UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

REPAIR OF 58-INCH BALANCED VALVES IN LOWER OUTLET TUNNEL SHOSHONE DAM

Hydraulic Laboratory Report No. Hyd-117

RESEARCH AND GEOLOGY DIVISION

BRANCH OF DESIGN AND CONSTRUCTION
DENVER, COLORADO

OCTOBER 30, 1942

HYD 117

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

Branch of Design and Construction
Engineering and Geological Control
and Research Division
Denver, Colorado
October 30, 1942

Laboratory Report No. 117
Hydraulic Laboratory
Compiled by: Jacob E. Warnock

Subject: Repair of 58-inch balanced valves in lower outlet tunnel - Shoshone Dam - Shoshone Project.

In accordance with office letter of September 30, 1942, to Superintendent, Powell, Wyoming, the two 58-inch balanced valves in the lower outlet tunnel in the south canyon wall downstream from Shoshone Dam were inspected during the afternoon of October 10, and the behavior of the west valve while discharging was witnessed during the morning of October 11, 1942.

The concrete for several feet downstream from the metal lining in each discharge conduit has been severely eroded and a majority of the twenty-four 2-inch pipes embedded in the conduit during the revision in 1931 have been torn out and washed away in the eroded areas. The leakage around the west valve in the closed position is abnormal indicating the seat packing is missing and a leakage through the needle face on the west valve has increased in size since it was noticed in December 1941. When repairs were made between the operating seasons of 1941 and 1942, the clearance on the west valve was apparently satisfactory inasmuch as the movement of the valve by use of jacks was easy, furthermore the valve has opened under all heads to date. The east valve has excess friction in it as evidenced by the breakage of timbers and jacking equipment during the last repairs and by the refusal to open under low heads when the reservoir was lowered to complete the Heart Mountain Intake.

Twenty-four 2-inch standard pipes are embedded in the conduit lining parallel to the center-line of each outlet, and equally spaced around the conduit. The inlet ends of these pipes (figure 1) are on the face of the cliff (figure 2A) at the discharge end of the conduits and the outlet ends are opposite the tip of the needle in the closed position of the valve. These pipes were installed to relieve the

sub-atmospheric pressures in the conduit downstream from the valve. In addition, an 8-inch pipe in each conduit was provided to conduct air from the space between the roof of the conduit and the roof of the original opening. The outlet end of the 8-inch pipe is downstream from the outlets of the 2-inch pipes.

In the east valve conduit, seven of the twenty-four 2-inch pipes are still intact, the remainder being torn out as shown in figure 2B and 3B. The concrete is stripped out from 6 to 10 feet downstream from the metal liner on the left side (figure 2C), 10 feet on the bottom, and 3 to 6 feet on the right side. In the bottom, the maximum depth of erosion was 11 inches below the original invert. The 8-inch pipe in the crown, which has been plugged since the trials on its effectiveness in 1931, is still intact but the concrete is torn from around it. The semi-steel conduit liner below the valve is severely pitted due to cavitation as shown in figure 2D. The severity of the pitting can be judged by study of figure 3A. The east valve closes satisfactorily but there is an extensive pitted area on the sealing ring at the invert. The face of the needle has pitted areas on which several kinds of metal have been tried such as Wilson 17, Airco Nickel, 25-12 stainless steel and Hobart cast iron. None have been satisfactory. Figures 3B and 4D show the extensive welding on the face of the needle. The areas of greatest pitting were directly below and above the respective valve guides. In those areas only 3/4-inch of the original two inches of parent metal remains. In repairing those areas studding has been used to hold the deposited metal. This is particularly the case on the west valve. The light color on the face of the needle in figures 3B and 4D shows the extent of the finish layer of nickel. It could not be used over the lower area when the metal had to be deposited practically overhead. The welding was done in place with an electric arc welder. The drummy sound produced by tapping this finish layer showed that the bond is none too good over a considerable area. It is significant that these valves have not been dismantled since their original installation was completed in May 1915.

The conduit downstream from the west valve is not as extensively eroded as the east valve but it is more severe in spots. Twelve of the twenty-four 2-inch pipes are still intact, the others being ripped from their embedment. Figure 3C shows the remains of these pipes and a hole in the concrete approximately 15 inches deep. In this conduit, the plug

in the outlet of the 8-inch air pipe had been torn out. It was plugged in 1931 the same as in the east valve. With this vent open, as the valve is opened past 25 percent, a crackling noise occurs resembling firecrackers. As the valve is opened further, a thundering or cannonading noise develops. This condition was described in detail in letters of September 25 and December 11, 1931, and was the reason for plugging the 8-inch vents.

The reason for the increased damage to the conduit lining and embedded pipes this season as compared to previous seasons, is that for the first time in the history of the installation the valves were operated for an extended period at 0.9 opening for flood control purposes. Previous to 1942, the valves had not been operated beyond 0.80 or below 0.30 opening for any length of time. The following table shows the operation from 1931 to 1941, inclusive, data on operation from 1915 to 1930 not being readily available in this office.

