High Pressure Emergency Gates for Echo Dam

U.S. Department of the Interior, Bureau of Reclamation

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UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

INVITATION FOR BIDS, SCHEDULE, SPECIFICATIONS
AND DRAWINGS

HIGH PRESSURE EMERGENCY GATES
FOR ECHO DAM

SALT LAKE BASIN PROJECT, UTAH
WEBER RIVER DIVISION

Bids will be received at the office of the Bureau of Reclamation, Denver, Colorado, until 3 o'clock p. m., April 20, 1928.
**CONTENTS**

<table>
<thead>
<tr>
<th>Invitation for bids</th>
<th>Page 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form of bid</td>
<td>Page 3</td>
</tr>
<tr>
<td>Schedule</td>
<td>Page 4</td>
</tr>
</tbody>
</table>

**SPECIFICATIONS**

General conditions:
1. Performance bond | Page 5
2. Shipment        | Page 5
3. Extras          | Page 5
4. Failure of Congress to appropriate funds | Page 5
5. Patents         | Page 5

Special conditions:
6. The requirement  | Page 5
7. Description of gates | Page 5
8. Drawings        | Page 6
9. Supplemental data not specifically shown on the drawings | Page 6
10. Delays—liquidated damages | Page 6
11. Payment        | Page 7

Construction:
12. Patterns       | Page 7
13. Finish for castings | Page 7
14. Tolerances and machine work | Page 7

Page 92050—28

<table>
<thead>
<tr>
<th>Construction—Continued.</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>15. Hoist cylinders</td>
<td>Page 7</td>
</tr>
<tr>
<td>16. Shop assembly and tests</td>
<td>Page 7</td>
</tr>
<tr>
<td>17. Painting and protection</td>
<td>Page 7</td>
</tr>
<tr>
<td>18. Federal Specifications Board specifications</td>
<td>Page 7</td>
</tr>
<tr>
<td>19. Test specimens</td>
<td>Page 7</td>
</tr>
</tbody>
</table>

Materials:
20. General specification for metals | Page 8
21. Cast iron            | Page 8
22. Semisteel            | Page 8
23. Cast steel           | Page 8
24. Cold-finished screw steel | Page 9
25. Bolt steel           | Page 9
26. Finish for bolts, studs, and nuts | Page 9
27. Bronze castings      | Page 9
28. Bronze               | Page 9
29. Class "C" bronze     | Page 10
30. Class "D" bronze     | Page 10
31. Cast manganese bronze | Page 10
32. Rolled bronze        | Page 10
33. High-tensile bronze  | Page 10
34. Finished weight of materials | Page 11
35. Manufacturer's name plate | Page 11
STANDARD GOVERNMENT FORM OF INVITATION FOR BIDS
(SUPPLY CONTRACT)

MARCH 6, 1928,

SEALED BIDS will be received in this office until the date and hour named in the accompanying schedules, and then publicly opened, for furnishing the materials and supplies called for therein.

Bids must be submitted upon the Standard Government Form of Bid (Standard Form No. 34) and in accordance with the Standard Government Instructions to Bidders (Standard Form No. 22) and any special instructions supplementary thereto.

Envelopes containing bids must be sealed and marked on the upper left-hand corner with the name and address of the bidder and the date and hour of opening and addressed to the purchasing agency named below:

Chief Engineer,
Bureau of Reclamation,
Denver, Colorado.

Guaranty will be required with each bid in an amount not less than ten (10) per cent of the total price bid. Performance bond will be required in an amount not less than fifty (50) per cent of the aggregate payments to be made under the contract.

(1)
STANDARD GOVERNMENT FORM OF BID

(SUPPLY CONTRACT)

Opening Date for this Bid

3 o'clock p.m., April 20, 1928

TO CHIEF ENGINEER,

Bureau of Reclamation,

DATE ____________________________

Denver, Colo.

In compliance with your invitation for bids to furnish materials and supplies listed on the reverse hereof or on the accompanying schedules, numbered:

the undersigned,

a corporation organized and existing under the laws of the State of

a partnership consisting of

an individual trading as

of the city of

hereby proposes to furnish, within the time specified, the materials and supplies at the prices stated opposite the respective items listed on the Schedules and agrees upon receipt of written notice of the acceptance of this bid within ____________ days (60 days if no shorter period be specified) after the date of opening of the bids, to execute, if required, the Standard Government Form of Contract (Standard Form No. 32) in accordance with the bid as accepted, and to give bond, if required, with good and sufficient surety or sureties, for the faithful performance of the contract, within 10 days after the prescribed forms are presented for signature.

Discount will be allowed for prompt payment as follows: 10 calendar days __________ per cent; 20 calendar days __________ per cent; 30 calendar days __________ per cent; or as stated in the schedules.

(Time will be computed from date of the delivery of the supplies to carrier when final inspection and acceptance are at point of origin, or from date of delivery at destination or point of embarkation when final inspection and acceptance are at those points, or from date correct bill or voucher properly certified by the contractor is received if the latter date is later than the date of delivery.)

(Witness to signature) (Full name of bidder)

(Special Conditions)

Note.—See Standard Government Instructions to Bidders and copy of the Standard Government Form of Contract, Bid Bond, and Performance Bond, which may be obtained upon application.

To insure prompt payment bills should be certified as follows: "I certify that the above bill is correct and just and that payment therefor has not been received."
<table>
<thead>
<tr>
<th>Item No.</th>
<th>Articles or services</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5 by 6 foot high-pressure emergency gates and conduit linings, each gate and conduit to include: (a) Materials in &quot;List of parts for one 5 by 6 foot gate,&quot; on drawing No. 100-D-2007. (b) Materials in &quot;List of parts for one 18-inch hydraulic hoist,&quot; on drawing No. 100-D-2094. (c) One (1) conduit lining on drawing No. 100-D-2149. (d) One (1) conduit lining-transitions on drawing No. 100-D-2150. All of the above complete in accordance with the attached specifications and drawings.</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

The bidder agrees to deliver the gates and conduit linings, f. o. b. cars at ____________________________ within _______ days after receipt of written notice of acceptance of this bid.

