE OF CLEARED AREAS

A. Maintain cleared work areas in a condition free from additional vegetation growth for the duration of the project.

B. Compensation for clearing each area will occur only one time. If weeds and brush growth require additional clearing, it shall be performed solely at the Contractor expense.

**END OF SECTION**

**SECTION 02315**
**EXCAVATION**

## PART 1 GENERAL

1.1 SECTION INCLUDES

A. Required loose rock removal as shown on the Drawings.

1.2 WORK NOT INCLUDED IN THIS SECTION

A. Work associated with clearing and grubbing or stripping and stockpiling topsoil and are not considered as excavation and shall be performed in accordance with Section 02230: Clearing and Grubbing.

B. Excavation by blasting is not allowed.

1.3 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

B. Proposed excavation plan at least 14 calendar days prior to performing any excavations. Include: Proposed excavation method(s) to be used; proposed excavation slopes, trench shields, bracing or other methods of construction to complete the construction safely; proposed excavation equipment; and proposed excavation sequence.

1.4 EXCAVATED MATERIALS CLASSIFICATION

A. Make provisions and plan for potential winter operations. This shall be documented in Contractor's method submissions and accommodated in their schedule.

B. Excavated materials are classified as follows:

1. Loose Rock Removal – Includes all earth materials ranging from loose gravels and stones to larger rocks and boulders to be removed.

1.5 PROTECTION

A. Comply with all safety requirements of OSHA.

B. Protect existing structures and facilities to remain. Damage to existing structures and facilities by the Contractor shall be repaired by the Contractor at no cost to the Owner and to the satisfaction of the Engineer

1.6 EXISTING SITE CONDITIONS

A. Use equipment and methods appropriate for site conditions.

B. Exploratory investigations cannot be relied on to accurately characterize all conditions that may exist in the foundations and that may be encountered during construction. Therefore, final excavated lines and grades will be determined in the field by the Engineer.

## PART 2 PRODUCTS

NOT USED.

## PART 3 EXECUTION

3.1 GENERAL EXCAVATION REQUIREMENTS

A. Identify required excavation lines, levels, contours, and datum, as shown on the Drawings.

B. Verify locations of buried underground utilities and pipes and overhead utilities prior to excavations. Immediately notify the Engineer if underground utilities or other unexpected underground structures are encountered. Repair any utilities or pipes damaged during construction at no cost to the Owner.

C. Excavate to the lines and grades as shown on the Drawings.

D. Repair damage to the work caused by the Contractor operations including disturbance of the material beyond the required excavation at no additional cost to the Owner. Make repairs in accordance with this section as directed by the Engineer, and at no additional cost to the Owner.

E. Assume all responsibility for determinations as to the nature of the materials to be excavated and the difficulties of making and maintaining the required excavations.

F. The Engineer reserves the right, during the progress of the Work, to vary the slopes, grades, or the dimensions of the excavations from those specified herein. Where the Engineer determines that foundation material is unsuitable through no fault of the Contractor, additional excavation will be ordered in writing and payment will be made in accordance with Section 01200: Price and Payment Procedures.

G. Take all necessary precautions to preserve the material below and beyond the established lines of all excavation. Repair any damage to the Work or the foundations as a result of the Contractor operations as directed by the Engineer at the expense of and by the Contractor. In no case should excavation near foundations extend below the foundation elevation.

H. Do not excavate in frozen materials, except with written approval of the Engineer.

I. Side slopes of all earth excavations shall be no steeper than that shown on the drawings. In all cases, excavations shall conform with all safety requirements of OSHA

J. Notify the Engineer as soon as possible of any unusual soil conditions, or soils of questionable stability or bearing capacity.

K. Dispose of excavated materials which are excess or deemed unsuitable. Dispose of unsuitable/excess excavated materials in accordance with Section 01575: Disposal of Waste Materials.

L. Do not waste any excavated material without the approval of the Engineer.

M. If slumping, heaving, or any other evidence of instability is observed during excavation, immediately report evidence of instability to the Engineer, whether it is observed during working or non-working hours.

N. Be prepared to temporarily backfill any unstable excavation to stabilize the area, if directed to do so by the Engineer.

3.2 FIELD QUALITY CONTROL

A. The Engineer will conduct visual inspections of excavations. Soft or yielding areas, indurated materials, gravel with large cobbles, or elsewhere, as determined by the Engineer, shall be excavated and backfilled as determined by the Engineer.

**END OF SECTION**

**SECTION 03100**
**CONCRETE FORMWORK**

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Formwork for cast-in place concrete with shoring, bracing, and anchorage, openings for other work, form accessories, and form stripping.

### 1.2 REFERENCES AND DEFINITIONS

A. American Concrete Institute (ACI)

| | | |
|---|---|---|
| 1. | ACI 117 | Standard Specifications for Tolerances for Concrete Construction and Materials. |
| 2. | ACI 301 | Specifications for Structural Concrete for Buildings |
| 3. | ACI 318 | Building Code Requirements for Structural Concrete |
| 4. | ACI 347 | Guide to Formwork for Concrete. |
| 5. | ACI SP-4 | Formwork for Concrete |

B. American Plywood Association

| | | |
|---|---|---|
| 1. | APA PS-1 | Construction and Industrial Plywood. |

### 1.3 SUBMITTALS

A. Submit the following in accordance with Section 01330: Submittals.

B. Shop Drawings:

1. Drawings for all formwork shall be submitted to the Engineer for approval at least 30 days prior to the commencement of the Work.
2. Include type, size, quantity, and strength of all form materials, plan for jointing of facing panels, and details affecting the appearance.

C. Product Data:

1. Manufacturer’s literature for form materials, form accessories, prefabricated forms, and form coating materials shall be submitted to the Engineer for approval at least 30 days prior to the commencement of the work.

### 1.4 QUALITY ASSURANCE AND QUALITY CONTROL

A. Include Work required in Contractor Quality Control plan submitted under Section 01450: Quality Control.

B. Perform Work in accordance with ACI 301, ACI 318 and ACI 347. Tolerance shall be as necessary to provide completed concrete structure within the tolerance specified in ACI 117.

C. Supply all labor, tools, equipment and materials to set forms so that resultant concrete conforms to required shapes, lines, and dimensions of the design, as well as the necessary code requirements. It is the Contractor's responsibility to design and build adequate

forms and to leave them in-place until the forms can be safely removed. The Contractor is responsible for damage and injury caused by removing forms carelessly or before the concrete has gained sufficient strength.

D. 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.

E. Monitor forms during concrete placement and correct deficiencies.

## PART 2 PRODUCTS

### 2.1 FORM MATERIALS

A. Plywood: Concrete form plywood, exterior grade, mill-oiled and edge-sealed as specified herein and in accordance with APA PS-1. High-density overlaid, or provided with an equivalent smooth form liner as the minimum form material for surfaces indicated to receive smooth form finish or any rubbed finish.

B. Glass Fiber Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to structural tolerances and appearance of finished concrete surface.

C. Lumber: Fir species; No. 2 grade or better; with grade stamp clearly visible.

D. Steel: Minimum 16 gauge sheet, well matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to structural tolerances and appearance of finished surfaces.

### 2.2 FORMWORK ACCESSORIES

A. Form Ties: Removable snap-off type, galvanized metal, ¾-inch break back dimension, fixed length, cone type, neoprene rubber washer for water seal, free of defects that could leave holes larger than 1-1/4 inch in concrete surface.

B. Form Release Agent: Standard manufactured product specifically formulated for form release. Colorless material that will not stain concrete, absorb moisture, or impair natural bonding or color characteristics of coating intended for use on concrete. Provide NSF 61 certified product where in contact with potable water.

C. Corners: Chamfered, rigid plastic or wood strip, 3/4 x 3/4 inch size, maximum practical lengths.

D. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

E. Joint Filler: A dense, closed-cell, foam rubber approved by the Engineer.

## PART 3 EXECUTION

3.1 GENERAL

A. Construct formwork for cast-in place concrete with shoring, bracing, and anchorage. The formwork shall include the openings for other work, form accessories, and form stripping.

3.2 INSPECTION

A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with the Drawings.

3.3 EARTH FORMS

A. Hand trim sides and bottom of earth forms. Remove loose soil and gravel prior to placing concrete.

B. Do not use rock cuts for forms except where specifically indicated on the Drawings or approved by the Engineer in writing.

C. When rock form is indicated or allowed, the rock face shall be sound.

3.4 DESIGN

A. Design, engineering, and construction of formwork shall be the responsibility of the Contractor.

B. Design, support, brace, and maintain formwork to safely support vertical and lateral loads that might be applied until such loads can be supported by the concrete structure. Vertical and lateral loads shall be carried to the ground by the formwork system until the in-place concrete has attained adequate strength.

C. Design formwork for anticipated live and dead loads.

D. Comply with tolerances specified in Section 03300: Cast-In-Place Concrete

E. Design as a complete system with consideration given to the effects of cementitious materials and mixture additives such as fly ash, cement type, plasticizers, accelerators, retarders, air entrainment, and others.

F. Monitor adequacy of formwork design and construction prior to and during concrete placement.

3.5 ERECTION - FORMWORK

A. Erect formwork, shoring, and bracing to achieve design requirements in accordance with requirements of ACI 301.

B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shoring.

D. Align joints and make watertight to prevent leakage of mortar. Keep form joints to a minimum.

E. Provide chamfer strips on all external corners, unless indicated otherwise.

3.6 APPLICATION - FORM RELEASE AGENT

A. Clean form surfaces of encrustations of mortar, grout, or other foreign material.

B. Apply form release agent on formwork in accordance with manufacturer's recommendations.

C. Apply prior to placement of reinforcing steel, anchoring devices and embedded items.

D. After form release agent is applied to form, the concrete shall be placed within 14 calendar days. If concrete is not placed within 14 calendar days, the forms shall be removed and form release agent reapplied.

E. Do not apply form release agent where concrete surfaces are scheduled to receive special finishes which may be affected by the agent such as crystal forming waterproofing. Soak contact surfaces of untreated forms with clean water. Keep surfaces wet prior to placing concrete.

3.7 INSERTS, EMBEDDED PARTS AND OPENINGS

A. Provide formed openings where required for items to be embedded in or pass through concrete work.

B. Locate and set in place items which will be cast directly into concrete.

C. Coordinate Work of other Sections in forming and placing openings, sleeves, bolts, anchors and other inserts.

D. Install accessories in accordance with manufacturer's instructions, straight, level, and plumb. Secure all embedded items before placing concrete. Ensure that items are not disturbed during concrete placement. Fill voids with readily removable material to prevent entry of concrete.

E. Provide blockouts for mechanical and electrical Work wherever necessary, and as shown on the Drawings.

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.

3.8 FORM CLEANING

A. Clean and remove foreign matter within forms as erection proceeds.

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 heat enclosure. Use compressed air or other means to remove foreign matter.

3.9 FORM REMOVAL

A. Notify the Engineer prior to removal of forms.

B. Remove forms in a manner, which will not damage concrete.

C. Do not wedge pry bars, hammers or tools against finish concrete surfaces scheduled for exposure to view.

D. Forms may be removed no less than one day after concrete placement.

E. It shall be the Contractor responsibility to limit construction loads at all times to those which can be carried safely by the developed strength of the structure at time of loading, and by formwork and shoring in-place at time of loading.

F. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

**END OF SECTION**

**SECTION 03150**
**CONCRETE JOINTS**

## PART 1 GENERAL

1.1 SECTION INCLUDES

A. Preparing construction joints in concrete between existing and new concrete overlays.

1.2 REFERENCES

A. American Concrete Institute (ACI)

| | | |
|---|---|---|
| 1. | ACI 224.3R | Joints in Concrete Construction. |
| 2. | ACI 318-05 | Building Code Requirements for Structural Concrete |

B. International Concrete Repair Institute (ICRI)

| | | |
|---|---|---|
| 1. | ICRI 0372 | Selecting and Specifying Concrete Surface Preparation for Sealing, Coatings, and Polymer Overlays |

1.3 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.
B. Joint preparation equipment, materials and methods.

1.4 CONTRACTOR QUALITY CONTROL

A. Perform concrete work in accordance with ACI 318 and ACI 224.

1.5 DEFINITIONS (Note: The following language regarding concrete joints takes precedence over the language in the referenced American Concrete Institute Document entitled “Joints in Concrete Construction.”)

A. Construction Joints (CJ):

1. Construction joints are joints which are purposely placed in concrete to facilitate construction; to reduce initial shrinkage stresses and cracks; to allow time for the installation of embedded metalwork; or to allow for subsequent placing of other concrete.
2. Bond is required at construction joints regardless of whether or not reinforcement is continuous across the joint.

B. Contraction Joints (CRJ):

1. Contraction joints are joints placed in concrete to provide for volumetric shrinkage of a monolithic unit or movement between monolithic units.
2. Contraction joints are constructed so no bond exists between concrete surfaces forming the joint
3. Except as provided for dowels, reinforcement is never continuous across a contraction joint.

C. Control Joints (CTJ):

1. Control joints are joints placed in concrete to provide for control of initial shrinkage stresses and cracks of monolithic units.
2. Control joints are constructed the same as contraction joints, with the exception that reinforcement is continuous across control joints.

D. Expansion Joints (EJ):

1. Expansion joints are joints provided to allow for expansion and contraction between two adjacent concrete members.
2. Joints are filled with sponge rubber joint filler.

E. Tooled Edges: Tool permanently exposed edges of slabs to a radius of ¼ inch.

## PART 2 PRODUCTS

## PART 3 EXECUTION

3.1 CONCRETE JOINTS

A. Construction Joints:

1. Locate construction joints where shown on Drawings or approved by the Engineer in writing. Show proposed locations of construction joints on the placement Drawings submitted under Section 03300: Cast-In-Place Concrete. Relocation, addition, or elimination of construction joints is subject to approval by the Engineer.
2. Locate horizontal joints in walls at the tops of footings or grade slabs. Place haunches at the same time as slabs.
3. Prepare construction joint surfaces for bonding by sandblasting, steel shot blasting, or high-pressure water jetting (6,000 psi minimum), or other method approved by the Engineer to thoroughly clean the surface. Remove all laitance, loose or defective concrete, coatings, sand, curing compound, and other foreign material to expose coarse aggregate uniformly, free of laitance, loose aggregate, or damaged concrete. Roughen concrete to produce minimum roughness profile of 1/4 inch. Surface preparation shall be conducted in a manner sufficient to keep from undercutting the edges of the larger particles of aggregate
4. Thoroughly moisten surfaces of construction joints to be covered with fresh concrete to surface saturated dry condition and remove standing water leaving the surface damp just before concrete placement.

**END OF SECTION**

**SECTION 03200**
**CONCRETE REINFORCEMENT**

## PART 1 GENERAL

1.1 SECTION INCLUDES

A. Reinforcing steel bars and accessories for cast-in-place concrete, and adhesive dowels.

1.2 REFERENCES

A. American Society of Testing and Materials International (ASTM)

| | | |
|---|---|---|
| 1. | ASTM A 615 | Standard Specification for Deformed and Plain Billet - Steel Bars for Concrete Reinforcement. |

B. American Concrete Institute (ACI)

| | | |
|---|---|---|
| 1. | ACI 301 | Standard Specifications for Structural Concrete for Buildings. |
| 2. | ACI 315 | Details and Detailing of Concrete Reinforcement. |
| 3. | ACI 318 | Building Code Requirements for Structural Concrete. |

C. Concrete Reinforcing Steel Institute (CRSI)

| | | |
|---|---|---|
| 1. | CRSI | Manual of Standard Practice. |
| 2. | CRSI 63 | Recommended Practice for Placing Reinforcing Bars. |
| 3. | CRSI 65 | Recommended Practice for Placing Bar Supports, Specifications, and Nomenclature. |

1.3 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

B. Reinforcement Placement Drawings:

1. Indicate bar sizes; spacings; locations and quantities of reinforcing steel; bending and cutting schedules; and supporting and spacing devices.
2. Show locations of splices. Proposed reinforcing splices not indicated on the Drawings will require written approval by the Engineer.

C. Mill Test Reports:

1. Submit certified copies of mill test reports of reinforcement material analyses.

D. Smooth dowel coating.

E. Manufacturer's installation instruction for adhesive dowels.

1.4 QUALITY ASSURANCE AND QUALITY CONTROL

A. Perform concrete reinforced work in accordance with the CRSI Manual of Standard Practice and Document 63 and 65.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store reinforcement of different sizes and shapes in separate piles or racks raised above the ground to avoid rusting.

B. Protect from contaminants such as grease, oil, and dirt.

C. Provide identification after bundles are broken and tags removed.

## PART 2 PRODUCTS

2.1 REINFORCEMENT

A. Reinforcing Steel and Foundation Anchors: ASTM A 615; billet steel deformed bars; uncoated finish; Grade 60.

B. Steel Dowels

1. Dowels: ASTM A615, Grade 60 steel bars, size as shown on the Drawings.
2. Bond Breaking Compound: Use a bond-breaking compound approved by the Engineer.

2.2 ACCESSORY MATERIALS

A. Tie Wire: Minimum 16 gage annealed type.

B. Chairs, Bolsters, Bar Supports, and Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions, in accordance with CRSI Manual of Standard Practice. Use of concrete block, rocks, or other items for reinforcement support will not be allowed.

C. Dowel Adhesive: Hilti, Inc., Tulsa, OK; HIT Doweling Anchor System (HIT HY-150), or approved equal.

2.3 FABRICATION

A. Fabricate concrete reinforcing in accordance with ACI 315.

B. Reinforcing splices have been located on the Drawings. Additional splices must be reviewed and approved in writing by the Engineer.

C. Welding reinforcing bars is not permitted.

## PART 3 EXECUTION

3.1 INSTALLATION

A. Before placing concrete, clean reinforcement of loose rust, loose mill scale, dirt, grease, and other substances, which would impair bond with concrete. Remove rust by vigorous rubbing with burlap cloth or wire brushing.

B. Accommodate formed openings.

C. Place, support, and secure reinforcement against displacement. Do not deviate from required position.

D. Place reinforcement in accordance with the Drawings, Contractor reinforcing steel placement submittals and CRSI 65.

E. See Drawings for structural notes, and for reinforcement cover requirements.

F. Splice reinforcing bars by lapping and securely wiring together. Splices at locations other than those indicated are subject to written approval by the Engineer and shall conform, to the requirements of ACI 318. Do not use mechanical splices. Do not weld or tack weld reinforcing bars.

G. Place and secure embedded metalwork and conduit so as to not interfere with reinforcement installation.

H. Field bending of reinforcement is not allowed unless approved by the Engineer in writing.

I. Place reinforcement with clear distance of 1-inch, minimum, between reinforcement and anchor bolts, form ties, or other embedded metalwork unless otherwise shown on Drawings.

J. Tolerances:

1. Maintain concrete cover over reinforcement within 1/4 inch of specified cover.
2. Maintain spacing of reinforcing bars within 1 inch of required spacing.

3.2 ADHESIVE DOWEL INSTALLATION

A. Install adhesive dowels only where shown on the Drawings or otherwise approved by the Engineer.

B. Install adhesive dowels in strict accordance with the manufacturers written instructions, including hole drilling and hole size, hole cleaning and preparation, adhesive injection, dowel placement, and cure times.

3.3 INSPECTION

A. Notify the Engineer at least 24-hours in advance of a requested concrete reinforcement inspection. Provide sufficient time in the schedule for the Engineer to inspect the reinforcing steel prior to placement of concrete. Concrete placed without inspection and approval by the Engineer may be subject to rejection and removal at no additional cost to the Owner.

B. Engineer inspection of steel reinforcing prior to concrete placement will not relieve the Contractor from responsibility to conform to the Drawings and Specifications.

**END OF SECTION**

**SECTION 03300**
**CAST-IN-PLACE CONCRETE**

## PART 1 GENERAL

1.1 SECTION INCLUDES

A. Cast-in-place concrete for new concrete overlays.

1.2 REFERENCES AND DEFINITIONS

A. American Concrete Institute (ACI)

| | | |
|---|---|---|
| 1. | ACI 117 | Standard Tolerances for Concrete Construction and Materials (ACI 117) and Commentary (ACI 117R-06) |
| 2. | ACI 301 | Specification for Structural Concrete. |
| 3. | ACI 302.1R | Guide for Concrete Floor and Slab Construction. |
| 4. | ACI 304.2R | Placing Concrete by Pumping Methods. |
| 5. | ACI 305R | Hot Weather Concreting. |
| 6. | ACI 306.1 | Standard Specification for Cold Weather Concreting. |
| 7. | ACI 306R | Cold Weather Concreting. |
| 8. | ACI 308.1 | Standard Specification for Curing Concrete. |
| 9. | ACI 308R | Guide to Curing Concrete. |
| 10. | ACI 309R | Guide for Consolidation of Concrete |
| 11. | ACI 309.2R | Identification and Control of Consolidation-Related Surface Defects in Formed Concrete. |
| 12. | ACI 318 | Building Code Requirements for Structural Concrete. |

B. American Society for Testing and Materials International (ASTM)

| | | |
|---|---|---|
| 1. | ASTM C 31 | Standard Practice for Making and Curing Concrete Test Specimens in the Field |
| 2. | ASTM C 33 | Standard Specifications for Concrete Aggregates. |
| 3. | ASTM C 39 | Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens |
| 4. | ASTM C 42 | Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete |
| 5. | ASTM C 94 | Standard Specifications for Ready-Mixed Concrete |
| 6. | ASTM C 114 | Standard Test Methods for Chemical Analysis of Hydraulic Cements |
| 7. | ASTM C 138 | Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete |
| 8. | ASTM C 143 | Standard Test Method for Slump of Hydraulic Cement Concrete |
| 9. | ASTM C 150 | Standard Specifications for Portland Cement. |
| 10. | ASTM C 171 | Standard Specification for Sheet Materials for Curing Concrete. |
| 11. | ASTM C 231 | Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method |
| 12. | ASTM C 260 | Standard Specification for Air Entraining Admixtures for Concrete. |
| 13. | ASTM C 309 | Specification for Liquid Membrane-Forming Compounds for Curing Concrete. |

14. ASTM C 441 Standard Test Method for Effectiveness of Pozzolans or Ground Blast-Furnace Slag in Preventing Excessive Expansion of Concrete Due to the Alkali-Silica Reaction
15. ASTM C 494 Standard Specification for Chemical Admixtures for Concrete.
16. ASTM C 618 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
17. ASTM C 1017 Standard Specification for Chemical for Use in Producing Flowing Concrete
18. ASTM C 1064 Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
19. ASTM C 1602 Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete

C. American Association of State Highway and Transportation Officials (AASHTO)

1. AASHTO M182 Burlap Cloth Made from Jute or Kenaf.

D. American National Standards Institute (ANSI)

1. ANSI/NSF 61 Drinking Water System Components–Health Effects

1.3 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

B. Material Approval Data

1. Mix Design: For each concrete mix design submit proposed mix designs in accordance with ACI 301 for review and approval.
2. Name and manufacturer of each cementitious material, aggregate source, admixture, and curing compound.

a. The Engineer reserves the right to require submission of manufacturer's test data and certification of compliance with specification.
b. The Engineer reserves the right to require submission of samples of concrete materials for testing before or during use in concrete.

3. Cementitious materials certifications and test reports:

a. Manufacturer's certification and test reports for each lot from which shipments are drawn.

1) Certify materials were tested during production or transfer in accordance with specified reference specification.
2) Submittal of certification and test reports shall not relieve Contractor of responsibility for furnishing materials meeting specified requirement.

C. Concrete Placement Drawings:

1. Drawings for each individual concrete placement. An individual concrete placement is defined as a portion of concrete Work placed in one continuous operation between specified lines or joints.

2. Show locations, dimensions, blockouts, openings, recesses, waterstops, and finishes. Identify construction joints, control joints, contraction joints, and expansion joints.
3. Show details of items embedded in or associated with placement except reinforcing steel.
4. Include a separate drawing showing placement sequence.
5. Place a title block with Contractor's name, contract title and number, placement identification, and identifying drawing number in lower right hand corner of each drawing.
6. List reference drawings from which details shown on placement drawing were obtained on each drawing.
7. Reference related steel reinforcement drawings associated with placement on each drawing.

D. Concrete Placement Schedule

1. Complete, detailed concrete placement schedule showing the Contractor's plan for placement of individual features, units, and other elements of concrete work.
2. Detail as necessary to show location, sequence, and date of concrete placements scheduled for each item of concrete work.
3. Show submittal of detail drawings and placement of reinforcement and embedded items.

1.4 QUALITY ASSURANCE AND QUALITY CONTROL

A. Include quality control required for Section 03100: Concrete Formwork in Contractor Quality Control Plan.

B. Include provisions for hot or cold weather concrete in Contractor Quality Control plan.

C. Perform Work in accordance with provisions of all applicable ACI standards.

D. Obtain materials from same source throughout the Work.

E. Project Record Documents

1. Accurately record as-built concrete dimensions and tolerances and locations of embedded utilities and components on placement drawings.

F. Sequencing and Scheduling

1. Notify the Engineer at least 48 hours prior to commencing concrete Work.
2. Allow the Engineer to perform an immediate inspection of concrete surfaces upon removal of forms.
3. Notify the Engineer upon discovery of any honeycombing, foreign-embedded items, and/or defective concrete.

## PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

A. Cement: ASTM C 150 Portland Cement, Type I/II;

1. Meet equivalent alkalies requirements of ASTM C 150 – Table 2.

2. Meet false-set requirement of ASTM C 150 – Table 4.

B. Pozzolan: ASTM C 618, Class F, Except,

1. Sulfur trioxide, maximum: 4.0 percent.
2. Loss on ignition, maximum: 2.5 percent.
3. Test for effectiveness in controlling alkali-silica reaction under optional physical requirements in Table 2 of ASTM C 618. Use low-alkali cement for test.
4. Does not decrease sulfate resistance of concrete by use of pozzolan.
5. Demonstrate pozzolan will have an "R" factor less than 2.5.

    a. R = (C-5)/F
    b. C: Calcium oxide content of pozzolan in percent determined in accordance with ASTM C 114.
    c. F: Ferric oxide content of pozzolan in percent determined in accordance with ASTM C 114.

6. Pozzolan when tested in accordance with ASTM C 441, shall conform to the following: 65 percent minimum reduction in mortar expansion at 14 days, and 0.02 percent maximum mortar expansion at 14 days. Expansion shall be less than control sample expansion.
7. Pozzolan content shall be 20 percent plus or minus 5 percent by weight of the total cementitious materials.
8. Pozzolan and cement shall be stored and batched separately.

C. Aggregates:

1. Fine aggregate: ASTM C 33.
2. Coarse aggregate ASTM C 33, Size No. 67
3. Fine and coarse aggregate shall not be of a carbonate-based rock. Coarse and fine aggregates shall not contain any materials that are deleteriously reactive with the alkalis in the cement in an amount sufficient to cause excessive expansion of mortar or concrete. The amount of coal and lignite in the fine aggregate shall be less than 0.5 percent.

D. Water: Water for concrete shall be clean and free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances that may be deleterious to concrete or reinforcement in accordance with ASTM C 1602, including optional requirements of Table 2.

2.2 ADMIXTURES

A. Air Entraining Admixture:

1. ASTM C 260.
2. Use a neutralized vinsol resin formulation for air-entraining admixture used with ASTM C 494, Type F or G; and ASTM C 1017, Type I or II chemical admixtures.

B. Other Admixtures: Use only when approved and at no additional cost to the Owner. Conform to ASTM C 494:

1. Accelerators: Approval does not relax cold-weather placement requirements. Calcium chloride is prohibited.

2. Set-retarders or stabilizers: Approval does not relax hot-weather placement requirements.
3. Water reducers: Type A, D, E, F or G, to achieve workability without exceeding specified water/cement ratio and slump.
4. Mineral admixtures to be used or furnished under this Specification shall be certified to comply with this Specification by the supplier. Certification shall include test results on Specifications, source, and location.

2.3 FIBER REINFORCEMENT

A. Fiber reinforcement shall conform to ASTM. C 1116 Type III (Synthetic Fiber).

B. Synthetic fibers shall be commercially available polypropylene fibers or chemically inert equivalent. Fiber content in concrete shall be between 0.1 and 0.2 percent by volume to produce a mix designed to control plastic shrinkage.

2.4 CURING MATERIALS

A. Water: ASTM C 1602, including optional requirements of Table 2.

B. Curing Compound: ASTM C 309

C. Polyethylene Film: ASTM C171.

2.5 CONCRETE MIX

A. Mix and deliver concrete in accordance with ASTM C 94.

B. Select proportions for normal weight concrete in accordance with ACI 301 and ACI 318.

C. Provide concrete to the following criteria:

1. Compressive Strength (28 days): 4500 psi minimum concrete for all structures.
2. Slump: In accordance with ASTM C 143, and with ASTM C 1017, Type I or II chemical admixtures, use slump appropriate for placing conditions, with a maximum slump of 8 inches.
3. Entrained Air: 4% to 7% at point of placement in accordance with ASTM C 231.
4. Maximum water/cementitious material ratio: 0.45.
5. Concrete temperature at placing: 50 to 80 degrees F.

D. Use accelerating admixtures in cold weather only when approved by the Engineer in writing. Use of admixtures will not relax cold weather placement requirements.

E. Use of calcium chloride is not permitted.

F. Use set retarding admixtures during hot weather only when approved by the Engineer.

G. Use set-controlling admixtures to increase allowable concrete delivery and placement restrictions in accordance with applicable provisions of this Section only when approved by the Engineer.

H. Add other approved admixtures (water reducer/superplasticizer, etc.) in accordance with the manufacturer’s recommendations.

I. Superplasticizer shall be added to the concrete trucks at the site and the following requirements shall be followed:

1. The manufacturer's recommendations for dosage, mixing, and use.
2. A calibrated field dispenser shall be used. Records of dosage for each concrete truck shall be recorded by the Contractor and provided to the Engineer.
3. Each truck shall be mixed after dosing with the minimum number of drum rotations in accordance with the requirements of ACI and the admixture manufacturer.
4. Field concrete tests (air content, temperature, and slump) shall be performed on each truck before and after adding the admixture.

J. Concrete mix shall meet all specified requirements. Failure to meet any one specified requirement shall be sufficient cause for rejection.

K. Concrete shall be able to flow completely around and below siphon pipe, leaving no voids or gaps.

2.6 CONCRETE CONSOLIDATION EQUIPMENT

A. Consolidation equipment shall be flexible, electric or pneumatic-drive immersion-type vibrators with an operating speed of 7000 rpm when immersed in concrete.

## PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that joint preparation conforms to these Specifications.

B. Verify requirements for concrete cover over reinforcement.

C. Verify that anchors, seats, plates, reinforcement, embeds, openings, water stops, and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

3.2 PREPARATION

A. Remove standing water, ice, mud, and debris from foundation surfaces to be covered by concrete.

B. Prepare rock surfaces free from oil, objectionable coatings, and loose, semi-detached, and unsound fragments. Immediately before placement of concrete, wash rock surfaces with an air-water jet and dry to a uniform surface-dry condition.

C. Prepare earth foundations free from frost or ice.

D. Thoroughly moisten surfaces of absorptive foundations to be covered with concrete so that moisture will not be drawn from fresh concrete.

E. Remove hardened concrete, wood chips, ice, and other debris from the interior of forms.

F. Place form release agent or wet forms just prior to placing concrete. Form release agent or any other deleterious material is not acceptable on concrete surfaces.

3.3 PLACING CONCRETE

A. Place concrete in accordance with ACI 304, ACI 309 and ACI 318.

B. Notify the Engineer a minimum of 48 hours prior to commencement of operations. The Engineer shall inspect all surfaces on which concrete is to be placed.

C. No concrete shall be placed until all formwork, installation of items to be embedded, and preparation of surfaces involved in the placement have been approved. Formwork and foundation surfaces on which cast-in-place concrete is placed shall be moistened and kept moist until overlying concrete is placed.

D. Place concrete in as nearly a continuous operation as practical and in a manner to produce a concrete mass with sufficient continuity and continuance so that it shall harden and act as a monolithic mass with no discontinuous joints or potential places of separation or weakness.

E. Concrete shall be placed in near horizontal layers; the depth of each layer shall not exceed 20 inches. Place mixture on prepared foundation or previously completed concrete materials with spreading equipment that prevents segregation and that produces layers of widths and thicknesses as necessary for compaction to the required dimensions. Place each successive layer as soon as practicable after the preceding layer is completed.

F. Ensure reinforcement, inserts, embedded parts, and waterstops are not disturbed during concrete placement.

G. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

H. Deposit concrete as close as practicable to its final position. Concrete shall be placed by methods that do not cause segregation. Do not drop concrete more than 3 feet.

I. Do not re-temper concrete.

1. Provide sufficient concrete placing capacity and equipment to deliver and place concrete without undue delay; do not permit cold joints to occur. Discharge concrete into forms within 90 minutes following the first introduction of water and cement or cement and aggregates, whichever occurs first. If the air temperature is 85° F or higher, the time limit specified above shall be reduced to 60 minutes unless the Engineer's approval has been obtained for means to maintain acceptable concrete quality without such time reduction. The Engineer may approve longer placement times provided no water is added after the specified time period above, and the approved concrete mix contains a water reducing and retarding admixture.

J. Cast-in-place concrete shall not be placed during heavy rain (more than 0.3 inch per hour or 0.03 inch in 6 minutes as defined by the Weather Bureau Glossary of Meteorology). If unusual adverse weather such as heavy rain, severe cold, heavy snow, high wind, or other adverse weather occurs, or is forecast to occur during placement, an interruption in placing operations may be approved or directed. All placed concrete materials shall be fully compacted before stopping Work. Allow for construction schedule risk and added expense that could occur as a result of adverse weather. Weather delays shall not be cause to receive additional compensation. Conform to ACI 306R for additional cold weather placement requirements.

K. Consolidate concrete in accordance with ACI 309. Do not place vibrator against reinforcing or forms or use vibrator to transport concrete within forms. Have one extra

vibrator and one extra generator on site at all times during placement of concrete to be used in the event of breakdown of primary equipment.

L. Do not use concrete which has been subjected to more than 250 total revolutions of any combination of mixing and agitating equipment following the first introduction of aggregates to the mixer.

M. Contractor may place concrete by pumping, at Contractor's option. Appropriate mix design provisions must be included in Contractor's approved concrete submittal before any concrete is placed by pumping methods. Concrete placement by pumping methods shall be performed in accordance with applicable provisions of ACI 304.2R.

N. Maintain concrete cover around reinforcement as indicated on the Drawings and in accordance with ACI 318.

O. Place concrete continuously between predetermined construction, contraction, control and expansion joints. Do not break or interrupt successive pours such that cold joints occur.

## 3.4 CONCRETE FINISHING

A. Finish all exposed concrete as follows:

1. All exterior slab surfaces shall be sloped a minimum of 1/8 inch in 1 foot or as indicated on the drawings. All exterior slab surfaces shall have a floated finish as defined in ACI 301.
2. All smooth, exposed, exterior vertical surfaces shall have a smooth form finish as defined in ACI 301 unless otherwise approved by the Engineer.
3. All interior formed surfaces shall have a smooth form finish as defined in ACI 301.
4. Edges:

    a. Chamfer edges of permanently exposed concrete, except slabs and top edges of walls, with a 45 degree bevel ¾ inch by ¾ inch unless otherwise shown on the drawings.
    b. Tool exposed edges of slabs and top edges of walls to a radius of ¼ inch unless shown otherwise on the drawings.

B. All other exposed concrete surfaces on the project shall be as follows:

1. Formed surfaces shall be smooth form surfaces as defined in ACI 301.
2. All unformed surfaces shall have a floated finish as defined in ACI 301.

C. Tolerances for Concrete Construction:

1. Tolerances are defined as allowable variations from specified lines and grades, and dimensions and as the allowable magnitude of the surface irregularities. Allowable variations from specified lines, grades, and dimension shall be in accordance with ACI 301 and ACI 117.

## 3.5 CURING AND PROTECTION

A. Cure fresh unformed concrete surfaces immediately, and formed surfaces following the removal of forms, for a minimum of 7 days, and as described in ACI 308.1 using one of the following methods as approved by the Engineer:

1. Using an approved clear membrane compound.
2. Other methods specified in ACI 308.1 submitted and approved by the Engineer.

B. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

3.6 FIELD QUALITY CONTROL

A. Furnish a batch ticket (delivery ticket) with each load of concrete. Concrete delivered without a batch ticket containing complete information as specified shall be rejected. Collect and complete the batch ticket at the placement site and deliver all batch tickets to the Engineer on a daily basis. The Engineer shall have access to the batch tickets at any time during the placement. The following information shall be provided on each batch ticket:

1. Supplier's name and date
2. Truck number
3. Project number and location
4. Concrete class designation and item number
5. Cubic yards batched
6. Time batched
7. Mix design number
8. Type, brand, and amount of each admixture
9. Type, brand, and amount of cement and pozzolan
10. Mass (weights) of fine and coarse aggregates
11. Moisture of fine and coarse aggregate
12. Gallons of batch water (including ice)

B. Add the following information to the batch ticket at the placement site:

1. Gallons of water added by truck operator plus quantity of concrete in the truck each time water is added
2. Number of revolutions of drum at mixing speed (for truck mixed concrete)
3. Discharge time
4. Location of batch in placement
5. Water cement ratio

C. The Contractor will be allowed to add water to the batched concrete once at the site, based upon concrete supplier approval and direction and provided that the specified water to cement ratio is not exceeded and the amount of water withheld at the batch plant is on the delivery ticket.

D. Maintain records of placed concrete items. Record truck number, date, start and stop times, location of placed concrete, quantity, air temperature, concrete placement temperature, slump, air content, admixture quantities, test samples collected and times, and cast test cylinder numbers.

E. Perform Work in accordance with ACI 301.

F. Maintain one copy of each document on site.

G. Acquire cement from same source for all Work.

H. Acquire aggregate from same source for all Work.

I. Conform to ACI 305R when concreting during hot weather.

J. Conform to ACI 306R when concreting during cold weather.

K. Concrete to be placed directly on earth or bedrock will not be placed without written approval by the Engineer that the earth or bedrock foundation has been prepared suitably for concrete placement.

L. Perform quality assurance inspection and testing using the contractors approved independent testing firm. Provide access and samples as required by the Engineer.

M. The Contractor's independent testing agency shall prepare 5 concrete test cylinders for each 50 or less cubic yards or at least once each day of concrete placement.

1. Test cylinders shall be made in accordance with ASTM C 31 and tested in accordance with ASTM C 39.
2. Note on Record Drawings placement location represented by cylinders.
3. Test 2 cylinders from each set at 7 days, and 2 from each set at 28 days. Maintain the last cylinder from each set for testing in the event the 28-day tests fall below the required strength.

N. One additional test cylinder will be taken during cold weather concreting and cured on jobsite under the same conditions as the concrete it represents.

O. One slump test will be taken for each truck and for each set of test cylinders taken. Slump of concrete shall be determined at point of discharge from the mixer in accordance with ASTM C 143.

P. Air content (ASTM C 231), Unit Weight (ASTM C 138), and temperature (ASTM C 1064) shall be taken for each set of test cylinders taken.

## 3.7 PATCHING

A. Allow the Engineer to inspect concrete surfaces immediately upon removal of forms.

B. Honeycombing or embedded debris in concrete is not acceptable. Notify the Engineer upon discovery, and repair as determined by the Engineer.

C. Patch imperfections if approved by the Engineer:

1. Place repair materials to the full depth of repair and such that the repaired surface matches the original structure dimensions.
2. Prepare surfaces to receive repair materials by wetting to a surface saturated dry condition and remove standing water.
3. Finish and cure repair materials in accordance with the manufacturer's instructions and as determined by the Engineer.

## 3.8 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not conforming to required lines, levels, details, elevations, dimensions, tolerances or specified requirements.

B. Defective concrete will be determined by the Engineer and repaired or replaced at no additional cost to the Owner.

C. Repair of Hardened Concrete Not Within Specified Tolerances: Hardened concrete that is not within specified tolerances shall be repaired to bring it within those tolerances. Such repair shall be accomplished in a manner approved by the Engineer. Concrete repair to bring concrete within tolerances shall be done only after consultation with the Engineer regarding the repair method. The Engineer shall be notified as to the time when repair shall be performed.

D. Concrete that shall be exposed to public view shall be repaired in a manner that shall result in a concrete surface with a uniform appearance. Grinding of concrete surfaces exposed to view shall be limited in depth such that no aggregate particles are exposed more than 1/6 inch in cross section at the finished surface. Where grinding has caused or shall cause exposure of aggregate particles greater than 1/6 inch in cross section at the finished surface, concrete shall be repaired by excavating and replacing the concrete at no additional cost to the Owner.

E. Prevention of Repeated Failure to Meet Tolerances: When concrete placements result in hardened concrete that does not meet specified tolerances, the Contractor shall, upon request, submit to the Engineer an outline of all preventative actions, such as modifications to forms, modified procedure for setting screeds, and different finishing techniques, to be implemented by the Contractor to avoid repeated failures. The Engineer reserves the right to delay concrete placements until the Contractor implements such preventative actions that are approved by the Engineer.

F. Modify or replace concrete not conforming to required levels and lines, details, and elevations.

G. Repair or replace concrete not properly placed or not of the specified type.

3.9 PROTECTION

A. Protect finished Work under provisions of ACI 301.

B. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical damage in accordance with the applicable provisions of ACI.

C. Unless otherwise approved by the Engineer, protect curing concrete from freeze-thaw cycles until concrete has attained a compressive strength of 2500 psi. Control rate of temperature drop per day in accordance with ACI 306.1 and 306R and as required to prevent temperature cracking.

D. Maintain concrete with minimal moisture loss at relatively constant temperature for the period necessary for hydration of cement and hardening of concrete.

E. Removal of formwork shall conform to requirements of Section 03100: Concrete Formwork.

**END OF SECTION**

**SECTION 05500**
**METAL FABRICATIONS**

## PART 1 GENERAL

1.1 SECTION INCLUDES

A. Providing all labor, materials, equipment, tools, and services necessary to fabricate, deliver, and install miscellaneous metal work as shown on the Drawings or specified herein; including but not limited to embedded bearing plate assemblies.