Approximate shipping weight of the material under Item 1 will be ___________ pounds.

Delivery, Urgency of.—Delivery within one hundred (100) calendar days after receipt of written notice of acceptance of this bid is important, and all bids specifying delivery within said number of days will be considered on an equal basis as regards time of delivery. Where the time of delivery specified by the bidder is greater than said number of days, each day in excess thereof will be evaluated at twenty dollars ($20) and bids will be compared on that basis.
SPECIFICATIONS

GENERAL CONDITIONS

1. Performance bond.—Unless another sum is specified in the invitation for bids, the contractor shall furnish bond in an amount not less than 20 per cent of the estimated aggregate payments to be made under the contract. Bonds in amounts of $1,000 or less will be made in multiples of $100; in amounts exceeding $1,000 but not exceeding $5,000, in multiples of $500; in amounts exceeding $5,000, in multiples of $1,000: Provided, That the amount of the bond shall be fixed by the contracting officer at the lowest sum that fulfills all conditions of the contract.

2. Shipment.—Material or machinery furnished and delivered f. o. b. cars at factory shipping point shall be shipped on Government bills of lading furnished by the contracting officer. The contractor shall prepare all materials and articles for shipment in such manner as to protect them from damage in transit, and shall be responsible for and make good any and all damage due to improper preparation or loading for shipment. Where necessary, heavy parts or machines shall be mounted on skids or crated, and any articles or materials that might otherwise be lost shall be boxed or wired in bundles and plainly marked for identification.

3. Extras.—The contractor shall, when ordered in writing by the contracting officer, perform extra work and furnish extra material, not covered by the specifications or included in the schedules, but forming an inseparable part of the work contracted for. Extra work and material will ordinarily be paid for at a lump sum or unit price agreed upon by the contractor and the contracting officer and stated in the order. Whenever, in the judgment of the contracting officer, it is impracticable, because of the nature of the work or for any other reason, to fix the price in the order, the extra work and material shall be paid for at actual necessary cost as determined by the contracting officer, plus 15 per cent for superintendence, general expense, and profit. The actual necessary cost will include all expenditures for material, labor, and supplies furnished by the contractor, and a reasonable allowance for the use of his plant and equipment, where required, to be agreed upon in writing before the work is begun, but will in no case include any allowance for office expenses, general superintendence, or other general expenses.

4. Failure of Congress to appropriate funds.—If the operations of this contract extend beyond the current fiscal year, it is understood that the contract is made contingent upon Congress making the necessary appropriation for expenditures thereunder after such current year has expired. In case such appropriation as may be necessary to carry out this contract is not made, the contractor hereby releases the Government from all liability due to the failure of Congress to make such appropriation.

5. Patents.—The contractor shall hold and save the Government, its officers, agents, servants, and employees harmless from liability of any nature or kind for or on account of the use of any patented or unpatented invention, article, or appliance furnished or used in the performance of this contract, excepting patented articles required by the Government in its specifications, the use of which the contractor does not control.

SPECIAL CONDITIONS

6. The requirement.—It is required that there be furnished and delivered, f. o. b. cars at the factory shipping point, two (2) 5 by 6 foot high-pressure emergency gates and conduit linings for Echo Dam, Weber River Division, Salt Lake Basin Project, Utah. The gates and conduit linings will be installed by the Government.

7. Description of gates.—The gates will be embedded in a solid concrete plug in the outlet tunnel for Echo Dam, and will be used under heads up to 108.5 feet as stop gates for protection and inspection of two 60-inch regulating valves which will later be installed at the outlet of the tunnel. An 8-inch by-pass is provided on each gate to permit normal operation under balanced pressure, but the gates are designed for operation in an emergency under an unbalanced head due to 140 feet of water. The 18-inch hydraulic hoist will be operated by a motor-driven triplex pump having a capacity of 10 to 12 gallons per minute under 1,000 pounds per square inch pressure, using oil as a medium.
8. Drawings.—The following drawings are made a part of these specifications:

5 by 6 foot high-pressure gate

1. (22001) 100–D–2001—Assembly with hydraulic hoist........................................ (Sheet 1 of 8)
2. (22002) 100–D–2002—Assembled sections................................................................. (Sheet 2 of 8)
3. (22003) 100–D–2003—Upstream frame................................................................. (Sheet 3 of 8)
4. (22004) 100–D–2004—Downstream frame................................................................. (Sheet 4 of 8)
5. (22005) 100–D–2005—Bonnet................................................................. (Sheet 5 of 8)
6. (22006) 100–D–2006—Leaf and seats................................................................. (Sheet 6 of 8)
7. (22007) 100–D–2007—Bolts and list of parts................................................................. (Sheet 7 of 8)
8. (22119) 100–D–2119—5-foot bonnet cover for 18-inch hoist................................. (Sheet 8 of 8)
9. (22149) 100–D–2149—Conduit lining.................................................................
10. (22150) 100–D–2150—Conduit lining transition.

18-inch hydraulic hoist

11. (22003) 100–D–2093—Cylinder, piston, stem extension........................................ (Sheet 1 of 2)
12. (22004) 100–D–2094—Stem, stuffing boxes, studs, bolts and list of parts............. (Sheet 2 of 2)

The contractor will not be held responsible for the correctness or sufficiency of designs, but he shall carefully check the drawings and advise the contracting officer of any error or omissions discovered by him. The contractor shall prepare, without charge to the Government, all necessary shop drawings covering the materials to be furnished under these specifications and he shall be responsible for the correct fitting of all of the parts. Unless otherwise specifically provided in the specifications or on the drawings, the contractor shall furnish all of the materials, accessories, and appurtenant parts called for in the specifications or shown on the drawings. Anything called for on the drawings and not mentioned in the specifications, or called for in the specifications and not mentioned on the drawings, shall be furnished the same as if called for or mentioned in or on both. Such additional copies of the specifications and complete sets of blue prints from original tracings as are necessary for carrying on the work will be furnished to the contractor.