1.2 REFERENCES

A. American Society for Testing and Materials International (ASTM)

| | | |
|---|---|---|
| 1. | ASTM A 6-05a | Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling |
| 2. | ASTM A 36-05 | Standard Specification for Carbon Structural Steel |
| 3. | ASTM A 123-02 | Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products |
| 4. | ASTM A 153-05 | Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware |
| 5. | ASTM A 167-99 (2004) | Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip |
| 6. | ASTM A 276-06 | Standard Specification for Stainless Steel Bars and Shapes |
| 7. | ASTM A 307-04 | Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength |
| 8. | ASTM A 312-05a | Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes |
| 9. | ASTM A 314-97 (2002) | Standard Specification for Stainless Steel Billets and Bars for Forging |
| 10. | ASTM A 325-06 | Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength |
| 11. | ASTM A 490-06 | Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength |
| 12. | ASTM A 500-03a | Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes |

| | | |
|---|---|---|
| 13. | ASTM A 501-01 (2005) | Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing |
| 14. | ASTM A 563-04a | Standard Specification for Carbon and Alloy Steel Nuts |
| 15. | ASTM A 572-06 | Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel |
| 16. | ASTM A 588-05 | Standard Specification for High-Strength Low-Alloy Structural Steel 50 ksi Minimum Yield Point to 4-in. Thick |
| 17. | ASTM A 759-00 (2005) | Standard Specification for Carbon Steel Crane Rails |
| 18. | ASTM A 780-01 | Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings |
| 19. | ASTM B 366-04b | Standard Specification for Factory-Made Wrought Nickel and Nickel Alloy Fittings |
| 20. | ASTM F 436-04 | Standard Specification for Hardened Steel Washers |
| 21. | ASTM F 593-02e2 | Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs |
| 22. | ASTM F 594-02 | Standard Specification for Stainless Steel Nuts |
| 23. | ASTM F 959-06 | Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners |
| 24. | ASTM F1554-04e1 | Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength |

B. American Institute of Steel Construction (AISC), Steel Construction Manual, 13th Edition.

C. American National Standards Institute (ANSI).

| | | |
|---|---|---|
| 1. | ANSI Z49.1 | Safety in Welding and Cutting. |

D. American Welding Society (AWS).

| | | |
|---|---|---|
| 1. | AWS B2.1-05 | Welding Procedure and Performance Qualification. |
| 2. | AWS D1.1-06 | Structural Welding Code. |

E. Occupational Safety and Health Administration (OSHA).

F. National Association of Architectural Metal Manufacturers (NAAMM).

1. NAAMM MBG 531-00 Metal Bar Grating Manual

G. Research Council on Structural Connections (RCSC):

1. Specification for Structural Joints Using ASTM A 325 or A 490 Bolts, 2004.

1.3 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

B. Shop Drawings and product data for all fabricated items.

1. Indicate materials, profiles, sizes, connection attachments, reinforcing, anchorage, hardware, size and type of fasteners and accessories.

2. Indicate welded connections using standard AWS welding symbols; indicate net weld lengths and proposed field welds.

C. Submit welder certifications of qualification showing date of qualification; qualification grade and rating; and notarized signature of inspector.

D. Submit fabricator's quality control plan meeting the requirements of Section 1704.2 of International Building Code 2006.

E. Before delivery of materials, provide certified laboratory test reports of materials.

**PART 2 PRODUCTS**

2.1 GENERAL

A. To ensure proper fitting of the work, field verify critical dimensions at the jobsite prior to preparation of Shop Drawings and before product fabrication begins. Field fabrication will not be permitted.

2.2 MATERIALS

A. Basic Ferrous Metal – All steel shall be hot dip galvanized except as noted in item 6 below.

1. Steel Plates: Carbon steel, ASTM A 36.

2. Headed Anchors: H4L Headed Concrete Anchors (HCA) by Nelson Stud Welding, or approved equal.

2.3 FABRICATED ITEMS

A. Bearing Plate Assemblies

1. Bearing Plate Assemblies shall be fabricated and installed at the intermediate supports, as shown on the Drawings. Fabrication details are provided for fabrication from carbon steel, ASTM A 36 and welded headed studs.

2.4 FABRICATION

A. Fabricate items of the material specified and with joints tightly fitted and secured.

B. Remove burrs from all exposed cut edges, remove spatter and grind exposed welds to match adjacent surface.

## PART 3 EXECUTION

3.1 PREPARATION

A. Examine surfaces for defects that would impair installation.

B. Obtain Engineer's approval before site cutting, field welding, or making non-scheduled adjustments.

C. Prepare for erection loads with temporary bracing; keep work in alignment.

D. Supply setting templates for items required to be cast into concrete.

E. Unless otherwise specified, use only metal braces, supports, and other items to position and align embedded metalwork, which will be embedded in concrete. Do not use wooden braces, supports, or other items to position and align embedded metalwork if they will also be embedded in concrete.

3.2 INSTALLATION

A. Install items plumb and level, accurately fitted, and free from distortion or defects.

**END OF SECTION**

# PHOTOGRAPHS AND HISTORICAL DRAWINGS


Overall View of Siphon

Thrust Block 2

Thrust Block 3

Thrust Block 4

Intermediate Support S7

Intermediate Support S8

Intermediate Support S9

Intermediate Support S10

Intermediate Support S11

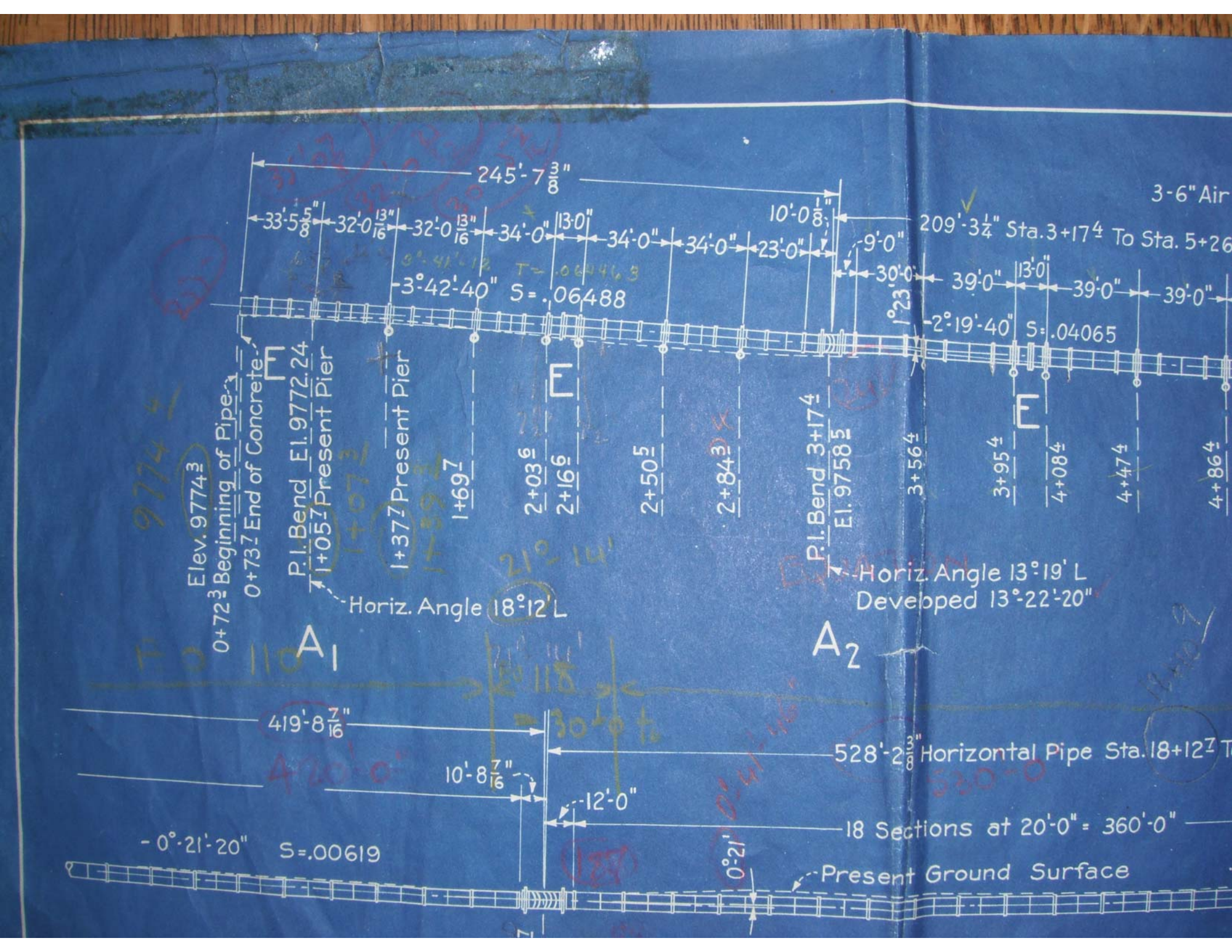
Intermediate Support S12

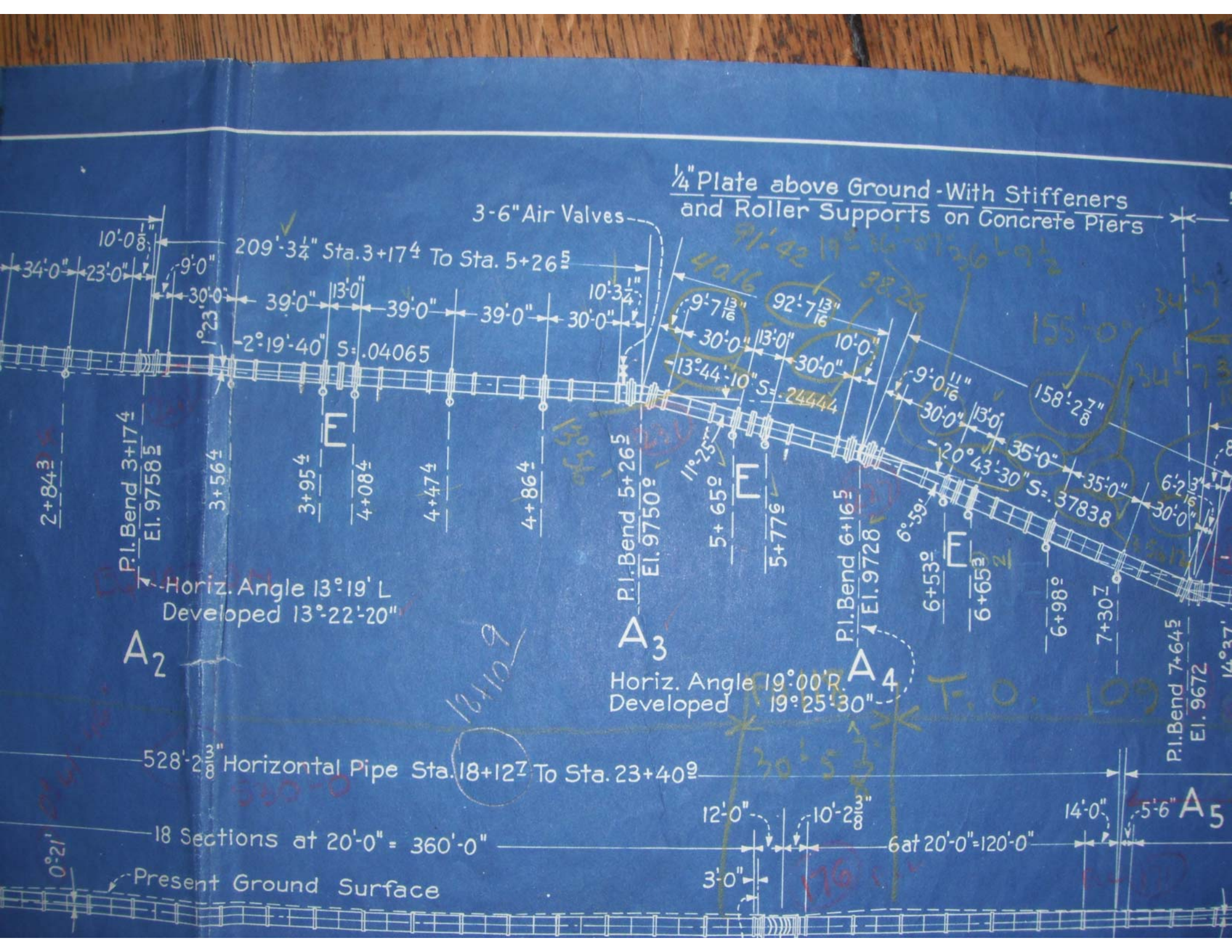
Intermediate Support S13

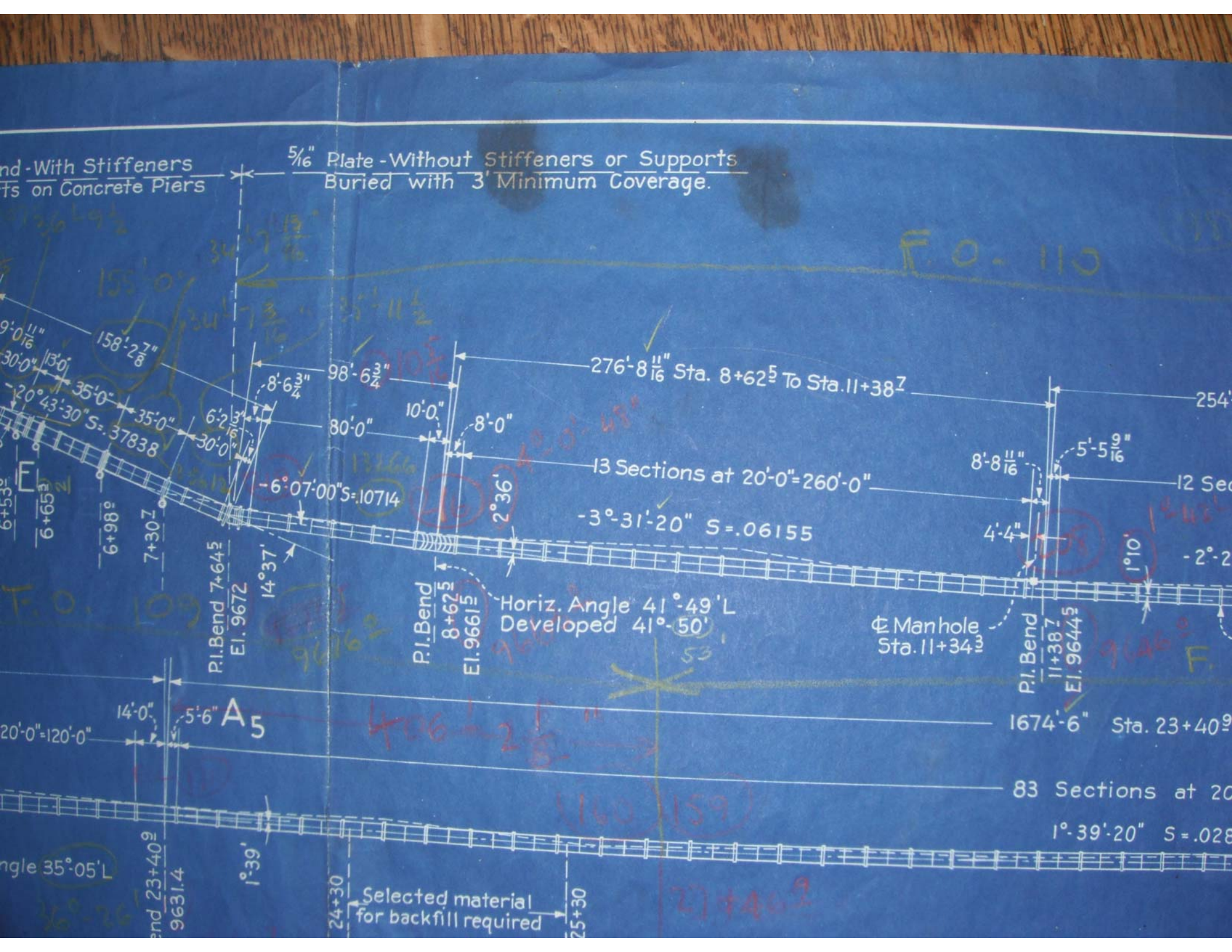
a) Rocker Supports (at S7 through S11)

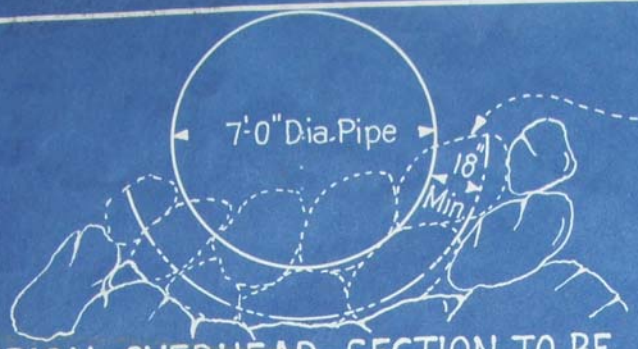
b) Roller Supports (at S12 and S13)

# Existing Support Assemblies


245'-7 3/8"
33'-5 5/8"
32'-0 13/16"
32'-0 13/16"
34'-0"
13'-0"
34'-0"
34'-0"
23'-0"
10'-0 1/8"
9'-0"
209'-3 1/4" Sta. 3+17 4 To Sta. 5+26
3-6" Air
30'-0"
39'-0"
13'-0"
39'-0"
39'-0"
3°-42'-40" S=.06488
1°23'
2°-19'-40" S=.04065
Elev. 9774 3
0+72 3 Beginning of Pipe
0+73 7 End of Concrete
P.I. Bend El. 9772.24
1+05 7 Present Pier
1+37 7 Present Pier
1+69 7
2+03 6
2+16 6
2+50 5
2+84 3
P.I. Bend 3+17 4
El. 9758 5
3+56 4
3+95 4
4+08 4
4+47 4
4+86 4
Horiz. Angle 18°12' L
Horiz. Angle 13°19' L
Developed 13°-22'-20"
A1
A2
419'-8 7/16"
528'-2 3/8" Horizontal Pipe Sta. 18+12 7
10'-8 7/16"
12'-0"
18 Sections at 20'-0" = 360'-0"
-0°-21'-20" S=.00619
0°21'
Present Ground Surface


¼" Plate above Ground - With Stiffeners and Roller Supports on Concrete Piers
3-6" Air Valves
209'-3¼" Sta. 3+17⁴ To Sta. 5+26⁵
10'-0⅛"
34'-0"
23'-0"
9'-0"
30'-0"
39'-0"
13'-0"
39'-0"
39'-0"
30'-0"
10'-3¼"
1°23'
2°19'-40" S=.04065
2+84³
P.I. Bend 3+17⁴
El. 9758⁵
3+56⁴
3+95⁴
4+08⁴
4+47⁴
4+86⁴
P.I. Bend 5+26⁵
El. 9750⁰
5+65⁰
5+77⁶
P.I. Bend 6+16⁵
El. 9728
6+53⁰
6+65³
6+98⁰
7+30⁷
P.I. Bend 7+64⁵
El. 9672
9'-7 13/16"
92'-7 13/16"
30'-0"
13'-0"
10'-0"
30'-0"
13°44'-10" S=.24444
9'-0 11/16"
158'-2 7/8"
30'-0"
13'-0"
35'-0"
20°43'-30" S=.37838
35'-0"
30'-0"
1°-25'
6°-59'
Horiz. Angle 13°19' L
Developed 13°22'-20"
A2
A3
Horiz. Angle 19°00' R.
Developed 19°25'30"
A4
A5
528'-2 3/8" Horizontal Pipe Sta. 18+12⁷ To Sta. 23+40⁹
18 Sections at 20'-0" = 360'-0"
12'-0"
10'-2 3/8"
6 at 20'-0" = 120'-0"
14'-0"
5'-6"
3'-0"
0°21'
Present Ground Surface


nd - With Stiffeners
ts on Concrete Piers
5/16" Plate - Without Stiffeners or Supports
Buried with 3' Minimum Coverage.
F.O. 110
158'-2 7/8"
98'-6 3/4"
276'-8 11/16" Sta. 8+62 5 To Sta. 11+38 7
254'
8'-6 3/4"
80'-0"
10'-0"
8'-0"
13 Sections at 20'-0"=260'-0"
12 Sec
-20°43'-30" S=.37838
-6°07'-00" S=.10714
-3°-31'-20" S=.06155
-2°-2
8'-8 11/16"
5'-5 9/16"
4'-4"
1°10'
2°36'
14°37'
P.I. Bend 7+64 5
El. 9672
P.I. Bend 8+62 5
El. 9661 5
Horiz. Angle 41°-49' L
Developed 41°-50'
℄ Manhole
Sta. 11+34 3
P.I. Bend 11+38 7
El. 9644 5
F.O. 109
14'-0"
5'-6"
A5
20'-0"=120'-0"
1674'-6"
Sta. 23+40 9
83 Sections at 20
1°-39'-20" S=.028
1°39'
ngle 35°-05' L
nd 23+40 9
9631.4
24+30
Selected material
for backfill required
25+30




Boulders or Other Material to be Removed so as to leave 18" Min. Clearance from pipe.

TYPICAL OVERHEAD SECTION TO BE EXCAVATED BY TRENCH CONTRACTOR

254'-6 3/16" Sta. 11+38.7 To Sta. 13+93

419'-8 7/16" Sta. 13+93 To Sta. 18+12.7

9'-0 5/8"

9'-0"

12 Sections at 20'-0" = 240'-0"

20 Sections at 20'-0" = 400'-0"

1°10'

-2°-21'-50" S = .04129

2°0'

-0°-21'-20" S = .00619

Field Girth Joints

P.I. Bend 13+93

El. 9634

Horiz. Angle 26°01' L
Developed 26°05'20"

Sta. 23+40.9 To Sta. 40+14.7

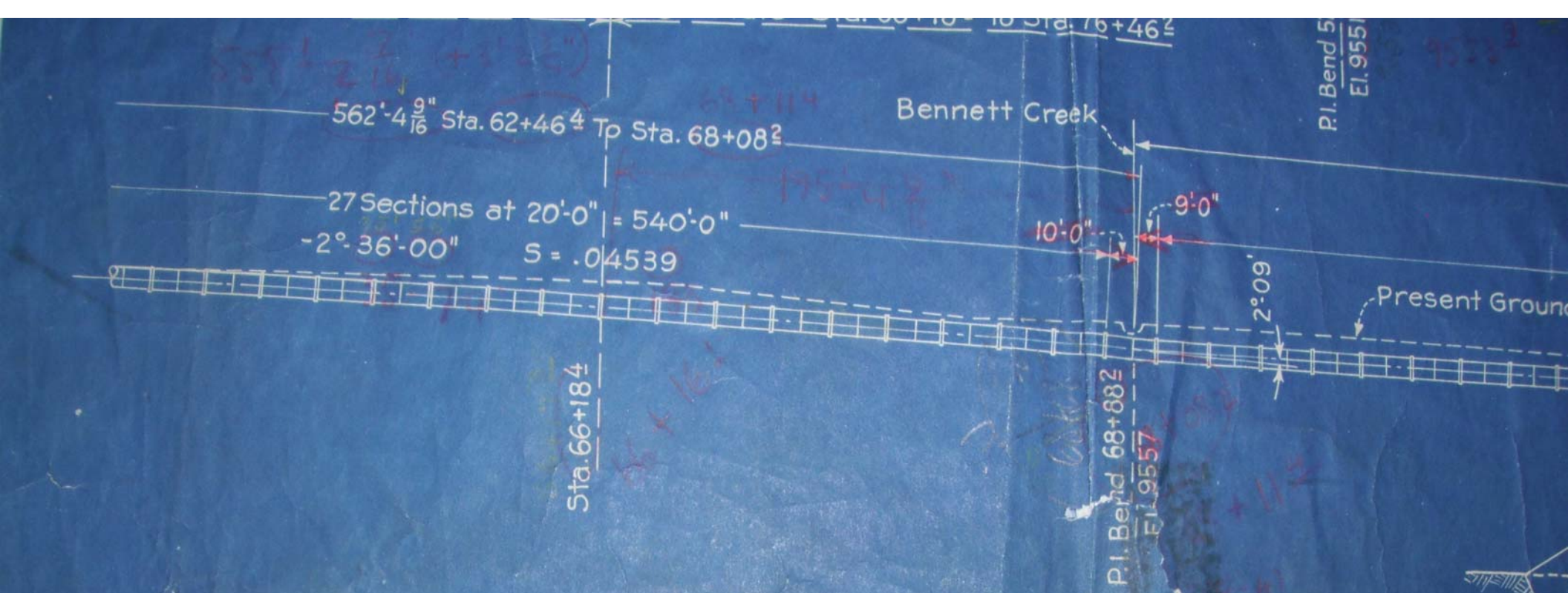
A6

ections at 20'-0" = 1660'-0"

°-39'-20" S = .02892

5'-0" 5'-0"

℄ Manhole




All dimensions, Stations and Elevations refer to Center Line of Pipe
Pier Stations as shown are for Excavation only.
**E** Denotes Expansion Joints. **A** Denotes Anchors.
Pipe to either 84" Inside Diameter thruout or 82", 84" and 86" Inside Diameter as Noted in Option. Total Length 8108'-2 5/16".
703'-7 1/8" of Pipe above ground to be made from 1/4" plates, with stiffeners and Roller Supports.
4561'-2 1/8" of buried pipe to be made from 5/16" plates, 2843'-5" from 3/8" plates.
Pipe to be arcwelded in shop (using 120" sheets) in 20'-0" sections, except as shown, with only ONE longitudinal joint. All shop joints to be plain butt welded. Field girth joints to be butt welded with outside butt strap.
All bends to be made with 17'-6" Radius and with maximum deflection angle of 7°30' and to be completely welded up in shop. Combination Horizontal and Vertical Angles to be developed.
Pipe to be properly fitted together in shop and match-marked for Field assembly.

638'-0¼" Sta. 68+08.2 To Sta. 74+46.2

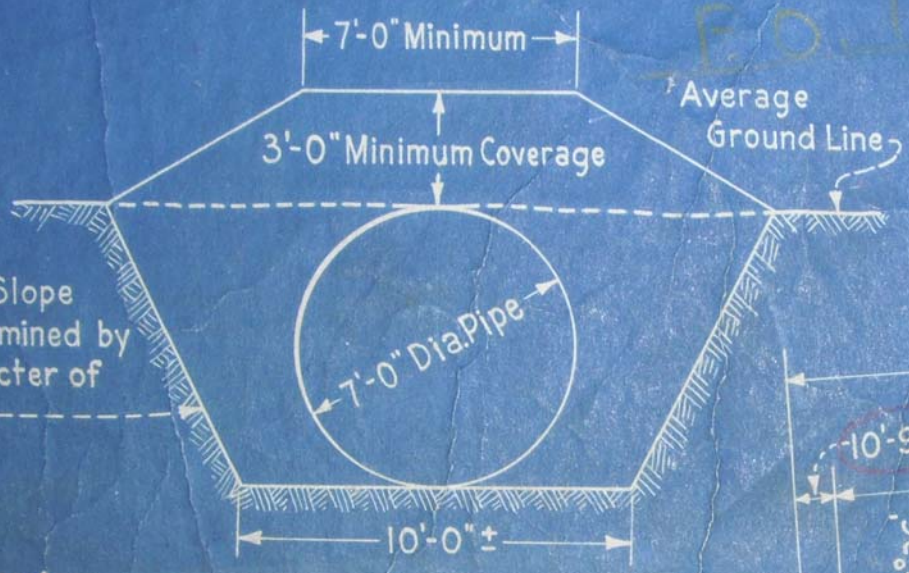
31 Sections at 20'-0" = 620'-0"

2'-09"

Present Ground Surface

-0°-27'-0" S=.00784

Sta. 73+77.2




TYPICAL PIPE TRENCH SECTION

Excavation of pipe trench to be made by Trench Contractor. Excavation of Bell Holes to be made by Pipe Contractor.

℄ Manhole and Dr
Sta. 74+41.7

⅜" Plate

5/16" Plate

200'-9 11/16" Sta. 74+46.2 To Sta. 76+46.2

11'-5 3/8"

10'-0"

10'-9 11/16"

9 at 20'-0" = 180'-0"

6'-21'

5'-36'

+5°08'-30" S=.09000

P.I. Bend 74+46.2
El. 955.2

P.I. Bend 76+46.2
El. 957.0

s and Roller Supports.
ates.
t as shown, with only ONE
oints to be butt welded

le of 7°30' and to be
Angles to be developed.
ssembly.


SANTA MARIA RESERVOIR COMPANY

R. J. TIPTON, CONSULTING ENGINEER

# INLET TO RESERVOIR

## PROFILE - PIPE

DRAWN BY: E.H.C.

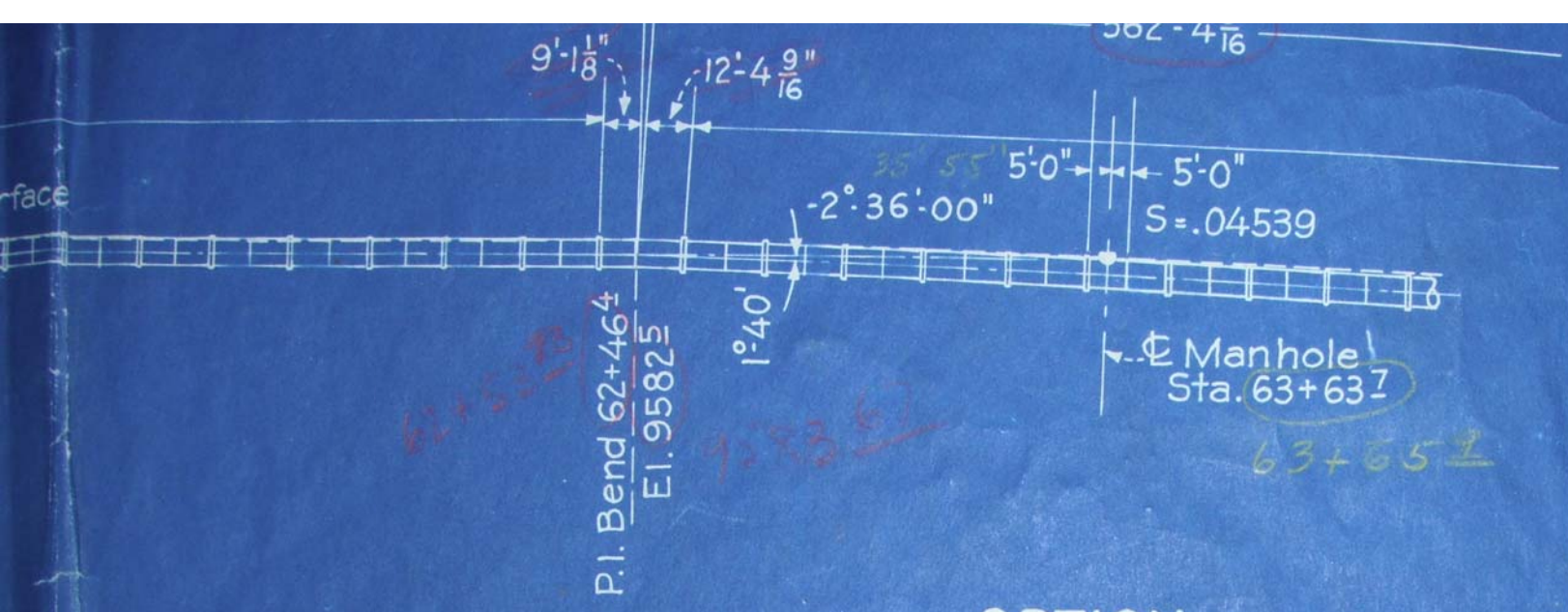
TRACED BY: R.E.B.

CHECKED BY: E.H.C., R.J.T.

APPROVED: R. J. Tipton

DENVER, COLO., JAN. 1934

SM-2




## OPTION

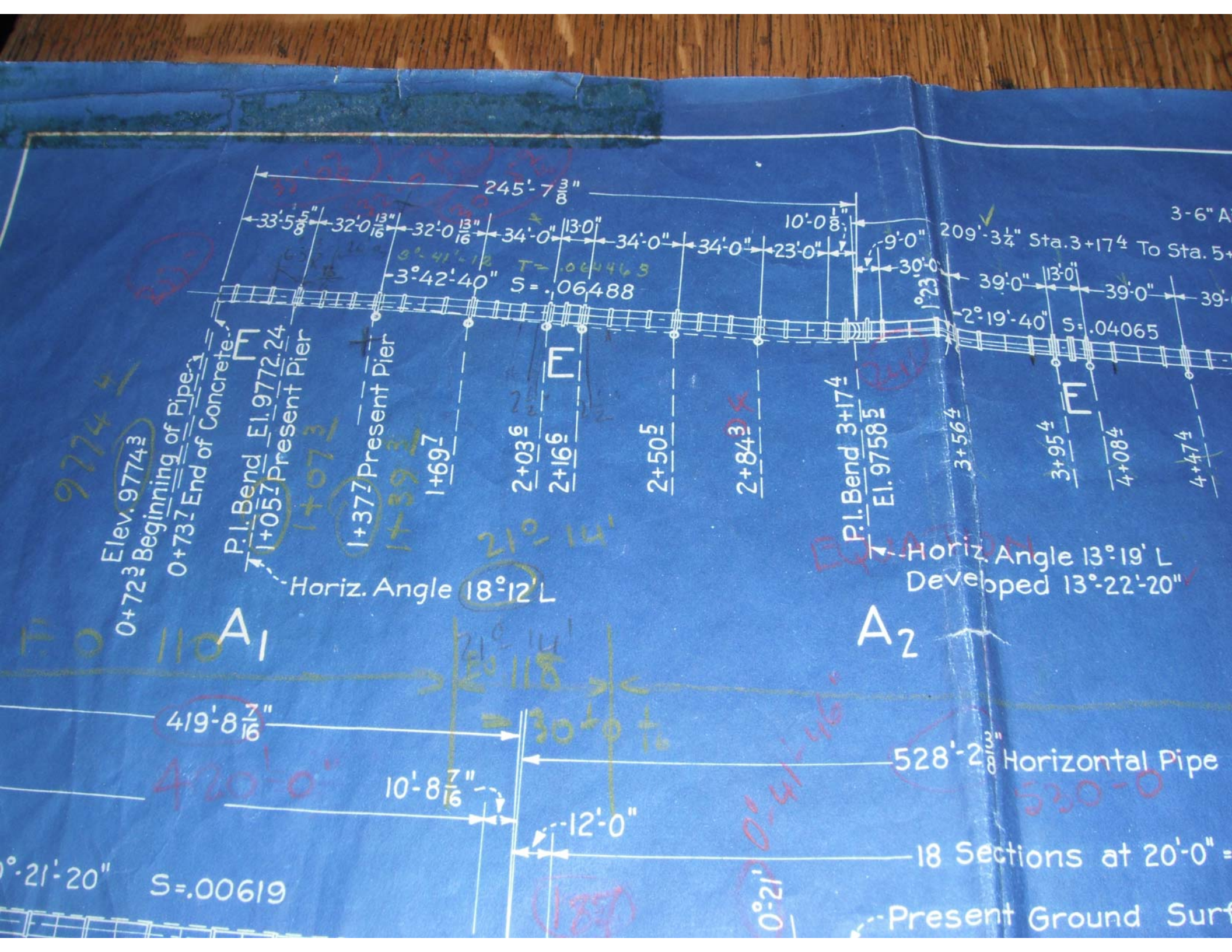
Pipe Contractor shall have the option of constructing pipe of the following sizes in order to nest pipe during shipment to increase car loadings. Thickness of shell to remain as shown on profile.

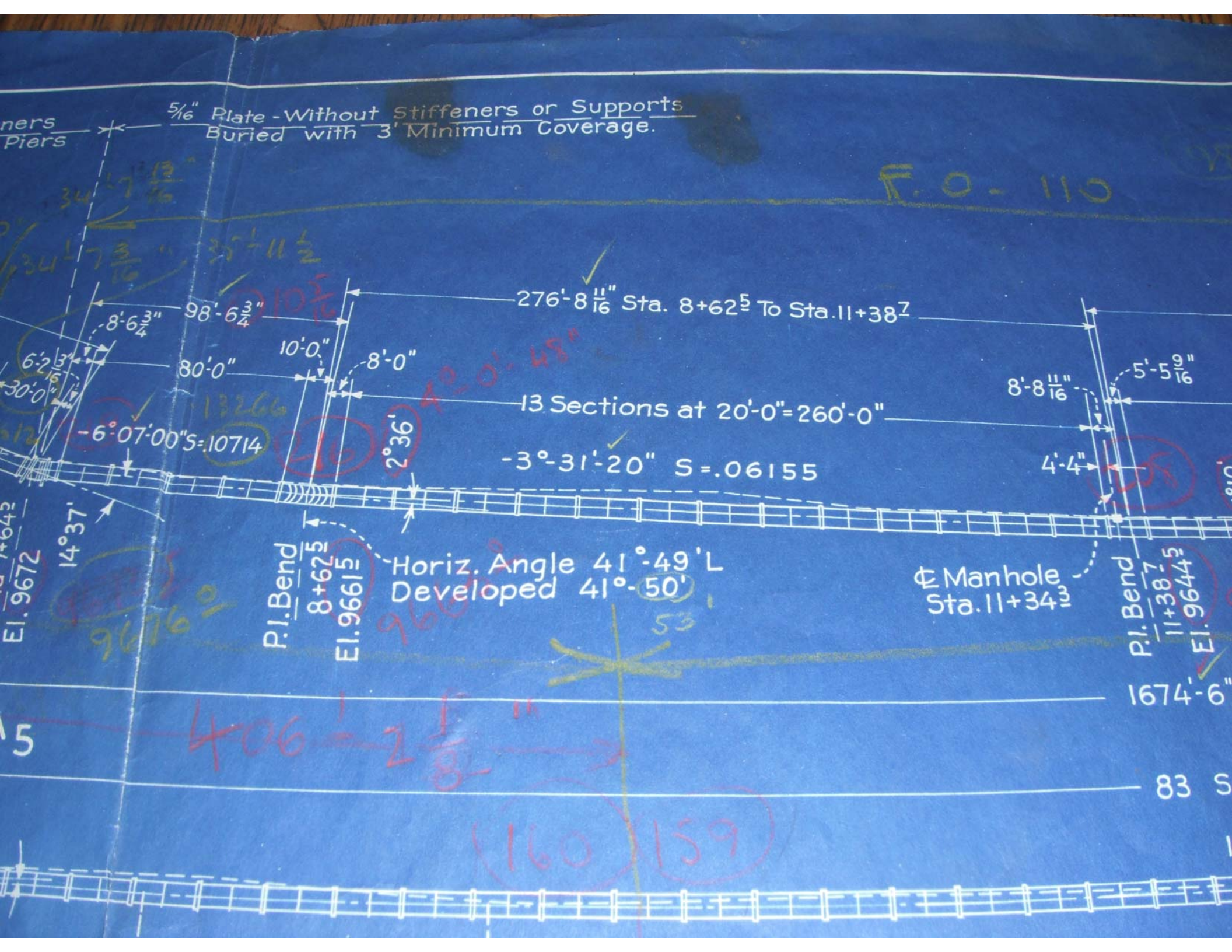
84" Dia. Sta. 0+72 3 to Sta. 7+64 5 and Sta. 81+04 5 to Sta. 81+41 5 ~ 743'-6 1/2"

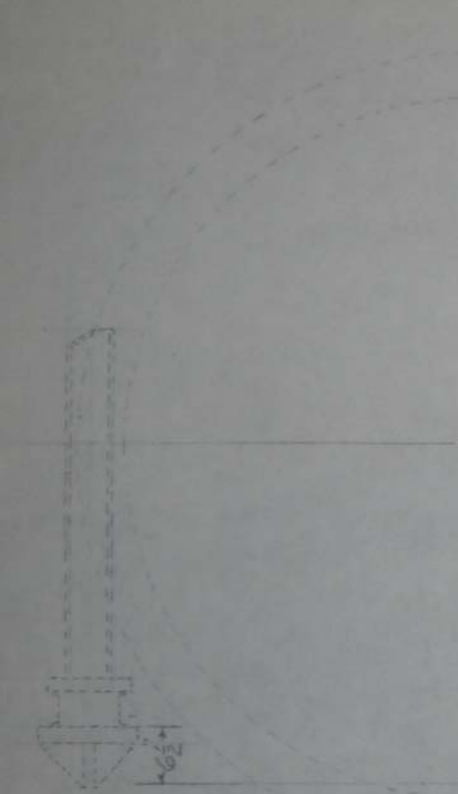
82" Dia. Sta. 37+05 8 to Sta. 73+77 2 ~ 3676'-8 13/16"

86" Dia. Sta. 7+64 5 to Sta. 37+05 8 and Sta. 73+77 2 to Sta. 81+04 5 ~ 3687'-10 5/16"


¼" Plate above Ground - With Stiffeners and Roller Supports on Concrete Piers
5/16" Plate - Without Stiffeners Buried with 3' Min. Cover
3-6" Air Valves
3+17.4 To Sta. 5+26.5
39'-0"
39'-0"
30'-0"
10'-3¼"
9'-7 13/16"
92'-7 13/16"
30'-0"
13'-0"
10'-0"
30'-0"
13°-44'-10" S=.24444
9'-0 11/16"
30'-0"
13'-0"
158'-2 7/8"
155'-0"
20°-43'-30" S=.37838
35'-0"
35'-0"
30'-0"
6°-59'
11°-25'
6°-07'-00" S=.10714
14°-37'
8'-6 3/4"
98'-6 3/4"
30'-0"
10'-0"
P.I. Bend 5+26.5
El. 9750.0
P.I. Bend 6+16.5
El. 9728
P.I. Bend 7+64.5
El. 9672
5+65.0
5+77.6
6+53.0
6+65.3
6+98.0
7+30.7
4+47.4
4+86.4
A3
A4
A5
Horiz. Angle 19°-00' R.
Developed 19°-25'-30"
18+12.7 To Sta. 23+40.9
12'-0"
10'-2 3/8"
6 at 20'-0" = 120'-0"
14'-0"
5'-6"
3'-0"