9. Supplemental data not specifically shown on the drawings.—The following information covers dimensions and notes on the drawings that are variable under different conditions of operation and furnishes supplemental data that apply to the gates to be furnished under these specifications:

<table>
<thead>
<tr>
<th>Purpose of gates</th>
<th>Emergency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum operating head</td>
<td>108.5 feet</td>
</tr>
<tr>
<td>Upstream frame</td>
<td>By-pass not required</td>
</tr>
<tr>
<td>Downstream frame</td>
<td>By-pass required, located on top</td>
</tr>
<tr>
<td>Leaf material</td>
<td>Semisteel</td>
</tr>
<tr>
<td>Conduit lining</td>
<td>One wanted for each gate; by-pass and weep holes not required</td>
</tr>
<tr>
<td>Conduit lining transition</td>
<td>One wanted complete for each gate; D=</td>
</tr>
</tbody>
</table>

72 inches; weep holes are required.

10. Delays—liquidated damages.—The article, "Delays—Liquidated damages," given in paragraph 5 of the directions for preparation of contract, Standard Government Form of Contract (Standard Form No. 32), will by this reference be substituted for article 5 of the contract. The article reads as follows:

"Article 5. Delays—Liquidated damages.—If the contractor refuses or fails to make delivery of the materials or supplies within the time specified in Article 1, or any extension thereof, the actual damage to the Government for the delay will be impossible to determine, and in lieu thereof the contractor shall pay to the Government, as fixed, agreed, and liquidated damages for each calendar day of delay in making delivery, the amount as set forth in the specifications or accompanying papers, and the contractor and his sureties shall be liable for the amount thereof: Provided, however, That the Government reserves the right to terminate the right of the contractor to proceed and to purchase similar material and supplies in the open market or secure the manufacture and delivery thereof by contract or otherwise, charging against the contractor and his sureties any excess cost occasioned the Government thereby, together with liquidated damages accruing until such time as the Government may reasonably procure similar material or supplies elsewhere: Provided, further, That the contractor shall not be charged with liquidated damages or any excess cost when the delay in delivery is due to unforeseeable causes beyond the control and without the fault or negligence of the contractor, including, but not restricted to, acts of God or the public enemy, acts of the Government, fires, floods, epi-
dimension, quarantine restrictions, strikes, freight embargoes, and unusually severe weather but not 
including delays caused by subcontractors: Provided further, That the contractor shall, within ten 
days from the beginning of any such delay notify the contracting officer in writing of the causes of 
delay, who shall ascertain the facts and extent of the delay, and his findings of facts thereon shall be 
final and conclusive on the parties hereto, subject only to appeal, within thirty days, by the contractor 
to the head of the department concerned, whose decision on such appeal as to the facts of delay shall 
be final and conclusive on the parties hereto.

The amount of liquidated damages to be charged for failure to deliver the gates called for in the schedule 
within the required time shall be twenty dollars ($20) for each calendar day of delay.

11. Payment.—Eighty-five (85) per cent of the contract price will be paid within thirty (30) days after 
receipt by the Bureau of Reclamation, Denver, Colorado, of proper invoices and Government bills of lading, 
properly receipted, covering complete shipment of the gates and conduit linings. Earlier payment may be 
made if a discount is allowed as provided for in Standard Government Form of Bid (Standard Form No. 31). 
When all of the material has been received at the railway destination, checked, and accepted by the contracting 
officer, final payment will be made of the balance due under the contract.

CONSTRUCTION

12. Patterns.—The prices bid in the schedule shall include the cost of all necessary patterns. Care shall be 
taken to avoid sharp corners or abrupt changes in cross section by the use of ample fillets. Patterns will remain 
the property of the contractor.

13. Finish for castings.—All castings shall be true to pattern, free from cracks, cold shuts, excessive shrink-

age, and other injurious defects. No porosity will be allowed in positions where the strength of the casting will 
be impaired. All sand shall be removed before the castings are machined and painted.

14. Tolerances and machine work.—Tolerances and clearances specified on the drawings shall be closely 
adapted to, and the machine work shall be carefully performed, with surfaces smooth and practically free from 
tool marks. Where tolerances are not specified on the drawings, the contractor shall follow the best modern 
shop practice for apparatus of the type covered by these specifications, due consideration being given to the 
special nature or functions of any parts, and to the corresponding accuracy required to secure proper operation.

15. Hoist cylinders.—(Drawing No. 100–D–2093.) The finished thickness of the wall of the barrel of the 
hoist cylinder is shown on the drawing as 1 inch minimum, tapering at each end to 1 ¼ inches at the flange. 
The contractor may increase the wall thickness to 1 ½ inches for the entire length of the cylinder if this increase 
in thickness will be beneficial in securing sound castings. Provision is made for a system of small weep holes 
in the cylinder, with connecting grooves communicating with the weep holes. These weep holes are provided 
to avoid the possibility of pressure occurring between the cylinder wall and the bronze lining on one side of the 
piston when pressure for operation is applied to the opposite side of the piston. Special care shall be taken to 
insure that the weep holes are opposite the circular grooves between the cylinder wall and the bronze lining and 
that helical communicating grooves are open. The interior surface of the bronze lining shall have a smooth 
finish, free from chatter marks. It shall be ground if necessary to produce this result.

16. Shop assembly and tests.—Each gate shall be completely assembled at the factory to insure that all 
parts fit accurately and that they are in proper working order. Each gate shall be opened and closed several 
times by means of oil pumped into the operating cylinder. The cylinder shall then be subjected to a test pres-

sure of 1,000 pounds per square inch, first on top of the piston, then on the bottom of the piston with the cy-

linder head removed, and there shall be not more than a trace of leakage under this pressure. Each gate shall 
be marked and match-marked for identification and to facilitate assembly in the field.