245'-7 13/8"
33'-5 5/8"
32'-0 13/16"
32'-0 13/16"
34'-0"
13'-0"
34'-0"
34'-0"
23'-0"
10'-0 8/8"
9'-0"
30'-0"
209'-3 1/4" Sta. 3+17 4 To Sta. 5+
39'-0"
13'-0"
39'-0"
3°-42'-40"
S = .06488
2°-19'-40"
S = .04065
1°-23'
Elev. 9774 3
0+72 3 Beginning of Pipe
0+73 7 End of Concrete
P.I. Bend El. 9772.24
1+05 7 Present Pier
1+37 7 Present Pier
1+69 7
2+03 6
2+16 6
2+50 5
2+84 3
P.I. Bend 3+17 4
El. 9758 5
3+56 4
3+95 4
4+08 4
4+47 4
Horiz. Angle 18°-12' L
Horiz. Angle 13°-19' L
Developed 13°-22'-20"
A1
A2
419'-8 7/16"
10'-8 7/16"
12'-0"
528'-2 13/16" Horizontal Pipe
18 Sections at 20'-0" =
°-21'-20"
S = .00619
Present Ground Surf


5/16" Plate - Without Stiffeners or Supports
Buried with 3' Minimum Coverage.
276'-8 11/16" Sta. 8+62 5 To Sta. 11+38 7
98'-6 3/4"
80'-0"
10'-0"
8'-0"
13 Sections at 20'-0" = 260'-0"
-6°-07'-00" S=.10714
-3°-31'-20" S=.06155
2°36'
14°37'
P.I. Bend 8+62 5
El. 966 1 5
Horiz. Angle 41°-49' L
Developed 41°-50'
℄ Manhole Sta. 11+34 3
P.I. Bend 11+38 7
El. 964 4 5
El. 9672
1674'-6"

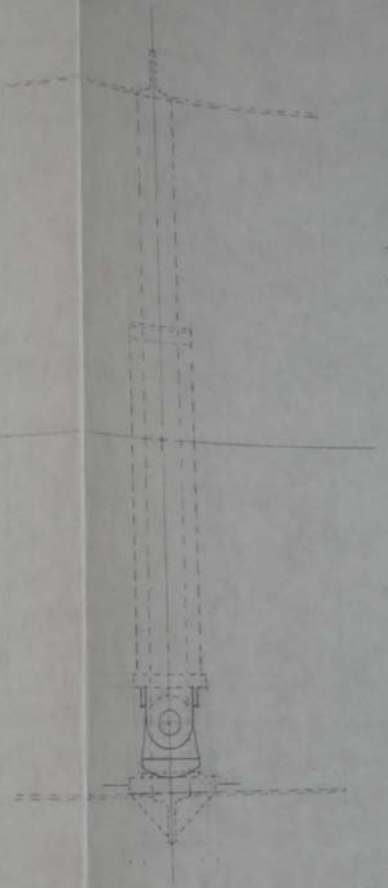


ROLLER ASSEMBLY
EXISTING

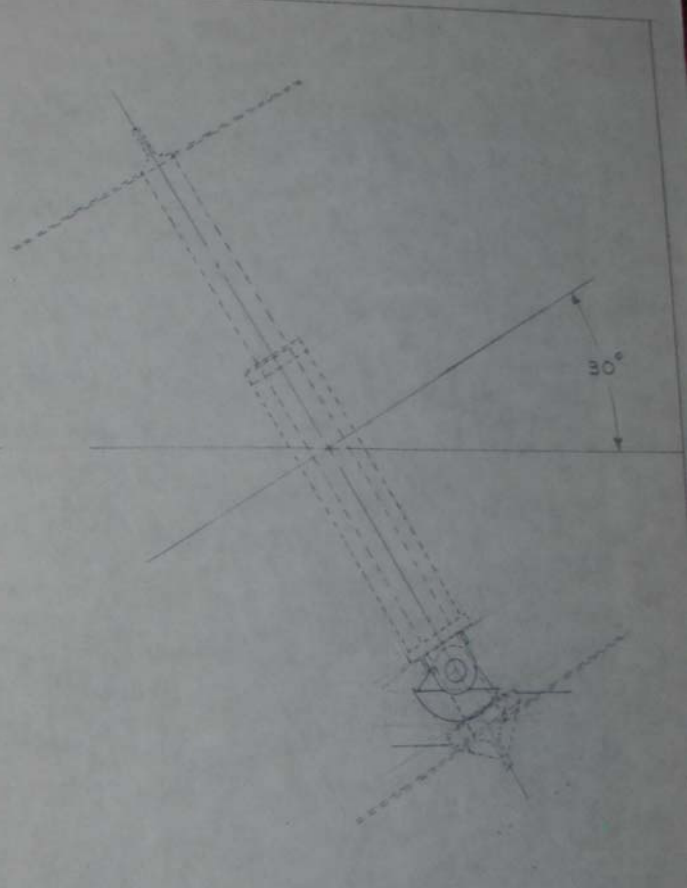


ROCKER ASSEMBLY
PROPOSED

END VIEW



SIDE ELEVATION
PROPOSED ROCKER ASSEMBLY




SIDE ELEV - 30° SLOPE
PROPOSED ROCKER ASSEMBLY

BASIS OF DESIGN:

PIPE DIAMETER - 84" I.D.
WALL THICKNESS - ¼"
NO. OF ROLLER SUPPORTS - 17
AVERAGE SPAN - 40'-0"
MAX. SLOPE - 30°
MAX STRESS - BEARING - 7000 PSI
MAX STRESS - SHEAR - 10,000 PSI
MAX TRAVEL OF PIPE - 2¼"

REFERANCE DWG. - 4613

THOMPSON PIPE & STEEL CO.
DENVER, COLO.

PROPOSED ROCKER ASSEMBLY
FOR 84" I.D. PIPELINE
SANTA MARIA RESERVOIR CO. - MANTA VISTA CO.

J. L. FORBES — 1-20-61
— 94"
— 4612

ROLLER ASSEMBLY
EXISTING

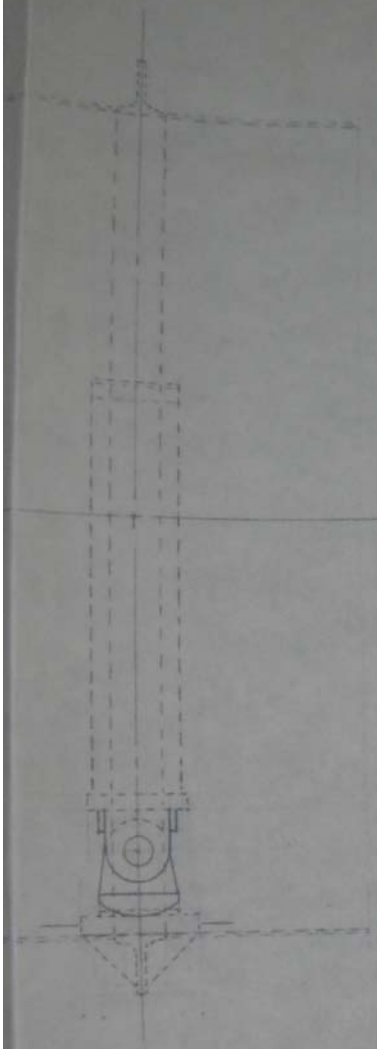
ROCKER ASSEMBLY
PROPOSED

SIDE ELEV
PROPOSED ROC

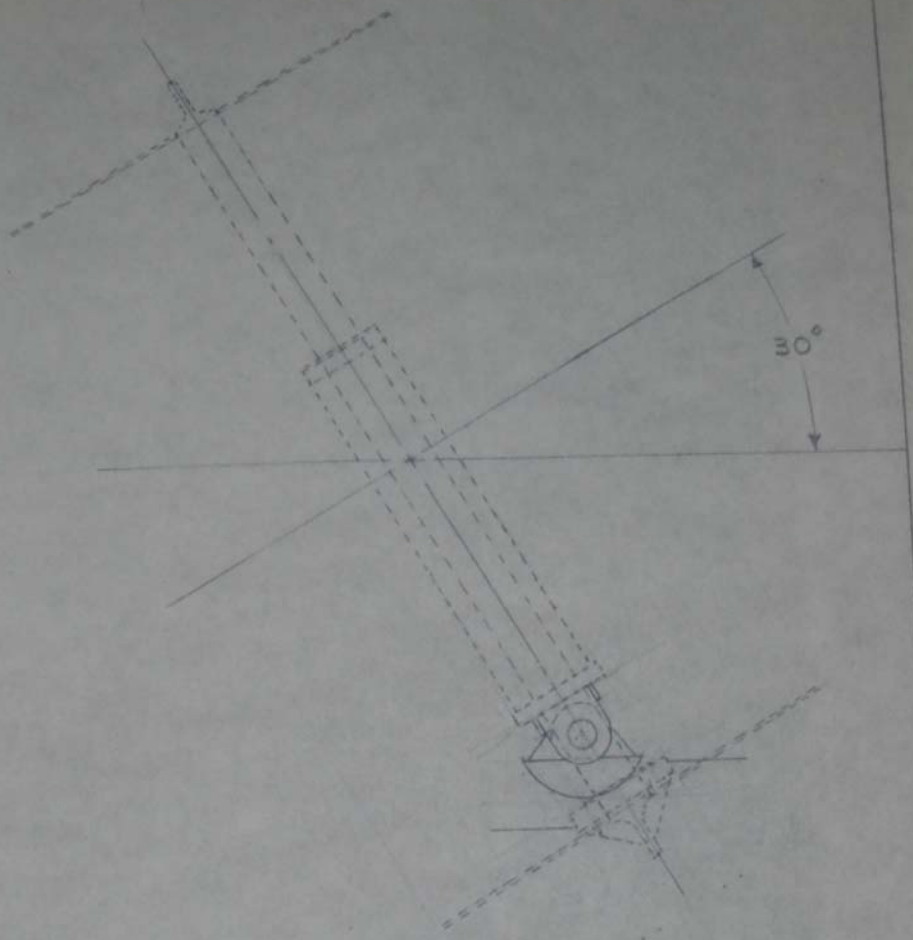
END VIEW

BASIS OF DESIGN:

PIPE DIAMETER - 84" I.D.
WALL THICKNESS - $\frac{1}{4}$"
NO. OF ROLLER SUPPORTS - 17
AVERAGE SPAN - 40'-0"
MAX. SLOPE - 30°
MAX STRESS - BEARING - 7000 PSI
MAX STRESS - SHEAR - 10,000 PSI
MAX TRAVEL OF PIPE - 2$\frac{1}{4}$"



SIDE ELEVATION.
PROPOSED ROCKER ASSEMBLY



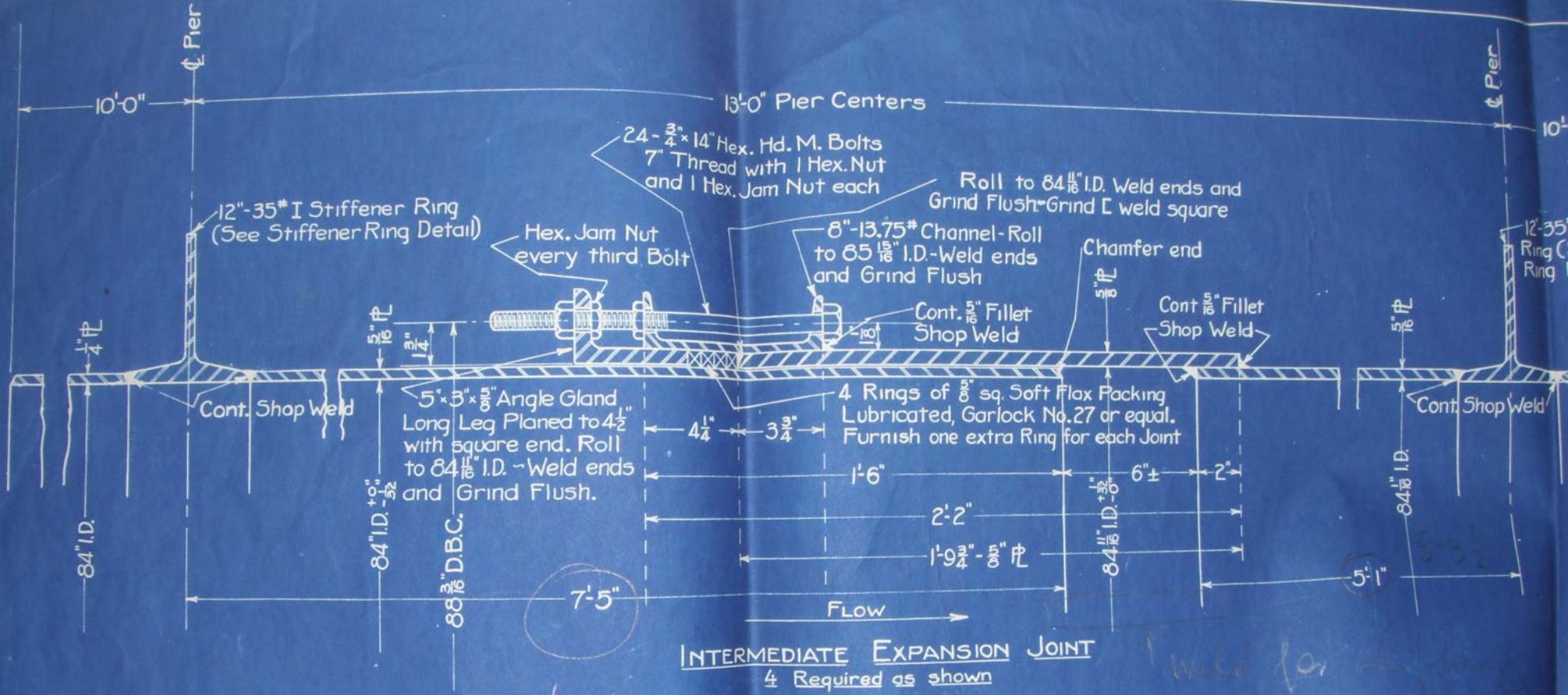

SIDE ELEV - 30° SLOPE
PROPOSED ROCKER ASSEMBLY

REFERANCE DWG. - 4613

THOMPSON PIPE & STEEL CO.
DENVER COLO.

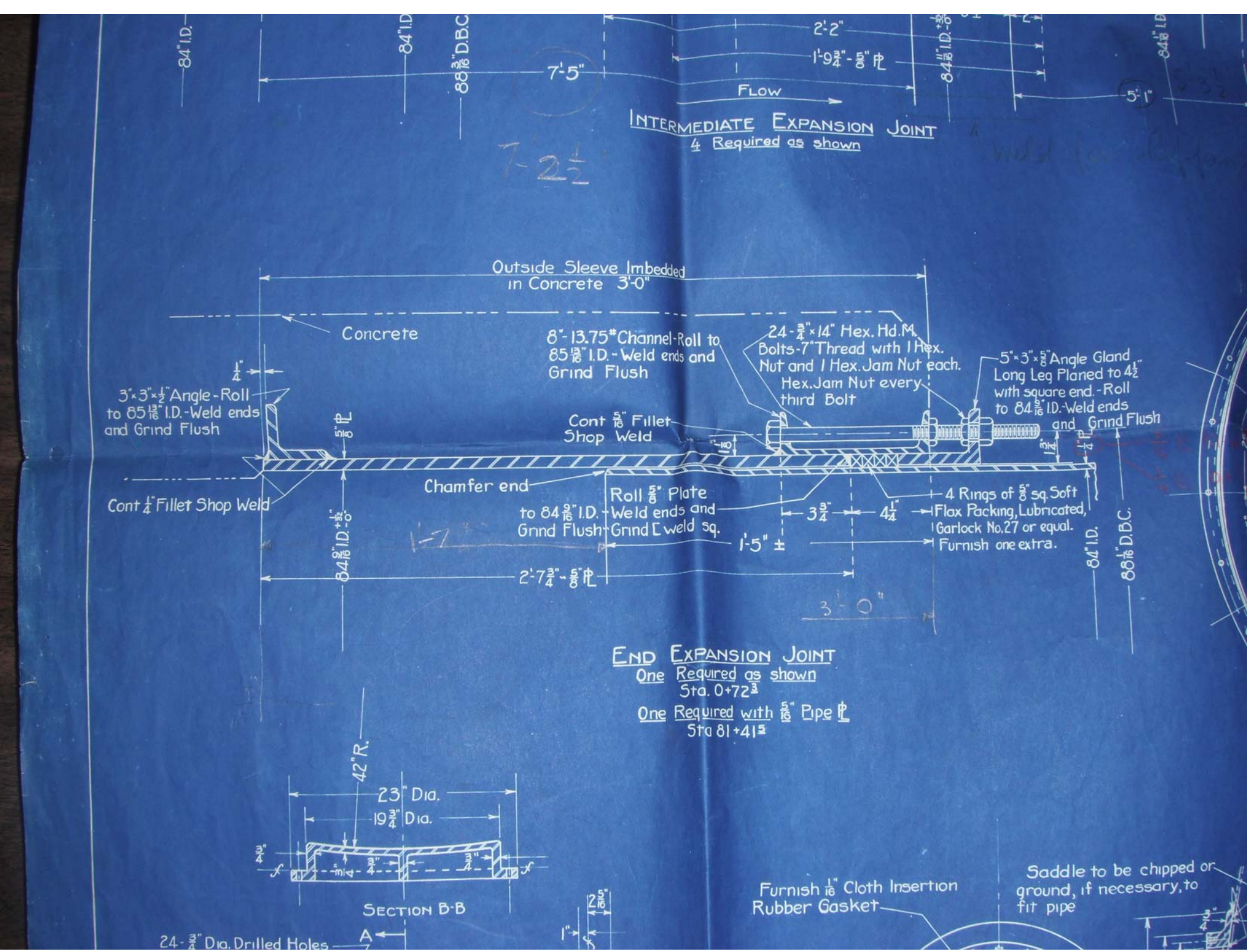
PROPOSED ROCKER ASSEMBLY
FOR 84" I.D. PIPELINE
SANTA MARIA RESERVOIR CO. - MONTA VISTA COLO

DRAWN BY J. L. FORBES DATE 1-20-61.
SCALE 3/4" PER FOOT
DWG. NO. 4612




INTERMEDIATE EXPANSION JOINT
4 Required as shown

7'-2 1/2"




## End Expansion Joint

One Required as shown
Sta. 0+72 3

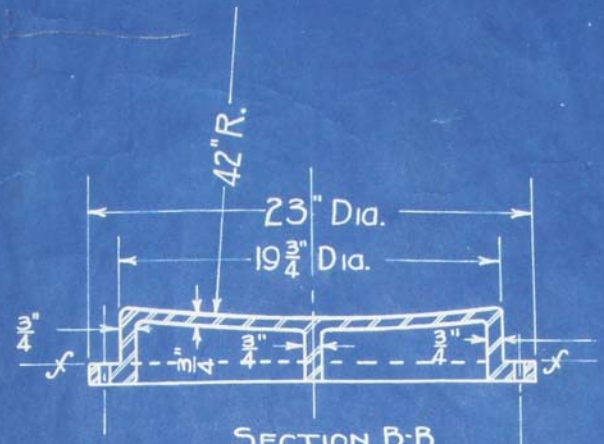
One Required with 5/16" Pipe ℄
Sta 81+41 5

2-7¼" ~ 5/8" PL

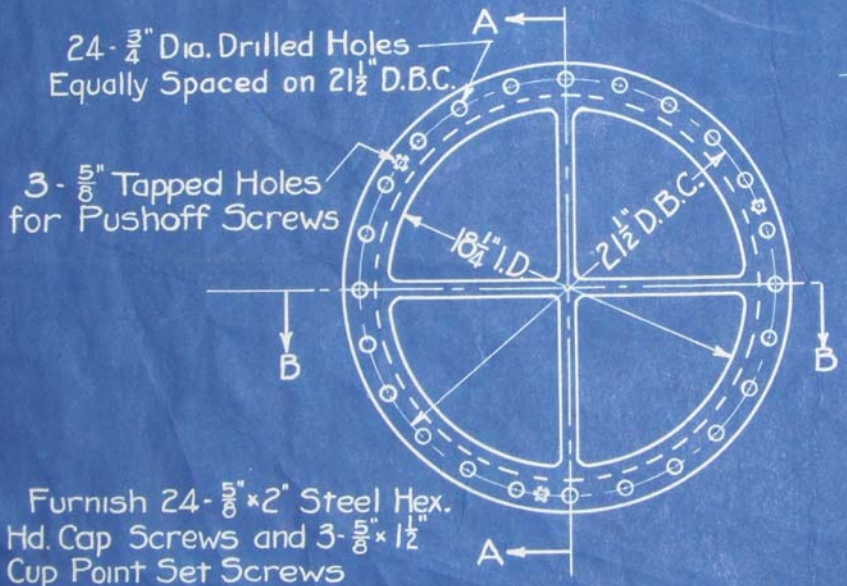
## END EXPANSION JOINT

One Required as shown
Sta. 0+72 3/8

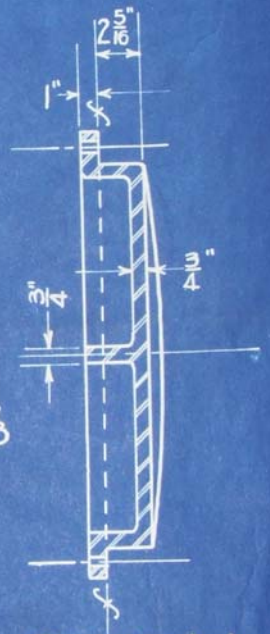
One Required with 5/16" Pipe PL
Sta 81+41 5/8




SECTION B-B




Furnish 24 - 5/8" × 2" Steel Hex. Hd. Cap Screws and 3 - 5/8" × 1½" Cup Point Set Screws




SECTION A-A

Furnish 1/16" Cloth Insertion Rubber Gasket

Tap Drill 1⅜" Deep and Tap for 24 - 5/8" Cap Screws Equally Spaced on 21½" Dia. B.C.