17. Painting and protection.—The unfinished surfaces of the bonnet covers and cylinders shall be painted 
with two coats of first-class black machinery paint. The unfinished surfaces of all other castings not in contact 
with concrete shall be given one coat of water-gas tar, followed by two coats of coal-gas tar, applied hot, while 
the temperature of the air and metal is not less than 60° F. Bolt holes, screw threads, and all finished surfaces 
shall be coated with a suitable heavy rust-preventative compound. All threads on gate stems shall be wrapped 
in burlap, wired in place for shipment.

referred to herein may be procured at a nominal cost from the Superintendent of Documents, Government 
Printing Office, Washington, D. C.

19. Test specimens.—The contractor shall provide, without charge to the Government, all necessary test 
specimens properly machined for testing, and all samples or drillings for analyses, and shall notify the con-
tracting officer or his representative when these test specimens or samples are ready. All test specimens and 
samples shall be plainly marked to indicate the materials they represent and shall be properly boxed and pre-
pared for shipment if desired.
20. **General specification for metals.**—Unless otherwise specifically stated herein, all metals covered by these specifications shall be furnished in accordance with the requirements of the "United States Government General Specification for Metals," Federal Specifications Board Specification No. 339, which specification covers certain requirements which are common to all detail specifications for metals and provides means for determining whether the technical requirements of the detail specifications and drawings are being met.

21. **Cast iron.**—Iron castings shall be of gray iron made by the cupola process, free from injurious defects, and shall be smooth and well cleaned before inspection. They shall be commercially machinable, and shall not be plugged or welded without permission from the inspector. Such permission will be given only when the defects are small and do not adversely affect the strength, use, or machinability of the castings. In all respects not specifically mentioned herein the castings shall conform to the "United States Government Master Specification for Gray Iron Castings," Federal Specifications Board Specification No. 141, adopted May 1, 1924. There shall be three classes of gray-iron castings as follows:

(a) **Light castings**, having a section less than one-half inch in thickness.
(b) **Medium castings**, falling between the two other classes.
(c) **Heavy castings**, having no section less than 2 inches in thickness.

The castings shall be of such a character that transverse test bars 1¼ inches in diameter and 15 inches long, placed on supports 12 inches apart, will have physical properties not less than the following:

<table>
<thead>
<tr>
<th>Class</th>
<th>Load at center</th>
<th>Deflection at center</th>
<th>Tensile strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light castings</td>
<td>2,800 Pounds</td>
<td>0.10 inches</td>
<td>20,000 pounds per square inch</td>
</tr>
<tr>
<td>Medium castings</td>
<td>2,900 Pounds</td>
<td>0.10 inches</td>
<td>21,000 pounds per square inch</td>
</tr>
<tr>
<td>Heavy castings</td>
<td>3,900 Pounds</td>
<td>0.10 inches</td>
<td>24,000 pounds per square inch</td>
</tr>
</tbody>
</table>

Two sets (two bars per set) of transverse test bars shall be cast from each melt, one set from the first and the other set from the last iron going into the castings. Each set of two bars shall be cast in a single mold. Tension tests of cast iron will not be required.

22. **Semisteel.**—Castings shall be made by the cupola process, free from injurious defects, and shall be smooth and well cleaned before inspection. They shall be free from hard spots and shall be annealed in a furnace, if necessary, to secure satisfactory machinability. Castings shall not be plugged or welded without permission from the inspector, and such permission shall be given only when the defects are small and do not adversely affect the strength, use, or machinability of the castings. In all respects not specifically mentioned herein, the castings shall conform to the "United States Government Master Specification for High-Test Gray Iron Castings (Semisteel)," Federal Specifications Board Specification No. 140, adopted May 1, 1924. There shall be three classes of semisteel castings, as follows:

(a) **Light castings**, having a section of less than one-half inch in thickness.
(b) **Medium castings**, falling between the other two classes.
(c) **Heavy castings**, having no section less than 2 inches in thickness.

The castings shall be of such a character that transverse test bars 1¼ inches in diameter and 15 inches long, placed on supports 12 inches apart, will have physical properties not less than the following:

<table>
<thead>
<tr>
<th>Class</th>
<th>Load at center</th>
<th>Deflection at center</th>
<th>Tensile strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light castings</td>
<td>3,500 Pounds</td>
<td>0.12 inches</td>
<td>26,000 pounds per square inch</td>
</tr>
<tr>
<td>Medium castings</td>
<td>3,700 Pounds</td>
<td>0.12 inches</td>
<td>28,000 pounds per square inch</td>
</tr>
<tr>
<td>Heavy castings</td>
<td>3,900 Pounds</td>
<td>0.12 inches</td>
<td>30,000 pounds per square inch</td>
</tr>
</tbody>
</table>

Two sets (two bars per set) of transverse test bars shall be cast from each melt, one set from the first and the other set from the last iron going into the castings. Each set of two bars shall be cast in a single mold. Tension tests will not be required.

23. **Cast steel.**—Steel castings shall be sound and free from injurious defects. They shall be well cleaned, with heads and gates removed for inspection in the green. When heads and gates are removed by burning,
this burning shall be done at least one-half inch from the body of the casting, the remaining metal to be removed by grinding, cutting, or machining. Castings shall not be repaired, plugged, or welded without specific authority from the inspector. Such permission will be given only for welding to be completed prior to final heat treatment, and when the defects, after being thoroughly cleaned out to sound metal, are judged not to affect the strength, use, or machinability of the castings. Castings shall be annealed in a properly constructed pit or furnace, and they shall be held at the treatment temperature at least long enough for each casting to be uniformly heated throughout its mass. They shall not be removed from the furnace until they have been cooled down to a temperature of about 700° F. Rapid cooling of castings, or any further heat treatment other than reannealing, shall not be undertaken without specific authority from the contracting officer. All castings shall be annealed so that the fracture of any part shall show to the eye a fine-grain structure. They shall be well cleaned for final inspection. In all respects not specifically mentioned herein the castings shall conform to the “United States Government Master Specification for Steel Castings (Medium Grade),” Federal Specifications Board Specification No. 170. Tension-test pieces properly machined shall be furnished by the contractor in accordance with the above specifications. The physical properties shall be not less than the following:

<table>
<thead>
<tr>
<th>Ultimate tensile strength</th>
<th>70,000 pounds per square inch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield point</td>
<td>45 per cent of tensile strength obtained</td>
</tr>
<tr>
<td>Elongation in 2 inches</td>
<td>20 per cent</td>
</tr>
<tr>
<td>Reduction of area</td>
<td>30 per cent</td>
</tr>
</tbody>
</table>

Cold-bend tests will not be required.

24. Cold-finished screw steel.—Cold-finished screw steel shall comply in all respects to the current “Standard Specifications for Commercial Bar Steel,” U.S. Government Standard Specification No. 5 or grade No. 6. Bolt steel: All steel rods from which bolts and studs are made shall be clean, straight, and of uniform quality and size. The physical properties of the steel from which bolts and studs are made shall be not less than the following:

<table>
<thead>
<tr>
<th>Material</th>
<th>Ultimate tensile strength</th>
<th>Yield point</th>
<th>Elongation in 2 inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolt steel:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class “A”</td>
<td>75,000</td>
<td>40,000</td>
<td>23 per cent</td>
</tr>
<tr>
<td>Class “B”</td>
<td>58,000</td>
<td>30,000</td>
<td>28 per cent</td>
</tr>
<tr>
<td>Commercial grade</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

26. Finish for bolts, studs, and nuts.—Bolts, studs, and nuts will be of two classes— semifinished and finished—as follows:

(a) Semifinished bolts and nuts shall be die-chamfered, machined under head and nut, threaded, with head of the bolt concentric with the body, and the faced side at right angles to the body.

(b) Finished bolts, studs, and nuts shall be machined throughout, threaded, with head chamfered, concentric with and at right angles to the body of the bolt.

27. Bronze castings.—Bronze castings shall be made only from the best grades of virgin metals. The use of scrap metal will not be allowed. They shall be of uniform quality free from blowholes, porosity, hard spots, shrinkage defects, cracks, or other injurious defects, and shall be smooth and well cleaned before inspection. Castings shall not be repaired, plugged, or welded without permission from the inspector. Such permission will be given only when the defects are small and do not adversely affect the strength, use, or machinability of the castings.

28. Bronze.—Where “bronze” only is specified on the drawings, the castings may be made of either grade No. 5 or grade No. 6 bronze. In all respects not specifically mentioned herein bronze castings shall conform to the “United States Government Master Specification for Bronze Castings,” Federal Specifications Board Specification No. 172a. The physical properties of the bronze castings shall be not less than the following:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Ultimate tensile strength</th>
<th>Yield point</th>
<th>Elongation in 2 inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>40,000</td>
<td>0.5 tensile strength</td>
<td>20 per cent</td>
</tr>
<tr>
<td>6</td>
<td>35,000</td>
<td>0.5 tensile strength</td>
<td>18 per cent</td>
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</table>
Chemical analysis shall show:

<table>
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<tr>
<th>Elements</th>
<th>Composition</th>
<th>Grade 5</th>
<th>Grade 6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Per cent</td>
<td>Per cent</td>
</tr>
<tr>
<td>Copper</td>
<td>Desired</td>
<td>88</td>
<td>88</td>
</tr>
<tr>
<td></td>
<td>Permissible</td>
<td>86-89</td>
<td>85-89</td>
</tr>
<tr>
<td>Tin</td>
<td>Desired</td>
<td>86</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Permissible</td>
<td>7.5-11</td>
<td>7.5-11</td>
</tr>
<tr>
<td>Zinc</td>
<td>Desired</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Permissible</td>
<td>1.5-4.5</td>
<td>1.5-4.5</td>
</tr>
<tr>
<td>Lead</td>
<td>Desired</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Permissible</td>
<td>0-0.3</td>
<td>0-1.0</td>
</tr>
<tr>
<td>Iron</td>
<td>Desired, maximum</td>
<td>0.1</td>
<td>0.25</td>
</tr>
<tr>
<td></td>
<td>Permissible, maximum</td>
<td>0.75</td>
<td>0.75</td>
</tr>
<tr>
<td>Nickel</td>
<td>Desired, maximum</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Permissible, maximum</td>
<td>0.05</td>
<td>0.50</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>Desired, maximum</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Permissible, maximum</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>Sulphur</td>
<td>Desired, maximum</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Permissible, maximum</td>
<td>0.25</td>
<td>0.25</td>
</tr>
<tr>
<td>Antimony</td>
<td>Desired, maximum</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Permissible, maximum</td>
<td>0.15</td>
<td>0.35</td>
</tr>
<tr>
<td>Other elements</td>
<td>Desired, maximum</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Permissible, maximum</td>
<td>0.2</td>
<td>0.2</td>
</tr>
</tbody>
</table>

29. Class "C" bronze.—The chemical composition of Class "C" bronze shall be as follows:

Copper: 82.5 to 83 per cent.
Tin: 7 to 7.25 per cent.
Lead: 4.75 to 5 per cent.
Zinc: 5.25 to 5.5 per cent.

30. Class "D" bronze.—The chemical composition of Class "D" bronze shall be as follows:

Copper: 82.5 to 83 per cent.
Tin: 4.75 to 5 per cent.
Lead: 7.75 to 8.25 per cent.
Zinc: 4.25 to 4.5 per cent.

31. Cast manganese bronze.—In all respects not specifically stated herein, cast manganese bronze shall conform to the "United States Government Master Specification for Manganese Bronze Castings," Federal Specifications Board Specification No. 370. The physical properties of the manganese bronze castings shall be not less than the following:

Ultimate tensile strength: 65,000 pounds per square inch.
Ultimate elongation in 2 inches: 20 per cent.