## MANHOLE COVER

CAST STEEL

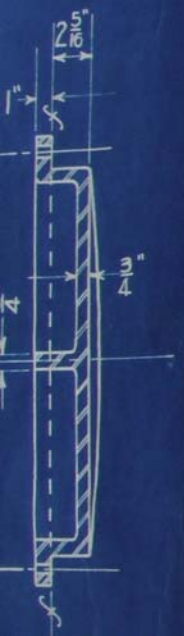
7 Required as shown

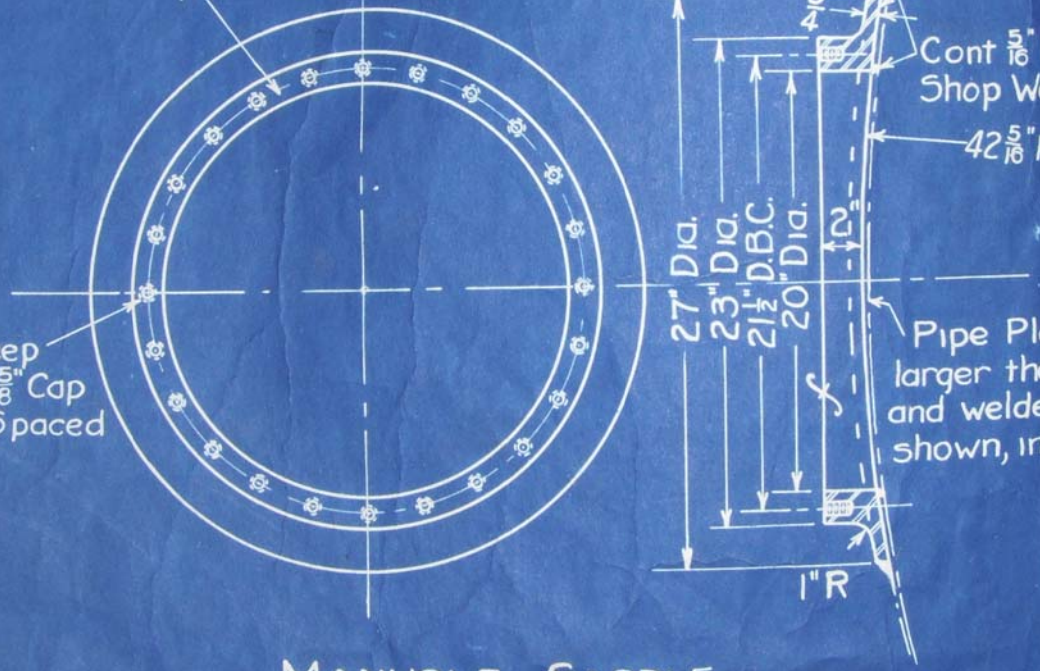
M

## END EXPANSION JOINT

One Required as shown
Sta. 0+72 3/8

One Required with 5/16" Pipe ℄
Sta 81+41 5/8

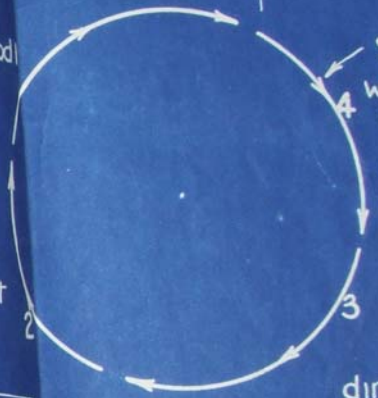



## MANHOLE SADDLE

CAST STEEL

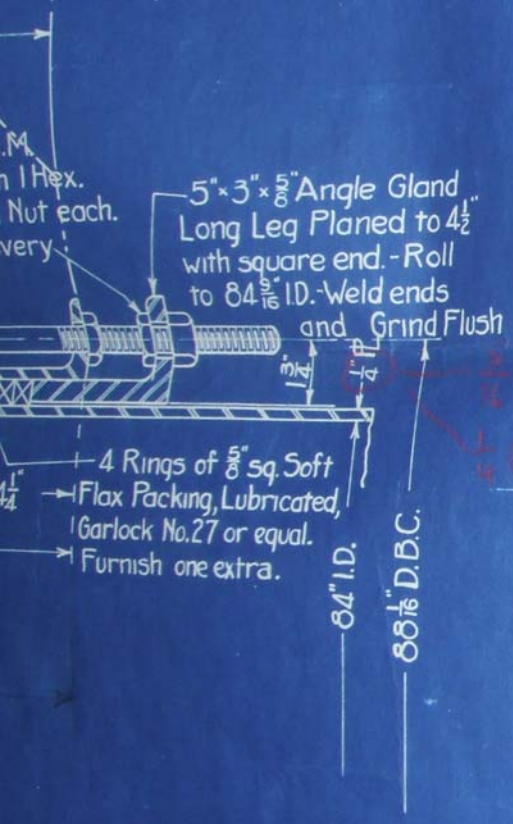
7 Required as shown

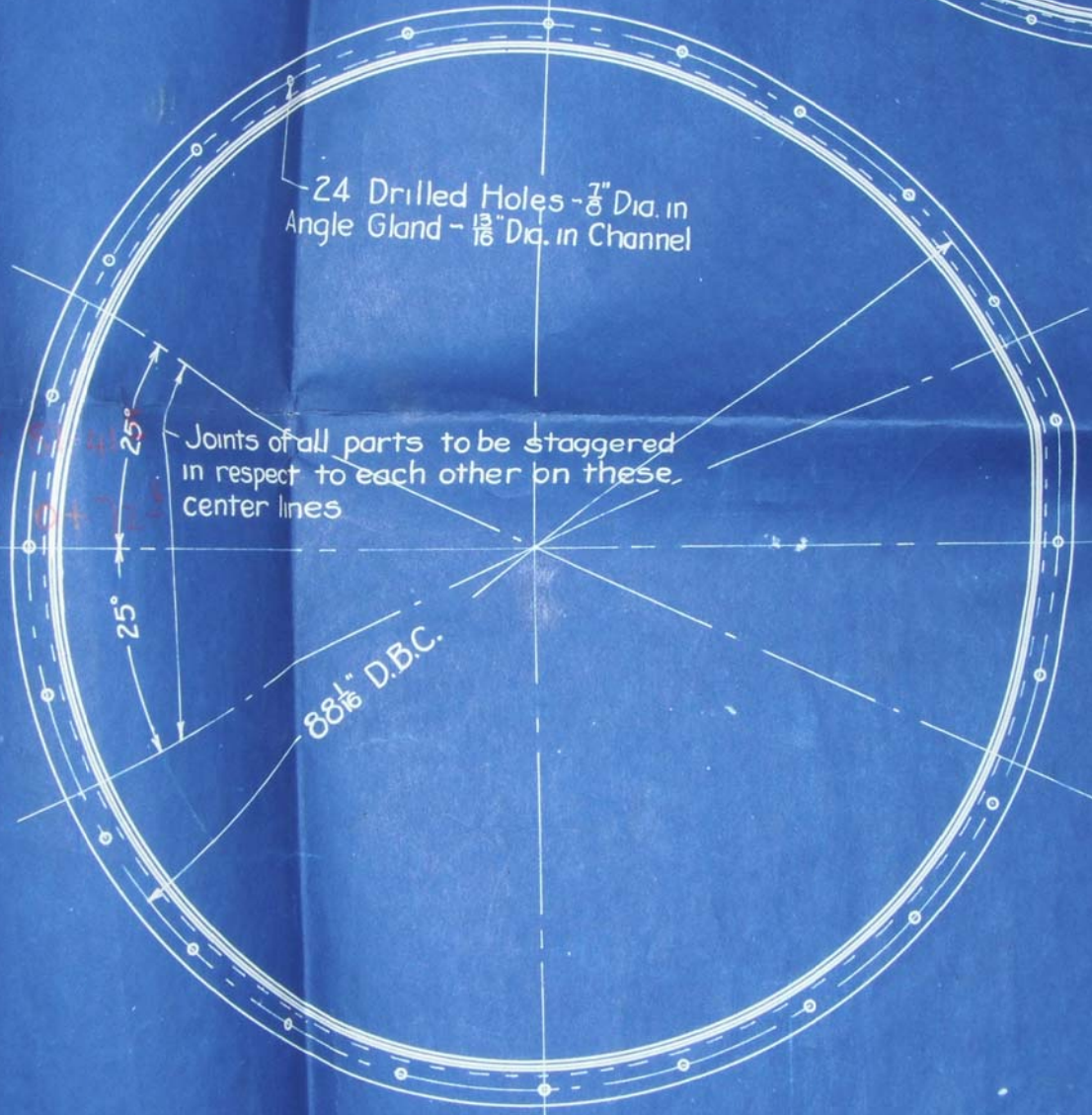



Sequence
welding se
Stress r
after ea

Expansi
dimensions
side Sleeve
All Ma
ed to pipe
and threa
See P
Drains.
All pa
to be furn
Boiler
place of

JOINT




Make all fillet welds flat or concave, thus, and not convex

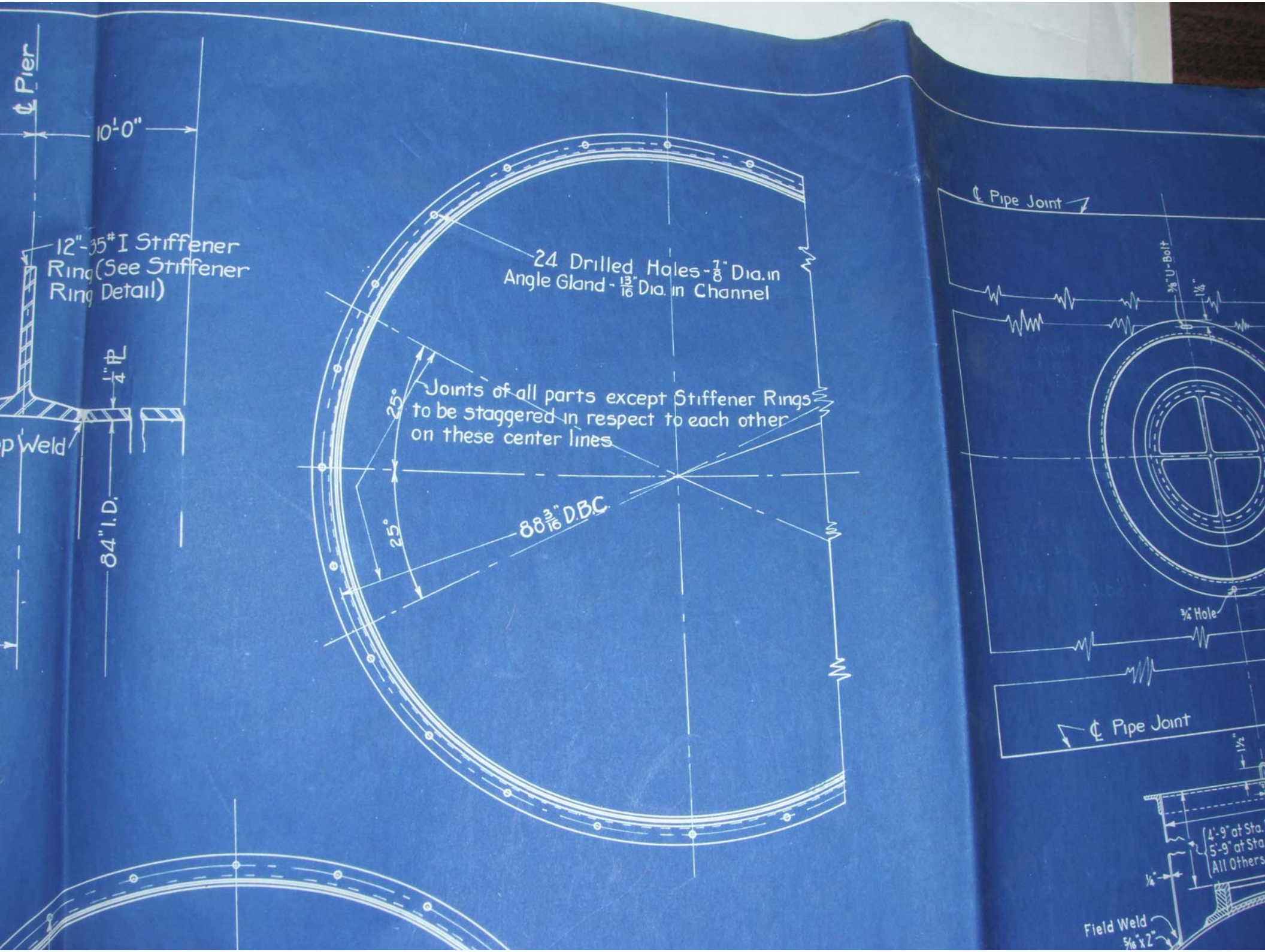
Rod

Sequence of Welding to be used in welding saddles and flanges to pipe. Stress relieve with Air Hammer after each rod.

Insertion

Saddle to be

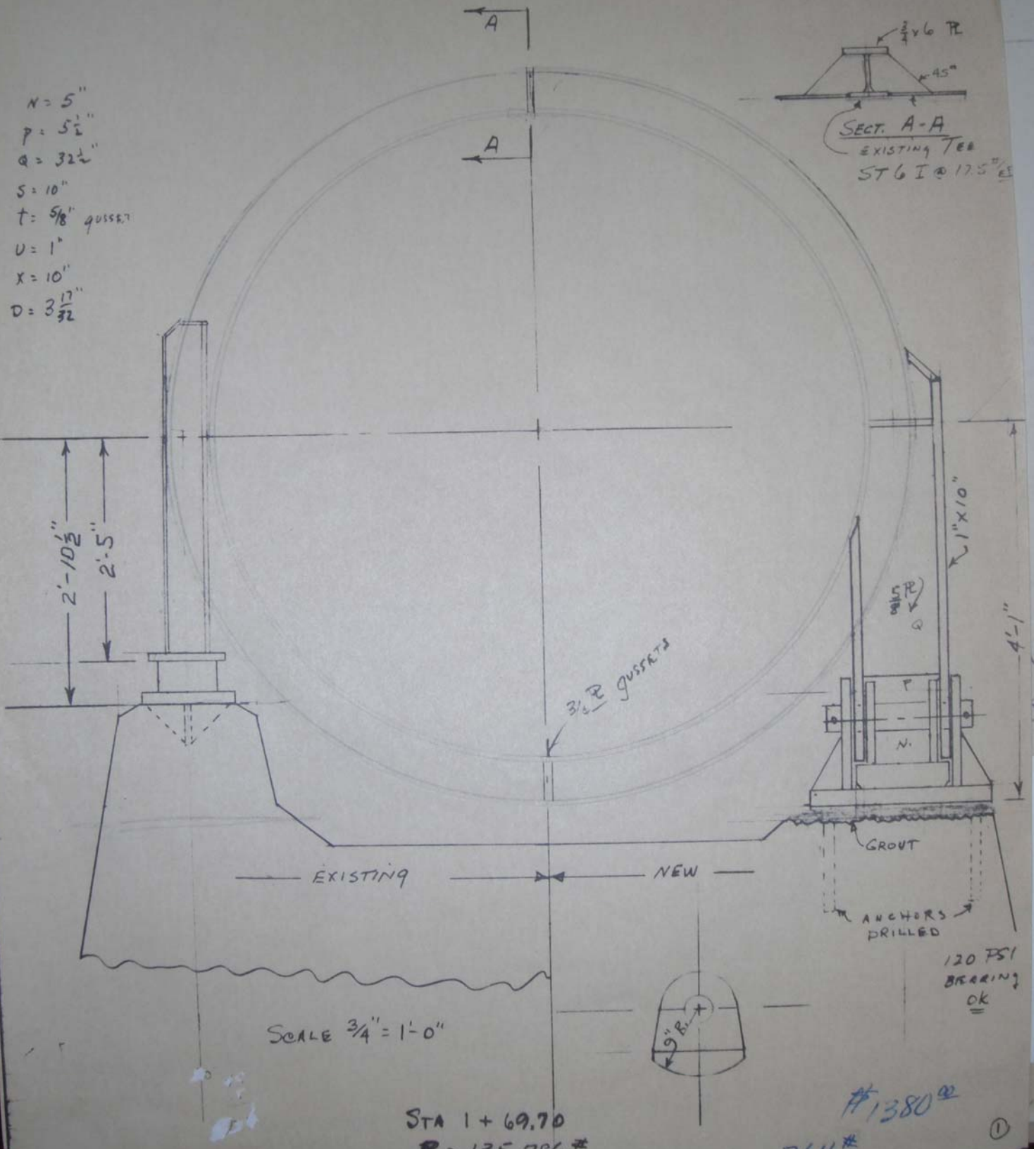
See Dwg. SM-9 f
detail of drain


℄ Pier
10'-0"
12"-35# I Stiffener Ring (See Stiffener Ring Detail)
1/4" PL
p Weld
84" I.D.
24 Drilled Holes - 7/8" Dia. in Angle Gland - 13/16" Dia. in Channel
Joints of all parts except Stiffener Rings to be staggered in respect to each other on these center lines
25°
25°
88 3/16" D.B.C.
℄ Pipe Joint
3/8" U-Bolt
1 1/4"
3/4" Hole
℄ Pipe Joint
1 1/2"
4'-9" at Sta.
5'-9" at Sta
All Others
1/4"
Field Weld
5/16" x 2"

# SANTA MARIA RESERVOIR


9-1-64

N = 5"
P = 5½"
Q = 32½"
S = 10"
t = 5/8" GUSSET
U = 1"
X = 10"
D = 3 17/32"