Chemical analysis shall show:

Copper: 55 to 60 per cent.
Zinc: 38 to 42 per cent.
Manganese: 3.5 per cent.
Aluminum: 1.5 per cent.
Lead, not over: 0.2 per cent.
Other elements: 0.2 per cent.

The remainder may be of such small percentages of other ingredients as the contractor considers necessary to produce the specified physical properties.

32. Rolled bronze.—The physical properties of rolled bronze shall be not less than the following:

Ultimate tensile strength: 60,000 pounds per square inch.
Yield point: 30,000 pounds per square inch.
Elongation in 2 inches: 30 per cent.
33. **High-tensile bronze.**—The gate stems shall be made from rolled or forged bronze having physical properties not less than the following:

- Ultimate tensile strength: 90,000 pounds per square inch.
- Yield point: 50,000 pounds per square inch.
- Elongation in 2 inches: 20 per cent.

34. **Finished weight of materials.**—After shop work or fabrication is completed and before boxing or crating for loading on cars for shipment, all materials shall be carefully weighed, and a record of the actual net weight of materials under each item of the schedule shall be forwarded to the office of the Bureau of Reclamation, Denver, Colorado.

35. **Manufacturer's name plate.**—Cast lettering, other than that shown on the drawings, will not be permitted on any of the castings. The contractor may, however, attach a small brass name plate giving manufacturer's name, address, etc., on one of the principal castings.
LIST OF DRAWINGS

GATE
GENERAL ASSEMBLY...........100-D-2001
ASSEMBLED SECTIONS........100-D-2002
UPSTREAM FRAME............100-D-2003
DOWNSTREAM FRAME........100-D-2004
BONNET....................100-D-2005
LEAF AND SEATS.............100-D-2006
BOLTS AND LIST OF PARTS...100-D-2007
BONNET COVER..............

HOIST
CYLINDER-PISTON-STEM EXTENSION...*
STEM ETC. AND LIST OF PARTS........*

CONDUIT
CONDUIT LINING................
CONDUIT LINING-TRANSITION.....

*See List of Drawings in Specifications for Number

DESIGN DATA
Cast Iron Gate Leaf,
Maximum Designed Head 90 feet
Semi Steel Gate Leaf,
Maximum Designed Head 140 feet
Cast Steel Gate Leaf,
Maximum Designed Head 240 feet
Working Pressure in Cylinder-750 lbs per sq. inch
Designed Pressure-1000 lbs per sq. inch
Bronze Gate Seat coefficient of Friction
2.0 (starting)
Concrete, surrounding Conduit and Bonnet Castings, designed to carry all the load.
Note: Dimensions of Stem and Nuts change with the requirements of different installations. See details.
NOTE:— Dimensions are Minimum add required Draft For By-pass Flange requirement and location see Specifications.
Drill and ream for T

30-1" Taps, 8-U.S. Standard threads 1/16" deep for A. Do not drill thru.

Drill and spotface 32-1/8 holes for B.

Drill and ream for 1"x3" dowels.

NOTE
Dimensions are minimum add required Draft. Furnish Standard 2 Eye Bolt with shoulder. One only for each Contract.
SEIMISTEEL -- ONE REQUIRED

BONNET

SECTION B-B

Ream for and drive in light 4-1/2 x 3 Steel Dowels in Bottom Flange

Grill and spotface 24-1/8 holes for E

SECTION B-B

Ream for and drive in light 2-1/2 x 3 Steel Dowels

SECTION D-D

36 taps for E
For size see BONNET COVER Sheet No. 6

DETAIL E

SECTION C-C

Drill and spotface 48 holes for B

DETAIL F

Shop Notes: Bolt Bonnet together before reaming for body bound bolts or finishing top and bottom flanges.
Dimensions are Minimum add required draft.

SECTION D-D

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
DENVER OFFICE STANDARD DESIGN
HIGH PRESSURE GATE BONNET
SHEET 5 OF 8
MARCH 1928

ACCESSION No.32005  DRAWING No.100-D-2005
LIST OF PARTS FOR ONE 5'-0" x 6'-0" GATE

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>DESCRIPTION</th>
<th>MATERIAL</th>
<th>NUMBER REQUIRED</th>
<th>DRAWING NUMBER</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Upstream Frame</td>
<td>Cast Iron</td>
<td>1</td>
<td>100-D-2003</td>
</tr>
<tr>
<td>2</td>
<td>Downstream Frame</td>
<td>Cast Iron</td>
<td>1</td>
<td>100-D-2004</td>
</tr>
<tr>
<td>3</td>
<td>Bonnet</td>
<td>Semi Steel</td>
<td>1</td>
<td>100-D-2005</td>
</tr>
<tr>
<td>4</td>
<td>Bonnet Cover</td>
<td>Semi Steel</td>
<td>1</td>
<td>Sheet No. B</td>
</tr>
<tr>
<td>5</td>
<td>Gate Leaf</td>
<td>See Specifications</td>
<td>1</td>
<td>100-D-2006</td>
</tr>
<tr>
<td>6</td>
<td>Gate Sill</td>
<td>Cast Iron</td>
<td>1</td>
<td>*</td>
</tr>
<tr>
<td>7</td>
<td>Horizontal Leaf Seat</td>
<td>Class &quot;B&quot; Bronze</td>
<td>1</td>
<td>*</td>
</tr>
<tr>
<td>8</td>
<td>Vertical Leaf Seat</td>
<td>Class &quot;B&quot; Bronze</td>
<td>2</td>
<td>*</td>
</tr>
<tr>
<td>9</td>
<td>Bonnet Seat</td>
<td>Class &quot;B&quot; Bronze</td>
<td>2</td>
<td>*</td>
</tr>
<tr>
<td>10</td>
<td>Horizontal Frame Seat</td>
<td>Class &quot;B&quot; Bronze</td>
<td>1</td>
<td>*</td>
</tr>
<tr>
<td>11</td>
<td>Vertical Frame Seat</td>
<td>Class &quot;B&quot; Bronze</td>
<td>2</td>
<td>*</td>
</tr>
<tr>
<td>12</td>
<td>Vertical Flange Cover</td>
<td># Brass Plate</td>
<td>1</td>
<td>100-D-2007</td>
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<tr>
<td>13</td>
<td>1/4&quot; Cap Screw</td>
<td>Rolled Bronze</td>
<td>6</td>
<td>*</td>
</tr>
<tr>
<td>14</td>
<td>1/2&quot; Cap Screw</td>
<td>Rolled Bronze</td>
<td>61</td>
<td>*</td>
</tr>
<tr>
<td>15</td>
<td>3/16&quot; Studs with Nut</td>
<td>Bolt Steel, Class &quot;B&quot;</td>
<td>16</td>
<td>*</td>
</tr>
<tr>
<td>16</td>
<td>3/32&quot; Studs with Nut</td>
<td>Bolt Steel, Class &quot;B&quot;</td>
<td>56</td>
<td>*</td>
</tr>
<tr>
<td>17</td>
<td>Studs with Nut</td>
<td>See Bonnet Cover</td>
<td>36</td>
<td>Sheet No. B</td>
</tr>
<tr>
<td>18</td>
<td>1/4&quot; Bolt with Nut</td>
<td>Bolt Steel, Class &quot;B&quot;</td>
<td>20</td>
<td>100-D-2007</td>
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</table>

* Furnish 8 additional of 3 for each By-pass Flange required

See Specifications

**FLAT COUNTER SUNK HEAD CAP SCREWS**

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>NUMBER REQUIRED</th>
<th>DIMENSION IN INCHES</th>
<th>N</th>
<th>MATERIAL</th>
<th>USED WITH PARTS</th>
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</thead>
<tbody>
<tr>
<td>13</td>
<td>6</td>
<td>1/16 1/8 1/4 5/8</td>
<td>13</td>
<td>Rolled Bronze</td>
<td>5 and 12</td>
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<tr>
<td>14</td>
<td>67</td>
<td>1/8 1/4 5/8 3/4 7/8 1</td>
<td>8</td>
<td>Rolled Bronze</td>
<td>2, 3, 5, 6, 9, 10 and 11</td>
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**STUDS WITH NUTS**

<table>
<thead>
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<th>SYMBOL</th>
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<th>DIMENSION IN INCHES</th>
<th>N</th>
<th>MATERIAL</th>
<th>USED WITH PARTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>10</td>
<td>1/16 1/8 1/4 5/8</td>
<td>10</td>
<td>Bolt Steel, Class &quot;B&quot;</td>
<td>2</td>
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<tr>
<td>16</td>
<td>50</td>
<td>5/32 1/8 5/32 3/16 1/4 5/8</td>
<td>56</td>
<td>Bolt Steel, Class &quot;B&quot;</td>
<td>1, 2 and 3</td>
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</tbody>
</table>

**BOLT WITH NUT**

BOLT STEEL CLASS "B" - USED WITH PART THREE
SIXTEEN REQUIRED - SEMI-FINISH
FOUR REQUIRED - BODY BOUND

NOTE: All Nuts to be cold pressed, chamfered and trimmed. Commercial Grade.

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
DENVER OFFICE STANDARD DESIGN
5' X 6' HIGH PRESSURE GATE
BOLTS AND LIST OF PARTS
SHEET 7 OF 8
MARCH 1928

ACCESSION NO. 22007 DRAWING NO. 100-D-2007
Drill and ream for 2 1"x3" Dowels set in Bonnet 2.

Drill 20-1/2" Holes equally spaced for (39) 1/2"x6" Bolts. Straddle this E.

Straddle this C.

Drill 20-1/2" Holes equally spaced for (39) 1/2"x6" Bolts. Straddle this E.

Thumb Tight Thread

Wrench Tight Thread

7-U.S.Std. Thd.s per inch

11/4" Stud

Bolt Steel - Class-B

Semi-Finished-Thirty-Six Required

Used with Parts 3 and 4.

Bore 1/8" Deep for (40) 1/4"x24" Flat Head Cap Screw

Bore 1/8" Deep for (36) 3/8" x 64" Studs

Bore 1/16" Drilled Hole

Make close fit in Counterbore of Cylinder (2)

Hydraulic Hoist Sheet No. 2

Provide one Bronze Plug

Sheets No. 2

Chill Finish

High Pressure Gate

BONNET COVER FOR 18" HOIST

Sheet B of 8

March 1928

Department of the Interior

Bureau of Reclamation

Denver Office Standard Design

HIGH PRESSURE GATE

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
DENVER OFFICE STANDARD DESIGN
HIGH PRESSURE GATE
5" BONNET COVER FOR 18" HOIST

SHEET B OF 8
MARCH 1928

J. H. Barry
Chief Engineer

A. F. Walker

ACCESSION NO. 22119
DRAWING NO. 100-D-2719

NOTES

Designed for Maximum Head of 150 feet.

Dimensions are Minimum, add required Draft.

Part Numbers in Prenathesis thus (2) refer to HYDRAULIC HOIST

BONNET COVER

SEMISTEEL - ONE REQUIRED

BOTTOM VIEW

SECTION A-A

SECTION B-B

SECTION C-C

SECTION D-D

SECTION E-E

SECTION F-F

END ELEV.

HALF SIDE ELEV.

DRILLING 20-1/2" Holes equally spaced for (39) 1/2"x6" Bolts. Straddle this E.

Thumb Tight Thread

Wrench Tight Thread

7-U.S.Std. Thd.s per inch

11/4" Stud

Bolt Steel - Class-B

Semi-Finished-Thirty-Six Required

Used with Parts 3 and 4.