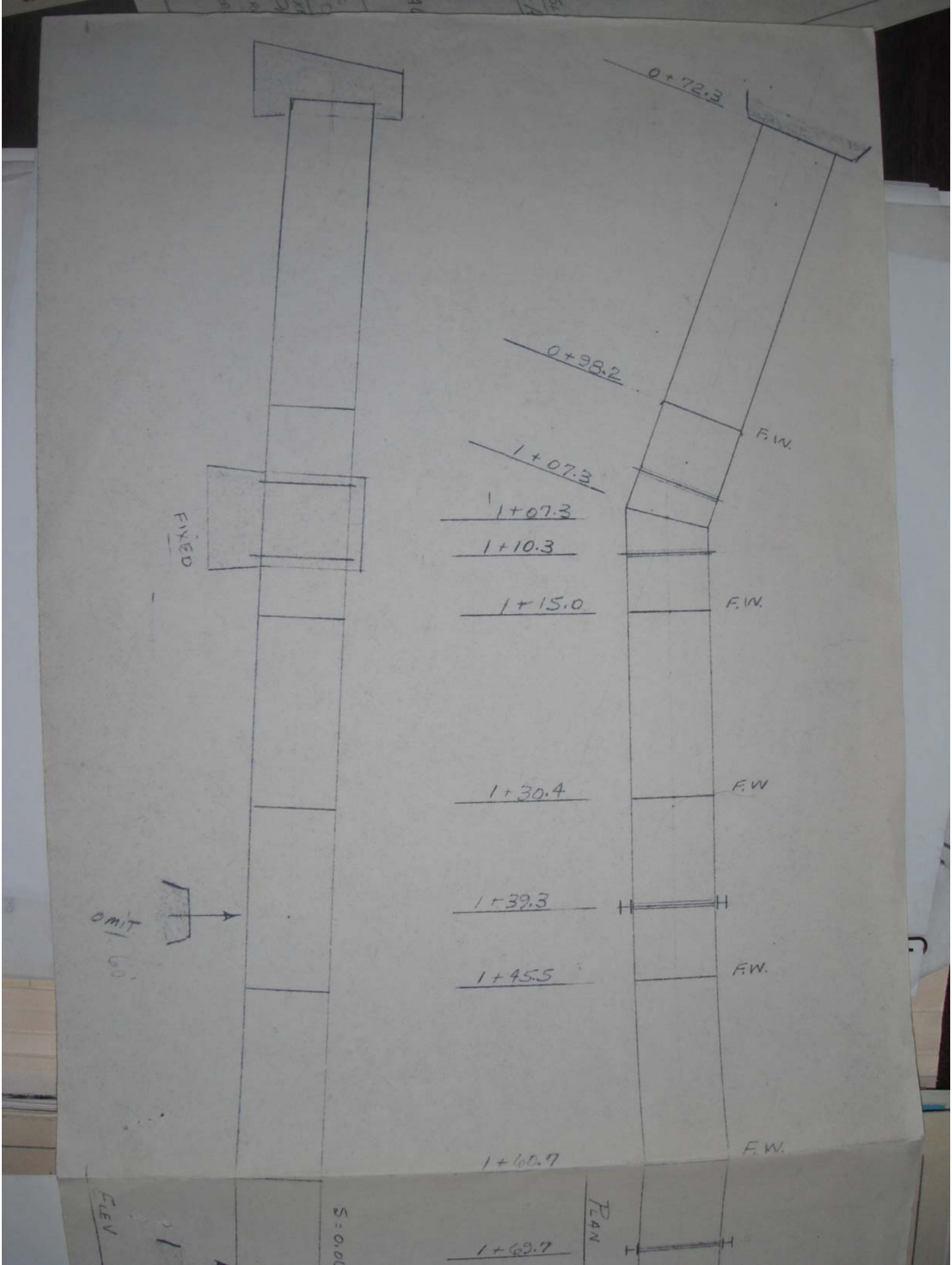


SECT. A-A
EXISTING TEE
ST 6 I @ 17.5#/FT

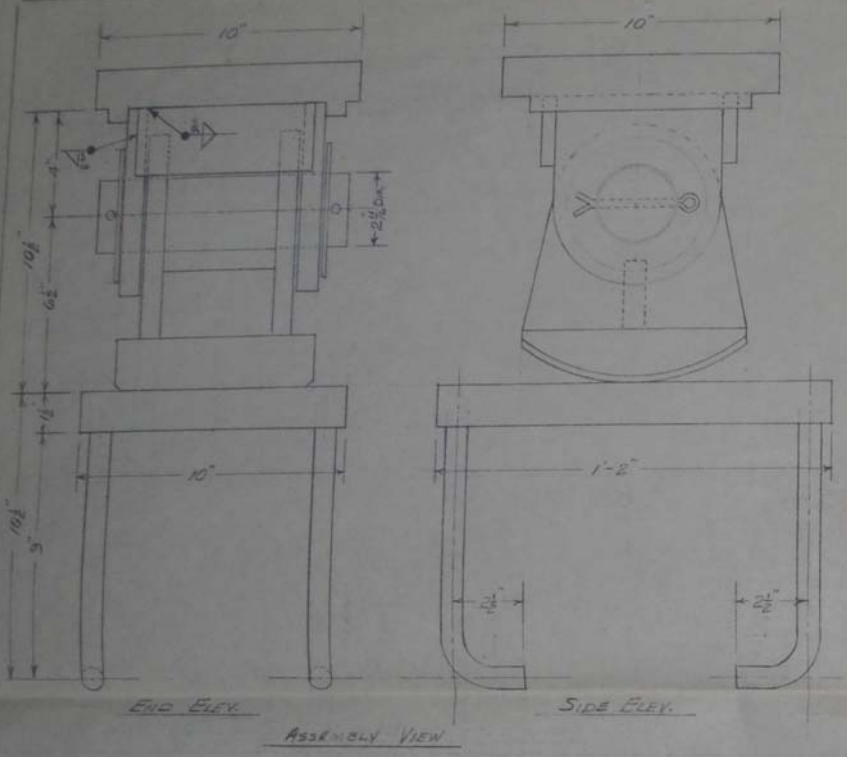
STA 1+69.70
R = 135,786#

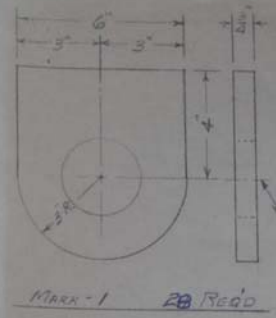
#1380
2611#

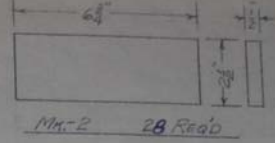
①


0+72.3
0+98.2
F.W.
1+07.3
1+07.3
1+10.3
1+15.0
F.W.
FIXED
1+30.4
F.W
OMIT
1+39.3
1+45.5
F.W.
F.W.
1+60.7
1+69.7
ELEV
PLAN
S=0.00

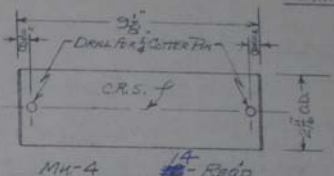
SCALE 1" = 1'-0"
84'
2+16.6
EXPANSION JT
2+03.6
1+93.3
1+78.6
1+69.7
PLAN
FIXED
ROLLER
S = 0.06488
ORDINARY ROLLER
ELEV

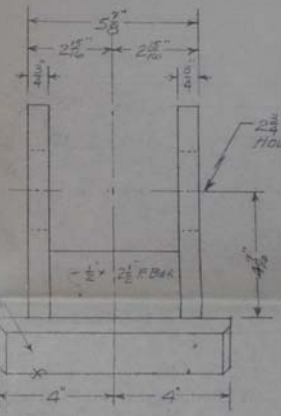


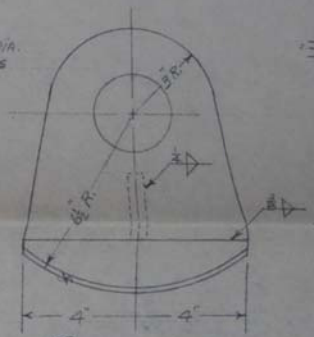



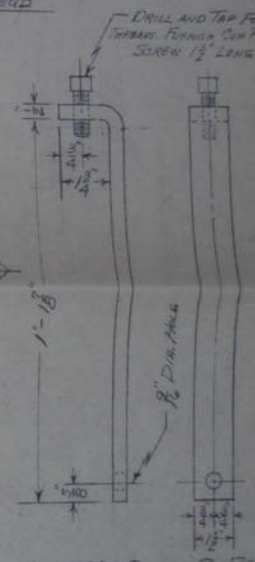



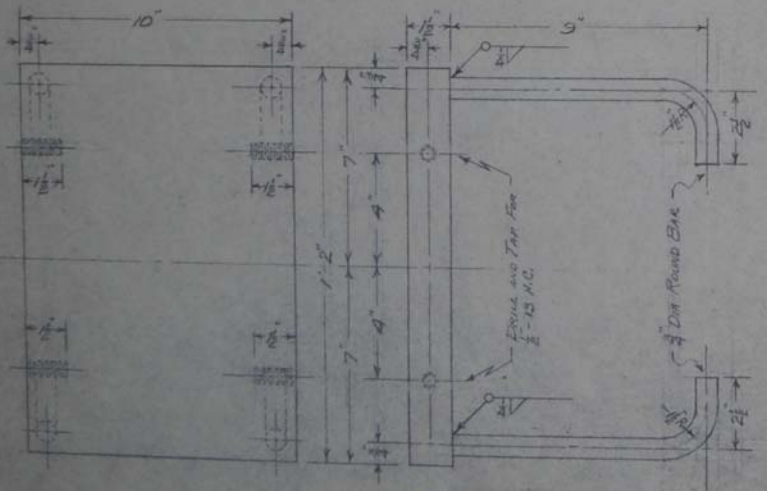


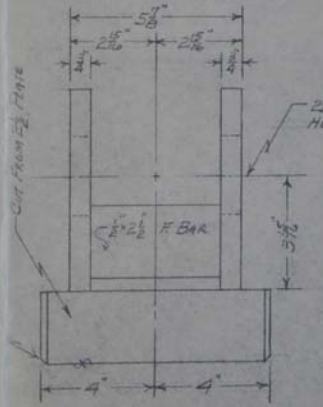


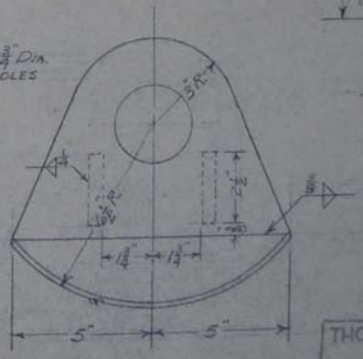




NOTE: THIS ROCKER FOR 60° SLOPE

SHOP NOTE:
1. SAND ALL ITEMS BARE. NO PAINT REQ'D.

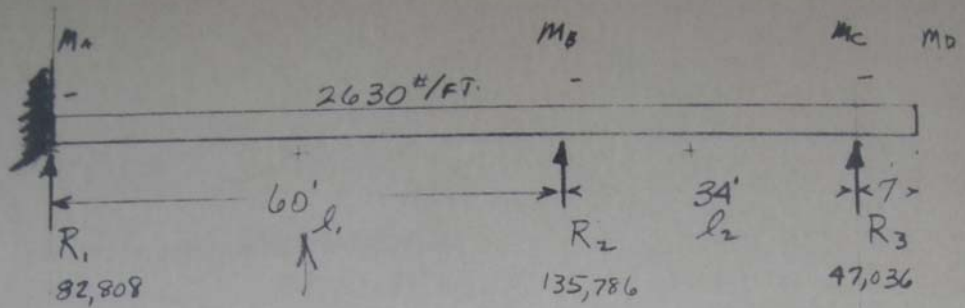
THOMPSON PIPE & STEEL CO.
DENVER, COLO.

ROCKER DETAILS FOR 84" DIA. PIPE
SANTA MARIA RESERVOIR
MONTA VISTA, COLORADO

DRAWN M.L. FORBES DATE 6-30-61
SCALE 4" = 1'-0"
CHECKED Edward F. Thompson JOB NO. 1-2254

SANTA MARIA RESERVOIR

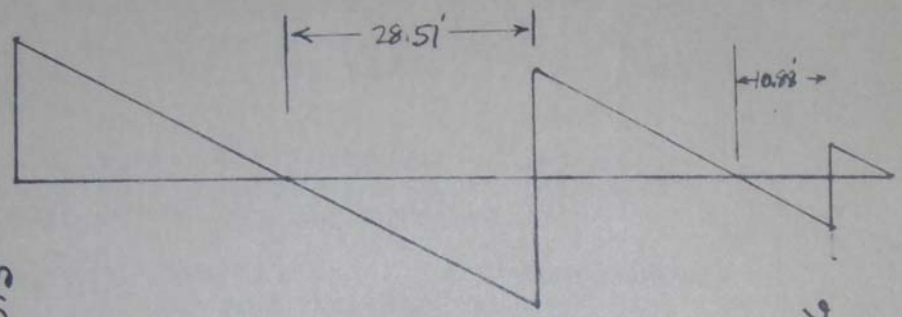





M TEN TOP = −
TEN BOT = +

(20)
20

(10)
SHEAR.

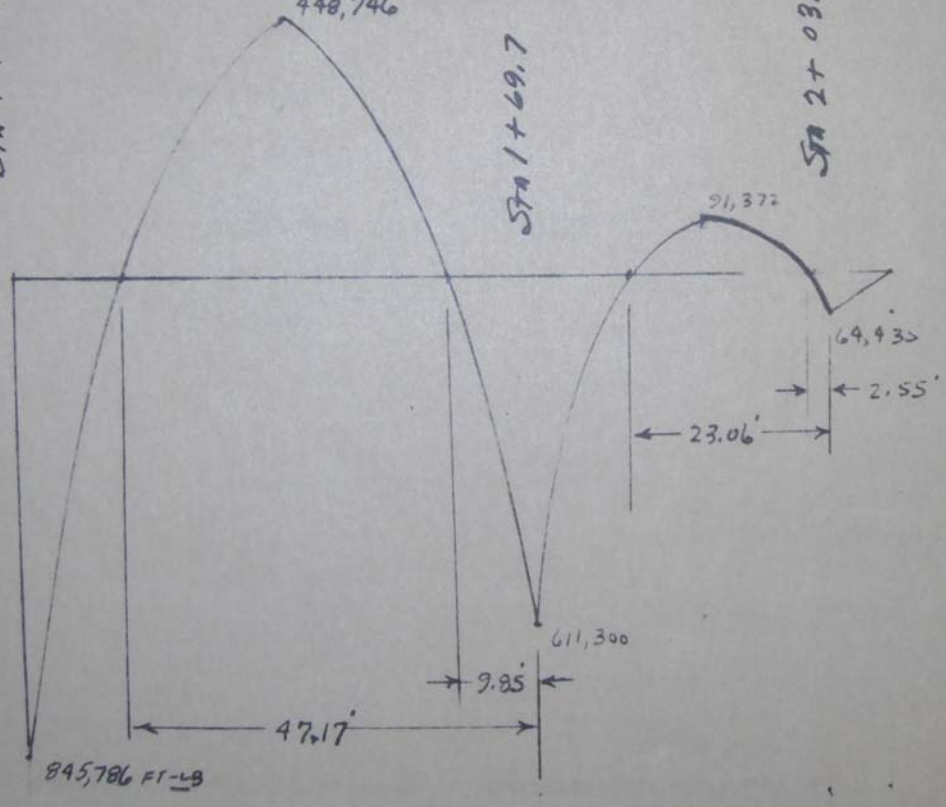



STA 1+10.3

STA 1+69.7

STA 2+03.6

MOMENT



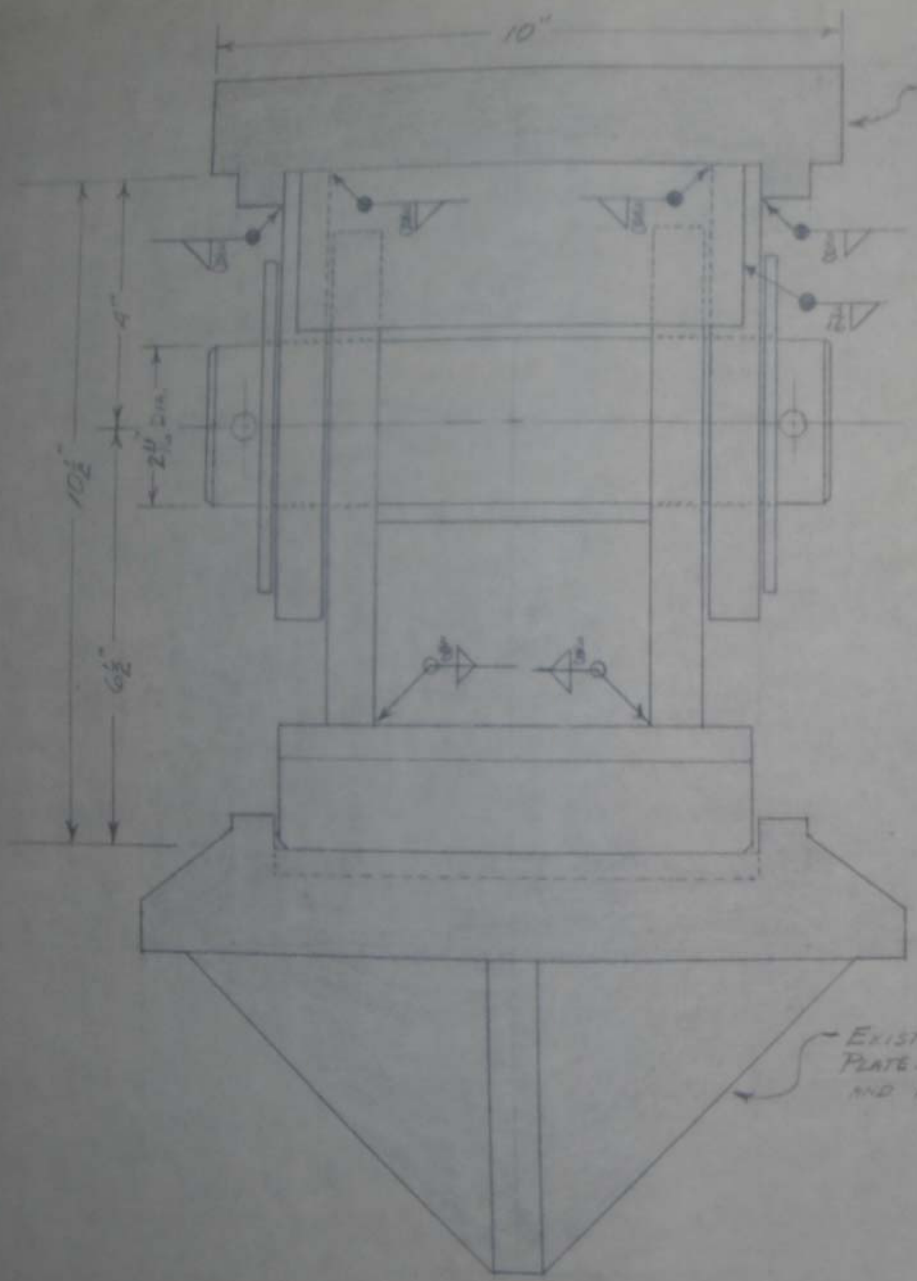

(30)

f = 7916 PSI
V = 1251 PSI

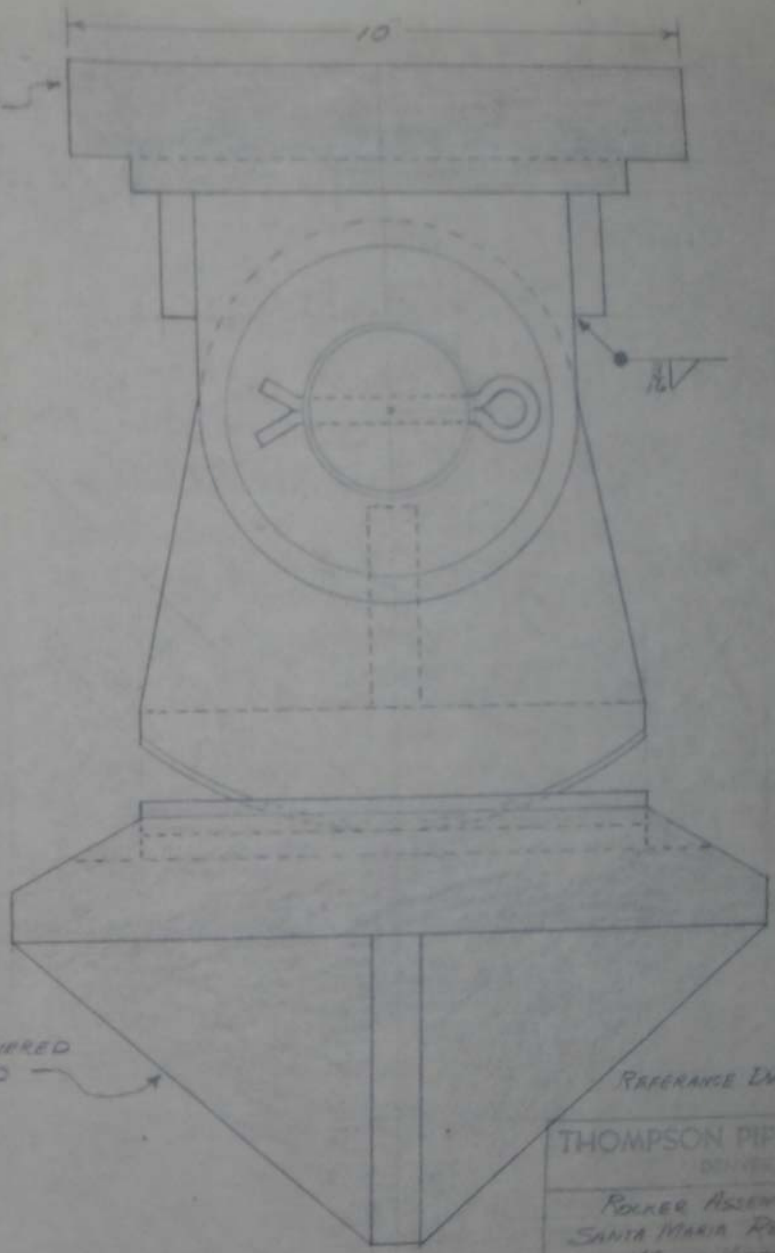
f = 5281 PSI
V = 2052 PSI

Δ = 0.19"

(1)




END ELEVATION




SIDE ELEVATION

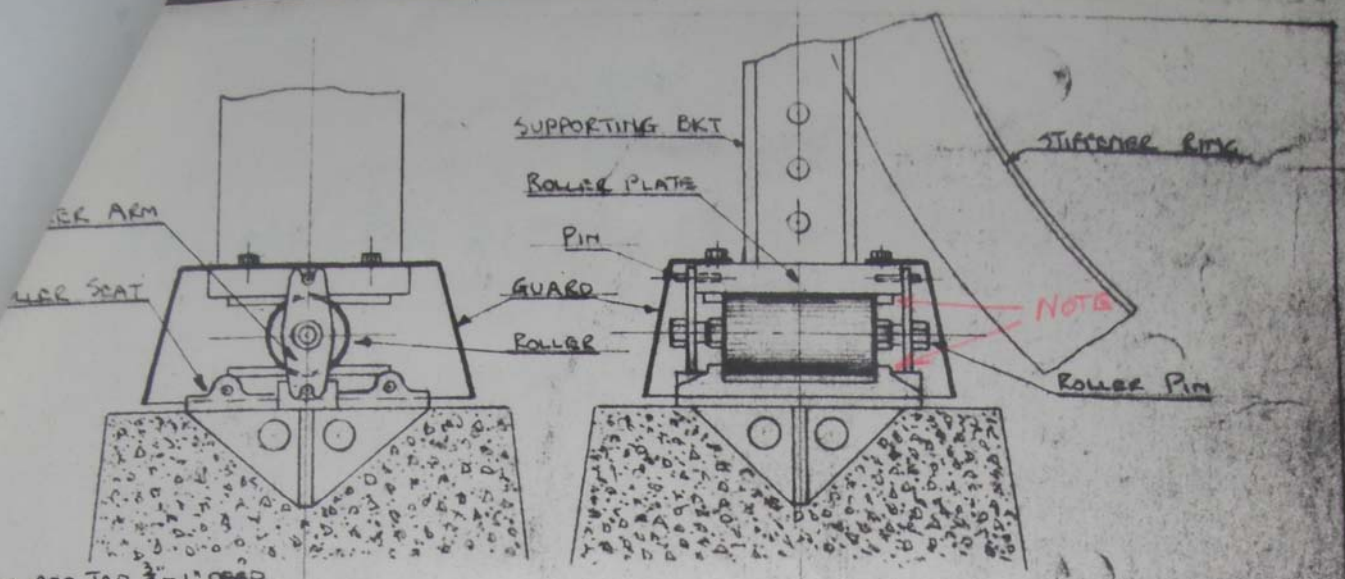
PROPOSED ROCKER DETAIL

REFERENCE DWG - 1612

THOMPSON PIPE & STEEL

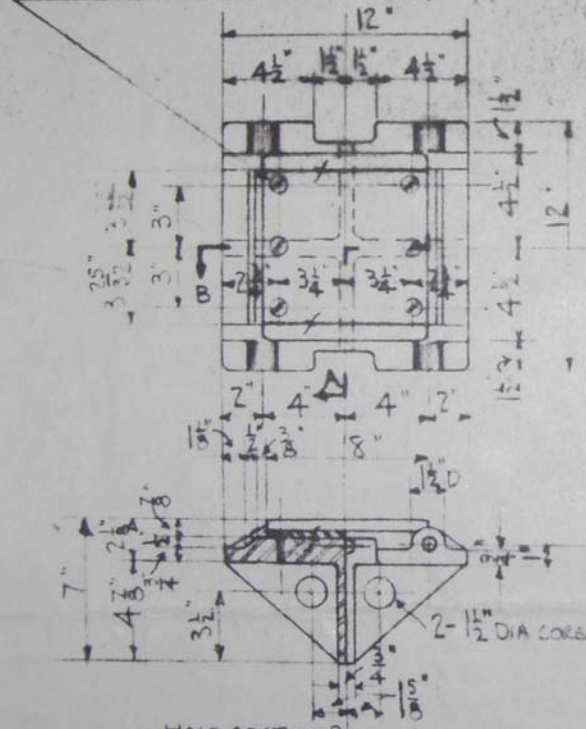
ROCKER ASSEMBLY DETAIL
SANTA MARIA RESERVOIR
MONTA VISTA, OHIO

J. H. FORBES




DRILL AND TAP $\frac{3}{4}$"-1" DEEP 6 HOLES - $\frac{3}{4}$-7 SCREWS TO BE SET FLUSH WITH BEARING PLATE. PUNCH MARKED IN 4 PLACES TO PREVENT TURNING, THEN DRAW FILE FLUSH WITH PLATE

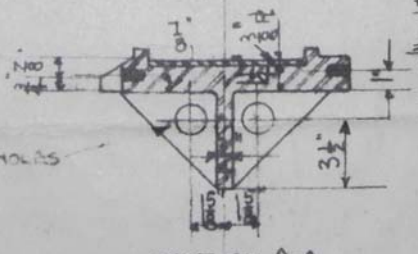
## -ASSEMBLY-





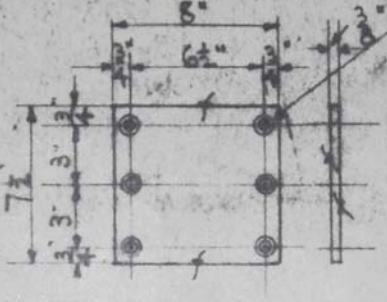


- HALF SECTION B -

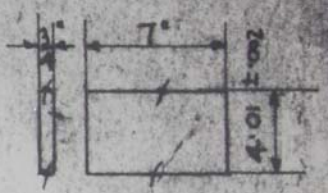


- SECTION A-A -

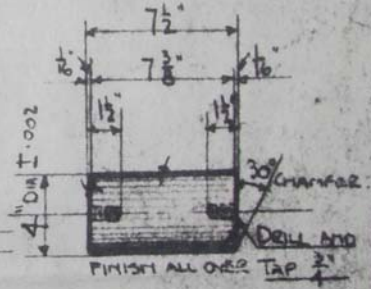
DRILL AND COUNTERSINK 6 HOLES FOR $\frac{3}{4}$" STEEL CAP SCREWS




- BEARING PLATE -
STEEL - S.A.E. #1045 - HEAT TREATED TO BRINELL HARDNESS OF 240
- 34 - REQD -




- SPACER STRIP -
$\frac{3}{4}$" STEEL PL - 8 REQD
CUT TO LENGTH AFTER MACHINING

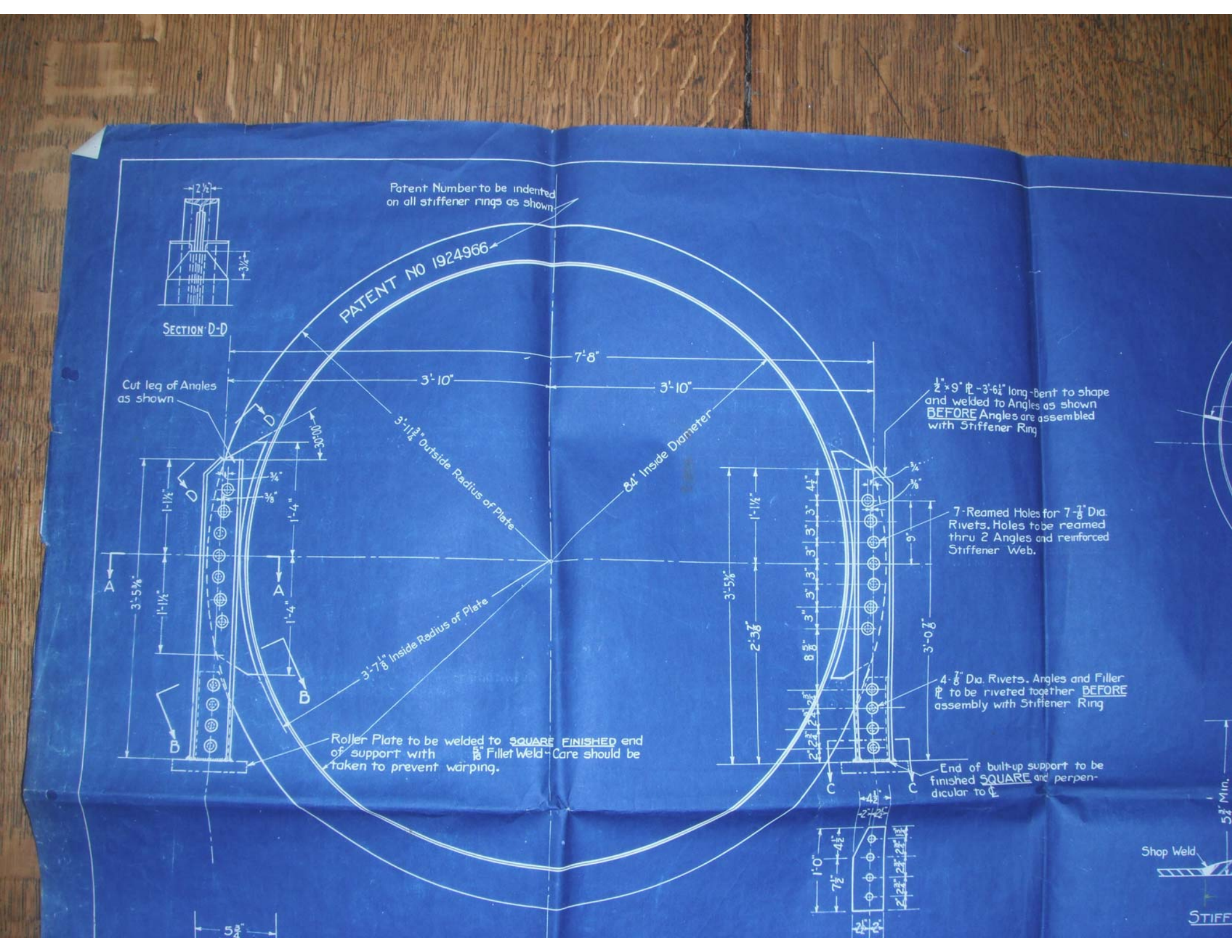


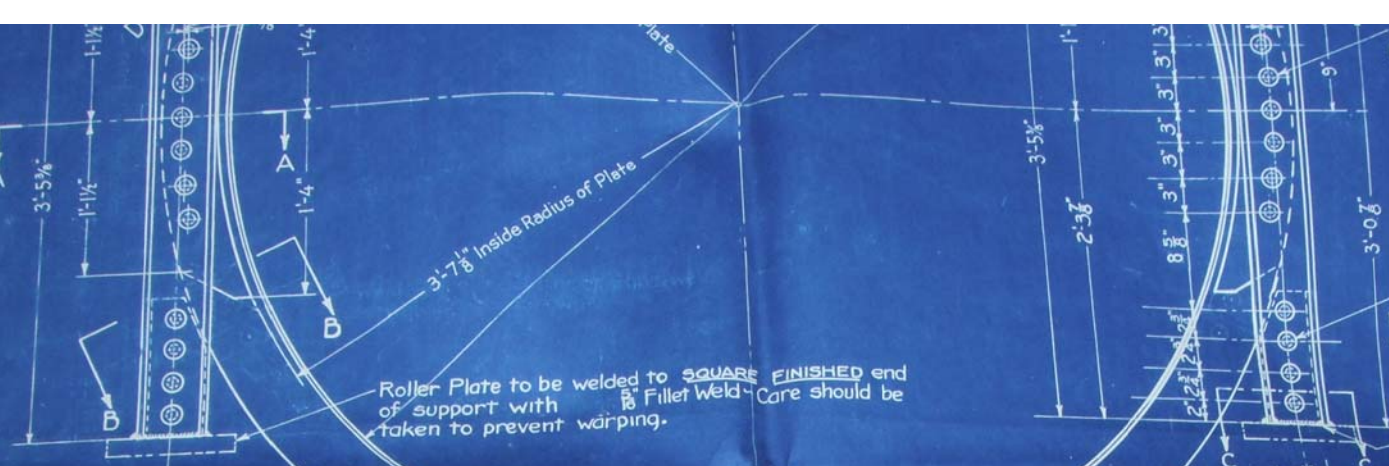

- ROLLER -
STEEL - S.A.E. #1045
- HEAT TREATED TO BRINELL HARDNESS OF 240
34 REQD


- PIN - STEEL
136 - REQD

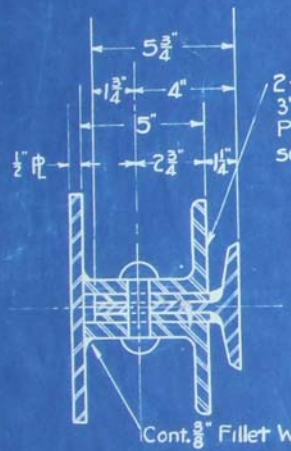
# - ASSEMBLY AND DETAIL ROLLER SUPPORTS -

| | | |
|---|---|---|
| SANTA MARIA PIPE LINE, DETAIL SHEET | F. O. 114 | THOMPSON MFG CO |
| SHEET 0 64 | 2810 D | SEPT 17TH 1934 |

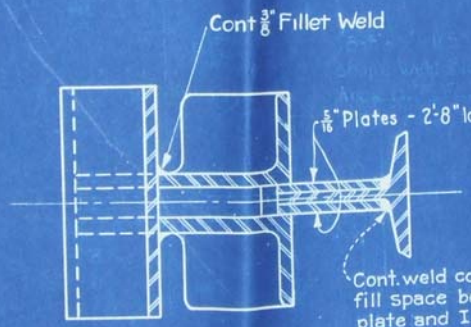

Patent Number to be indented on all stiffener rings as shown
PATENT NO 1924966
SECTION D-D
7'-8"
3'-10"
3'-10"
Cut leg of Angles as shown
3'-11 3/4" Outside Radius of Plate
84" Inside Diameter
3'-7 1/8" Inside Radius of Plate
Roller Plate to be welded to SQUARE FINISHED end of support with 5/16" Fillet Weld - Care should be taken to prevent warping.
1/2" x 9" PL - 3'-6 1/4" long - Bent to shape and welded to Angles as shown BEFORE Angles are assembled with Stiffener Ring
7 - Reamed Holes for 7/8" Dia. Rivets. Holes to be reamed thru 2 Angles and reinforced Stiffener Web.
4 - 7/8" Dia. Rivets. Angles and Filler PL to be riveted together BEFORE assembly with Stiffener Ring
End of built-up support to be finished SQUARE and perpendicular to ℄
Shop Weld
STIFF



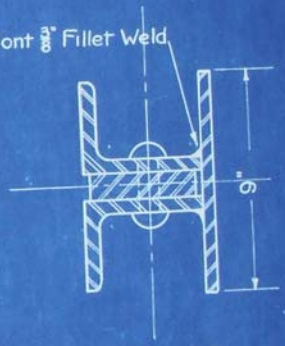





SECTION A-A




SECTION B-B




SECTION C-C


34 REQ.

STIFFENER RING AND SUPPORTING BRACKET

17 REQUIRED AS SHOWN

NOTES

Pipe to be fabricated in shop in shipping lengths of 20'-0" except as noted on profile, from plates, using 120" sheets with one longitudinal and one girth joint.

Welding shall be "CLASS 2" in accordance with A.S.M.E Code for Unfired Pressure Vesse

See Profile and Bend Detail Sheets for number and location of Stiffener Rings without

Stiffener Web.

3'-0"

4-⅞" Dia. Rivets. Angles and Filler ℄ to be riveted together BEFORE assembly with Stiffener Ring

End of built-up support to be finished SQUARE and perpendicular to ℄

C

Plates

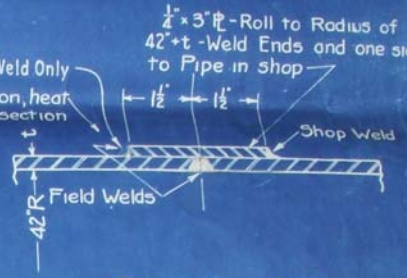
C-C

## Stiffener Ring Joint

## Location Longitudinal Pipe Joints

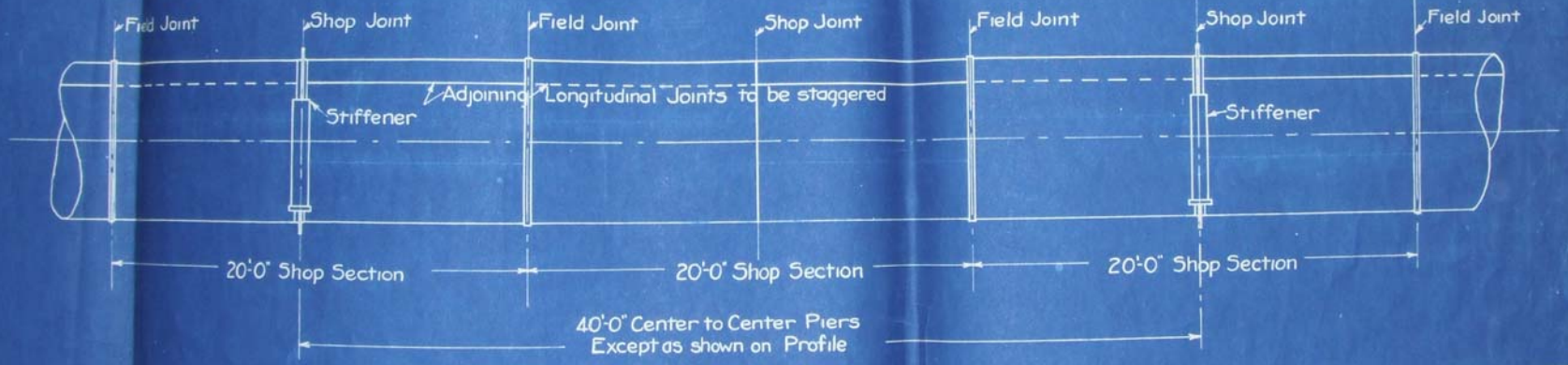

Stiffener And Pipe Joint


Shop Longit. And Girth Joints




Field Girth Joint

Maximum Offset Of Interior Surface For All Girth Joints Must Not Exceed 1/16" After Welding




Typical Section Of Pipe Line

## NOTES

ths of 20'-0" except as noted on profile, from ¼" and 5/16" and one girth joint.

h A.S.M.E Code for Unfired Pressure Vessels.
mber and location of Stiffener Rings without Brackets.

SANTA MARIA RESERVOIR COMPANY
R.J. TIPTON, CONSULTING ENGINEER

# INLET TO RESERVOIR

## STIFFENERS - JOINTS - SUPPORTING BRACKETS

DRAWN BY: E.H.C.-J.W.M.E. APPROVED: R.J. Tipton
TRACED BY: E.H.C.
CHECKED BY: E.H.C.-J.W.M.E.-R.J.T

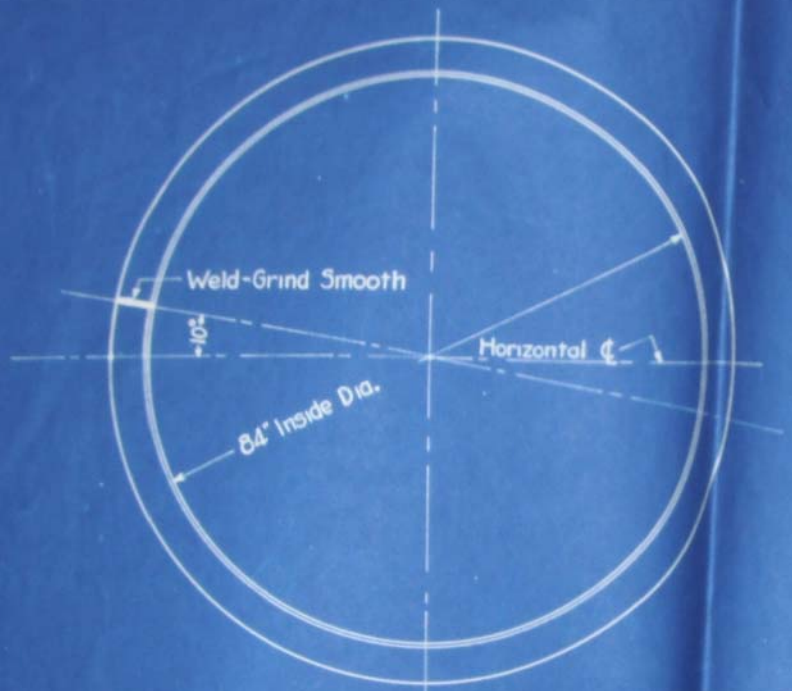
DENVER, COLO., JAN. 1934 | SM-3

-9" ℄ -3'-6¼" long - Bent to shape
welded to Angles as shown
FORE Angles are assembled
h Stiffener Ring

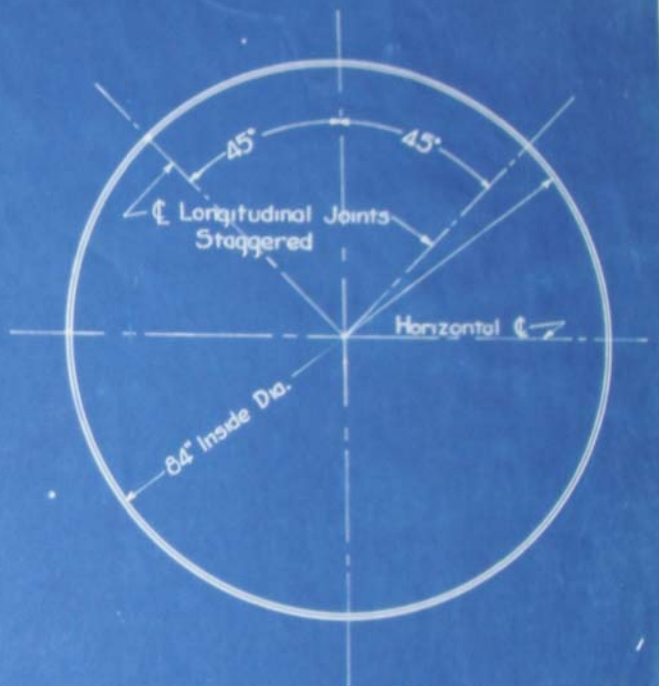
- 7 - Reamed Holes for 7-⅞" Dia.
Rivets. Holes to be reamed
thru 2 Angles and reinforced
Stiffener Web.

4-⅞" Dia. Rivets. Angles and Filler
to be riveted together BEFORE
ssembly with Stiffener Ring

End of built-up support to be
shed SQUARE and perpen-
lar to ℄




STIFFENER RING JOINT




LOCATION LONGITUDINAL PIPE JOINTS