Bore 1/8" Deep for (40) 1/4"x24" Flat Head Cap Screw

Bore 1/8" Deep for (36) 3/8" x 64" Studs

Bore 1/16" Drilled Hole

Make close fit in Counterbore of Cylinder (2)

Hydraulic Hoist Sheet No. 2

Provide one Bronze Plug

Sheets No. 2

Chill Finish

High Pressure Gate

BONNET COVER FOR 18" HOIST

Sheet B of 8

March 1928

Department of the Interior

Bureau of Reclamation

Denver Office Standard Design

HIGH PRESSURE GATE

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
DENVER OFFICE STANDARD DESIGN
HIGH PRESSURE GATE
5" BONNET COVER FOR 18" HOIST

SHEET B OF 8
MARCH 1928

J. H. Barry
Chief Engineer

A. F. Walker

ACCESSION NO. 22119
DRAWING NO. 100-D-2719

NOTES

Designed for Maximum Head of 150 feet.

Dimensions are Minimum, add required Draft.

Part Numbers in Prenathesis thus (2) refer to HYDRAULIC HOIST

BONNET COVER

SEMISTEEL - ONE REQUIRED

BOTTOM VIEW

SECTION A-A

SECTION B-B

SECTION C-C

SECTION D-D

SECTION E-E

SECTION F-F

END ELEV.

HALF SIDE ELEV.

DRILLING 20-1/2" Holes equally spaced for (39) 1/2"x6" Bolts. Straddle this E.

Thumb Tight Thread

Wrench Tight Thread

7-U.S.Std. Thd.s per inch

11/4" Stud

Bolt Steel - Class-B

Semi-Finished-Thirty-Six Required

Used with Parts 3 and 4.

Bore 1/8" Deep for (40) 1/4"x24" Flat Head Cap Screw

Bore 1/8" Deep for (36) 3/8" x 64" Studs

Bore 1/16" Drilled Hole

Make close fit in Counterbore of Cylinder (2)

Hydraulic Hoist Sheet No. 2

Provide one Bronze Plug

Sheets No. 2

Chill Finish

High Pressure Gate

BONNET COVER FOR 18" HOIST

Sheet B of 8

March 1928

Department of the Interior

Bureau of Reclamation

Denver Office Standard Design

HIGH PRESSURE GATE

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
DENVER OFFICE STANDARD DESIGN
HIGH PRESSURE GATE
5" BONNET COVER FOR 18" HOIST

SHEET B OF 8
MARCH 1928

J. H. Barry
Chief Engineer

A. F. Walker

ACCESSION NO. 22119
DRAWING NO. 100-D-2719

NOTES

Designed for Maximum Head of 150 feet.

Dimensions are Minimum, add required Draft.

Part Numbers in Prenathesis thus (2) refer to HYDRAULIC HOIST

BONNET COVER

SEMISTEEL - ONE REQUIRED

BOTTOM VIEW

SECTION A-A

SECTION B-B

SECTION C-C

SECTION D-D

SECTION E-E

SECTION F-F

END ELEV.

HALF SIDE ELEV.
2" Top, 45° U.S. Std Threads 3/4" Deep and Counterbore 2 1/2" x 4 1/2" deep for 2" Std. Eyebolt
This Eyebolt Boss not required if By-pass Flange is located on Top of Conduit

Drill and spotface 26-1/8" holes

1" Weep Holes, Carefully Drilled, Similar arrangement on all sides. Required only when Conduit Lining is below gate

8- 26" Tapped holes, 10 U.S. Std. thds. for 15

Pipe Connection Furnished by U.S.

BY-PASS FLANGE
See Specifications for requirement and location

SHOP NOTE
Manufacturer to furnish one set of flange bolts with nuts (2B-46 U.S. Std. Steel. Class "B" U.S. Std. thds. semi-finished) for each length of Conduit required.
All adjoining interior surfaces must be practically flush; maximum allowable offset to be chipped to form smooth water line
Weep Holes and By-pass Flange to be provided if required (See Specifications)
Dimensions are Minimum add required Draft.

FIELD NOTE
This Casting is designed to be embedded in concrete.

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
DENVER OFFICE STANDARD DESIGN
5X 6" HIGH PRESSURE GATE
MARCH 1928

CONDUIT LINING
CAST IRON

PROJECTING FLANGE
By-pass Flange

ACCESSION No. 22149 DRAWING No.100-D-2149
Drill and spotface 26 1/8 holes in rectangular end

Drill and spotface 26 1/8 holes equally spaced


TRANSITION
CAST IRON - ONE REQUIRED

NOTE
Transition may be furnished in one part 10" long or in two parts as detailed.
All adjoining interior surfaces must be practically flush, a maximum offset of 1/2" will be allowed which must be chipped flush.
Dimensions are minimum and required draft.
Transition as detailed to be used below Gate. When used above Gate omit Weep Holes.
See Specifications for requirement.

CIRCULAR FLANGE DATA

<table>
<thead>
<tr>
<th>Diameter</th>
<th>0.5</th>
<th>0.75</th>
<th>0.80</th>
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<tbody>
<tr>
<td>9.5172</td>
<td>86</td>
<td>90</td>
<td>95</td>
</tr>
<tr>
<td>Thickness</td>
<td>3/16</td>
<td>3/16</td>
<td>3/16</td>
</tr>
<tr>
<td>Bolt Circle</td>
<td>3/16</td>
<td>3/16</td>
<td>3/16</td>
</tr>
<tr>
<td>No. Bolts</td>
<td>60</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Size Bolts</td>
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<td>5/8&quot;</td>
<td>5/8&quot;</td>
</tr>
<tr>
<td>Size Holes</td>
<td>5/16&quot;</td>
<td>5/16&quot;</td>
<td>5/16&quot;</td>
</tr>
</tbody>
</table>

ASSEMBLY

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
DENVER OFFICE STANDARD DESIGN
5' x 6' HIGH PRESSURE GATE
CONDUIT LINING TRANSITION
MARCH 1928

ACCESSION No. 22150 DRAWING No. 100-0-2150

J. J. Savage
CHIEF ENGINEER
A. F. Walter
ASSISTANT DRAFTSMAN