	East Valve		West Valve	
Year	Average Opening	Days	Average Opening	Days
1931	0.33	92	0	0
1932	0.67	44	0.73	26
1933	0.80	60	0.52	56
1934	0.42	113	0.42	19
1935	0.40	86-2/3	0	0
1936	0	0	0.30	79-22/24
1937	0.47	114-23/24	0.45	14-23/24
1938	0.40	22-19/24	0.43	131-1/24
1939	0.44	150-5/24	0.45	137-4/24
1940	0.53	172-18/24	0.53	174-23/24
1941	0.50	124-19/24	0.40	95-11/24

In 1942, the east valve was opened on April 14, and the west valve on April 15. Both valves were operated for the remainder of the month at 0.46 to 0.52 openings. During May they were operated at 0.52 openings until the 26th when they were opened to 0.9. They were operated at 0.9 opening until July 11, when the water surface in the reservoir had practically reached the crest of the spillway and sufficient water was flowing through the notch in the spillway to supply irrigation needs. On July 11, both valves were closed. The west valve was opened to 0.22 on August 5. On August 7, it was closed and the east valve opened and it has been operated at 0.22 to 0.48 for the remainder of the season. This operation of both valves at 0.9 opening from May 26 to July 11, or 47 days was for releasing stored water from Shoshone Reservoir for flood-control purposes,

an experiment made at the request of the Lovell (Wyoming) Commercial Club to benefit farmers along the Shoshone River in the vicinity of Kane whose lands are subject to flooding when there is a large quantity of water in the river. In his letter of March 6, 1942, on the subject, "Release of stored water from Shoshone Reservoir for flood control," the project superintendent offered the increased cost of valve maintenance as one of his reasons for not operating the reservoir for flood control.

In previous years, the damage due to pitting by cavitation has been concentrated on the face of the needle between the seat and the contact line between the piston and body of the needle as described in paragraph 4. The repairs have been by welding on the face with the valve in its open position. The valve in a partial open position creates a hydraulic passage whereby the high-velocity water around the sharp corner at the seat cannot follow the extreme curvature of the needle. A zone of cavitation is created adjacent to the seat and the collapse of those cavities causes the severe pitting which has required such intensive welding repairs. This season, however, with the valve at 0.9 opening that condition has been materially relieved and very little damage was evident on the face of the needle. Instead, with the much larger jet due to the larger valve opening the zone of cavitation has been intensified on the metal conduit liner and the collapse has occurred on the concrete immediately below, hence the extensive erosion in the concrete this year. The twenty-four 2-inch air pipes have relieved the zone of cavitation when the valve was operated at smaller openings but as the valve is opened the jet expands to fill the conduit a shorter distance downstream and the air space around the vena contracta becomes smaller both in width and length. If the valve had been operated at full opening, the damage would have been worse.

Another operating problem in these valves is the uncertainty of starting the closure of the valves from the full open position. This was mentioned in a report from the project manager in July 1918, and is the reason the valves are never operated beyond 0.9 opening. It was the intention in the design of the valves that the pressure to close them be supplied through the clearance gap between the valve plunger and the inner edge of the base. That pressure is then transmitted through the clearance between the bull ring and bull-ring cylinder into the chamber behind the valve piston where it acts to close the valve. Because of the slight reverse curve on the inner edge of the base at full valve opening, the

pressure at the clearance gap instead of being positive and capable of transmission into the chamber behind the valve plunger is probably sub-atmospheric, perhaps severely so. Naturally, with the pressure in the wrong direction the valve cannot be closed and when the pressure from the centrifugal pump in the operating chamber is applied, it is neutralized by escape around the bull ring into the low-pressure zone created by the high-velocity water past the clearance gap.

On the assumption that sufficient material can be obtained to make alterations, it is recommended that changes be made in the design of these valves based on model studies, preparations for which are under way on the instructions of the Chief Electrical and Mechanical Engineer. These changes would be:

(a) Modification of the needle so as to supply a less abrupt curve on which pressures would be positive for all valve openings.

(b) Complete removal of the present metal liners in the entrances to the conduits and replacing them with new liners in which would be incorporated air supply chambers connected by supply pipes of ample size to the passages above the roofs of the present conduits.

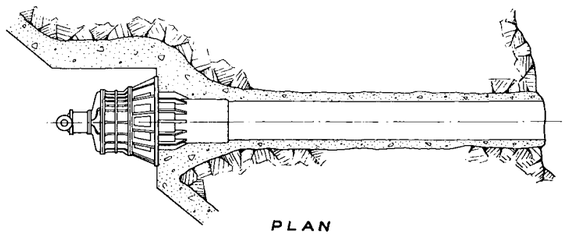
(c) Complete elimination of the present valve seat which produces bad hydraulic conditions and in which it is difficult to maintain packing because of the extremely low pressures above it during operation and replacing it with a metal-to-metal line contact seat similar to that now used in needle valves. This change will assist in establishing the stream lines now so grossly absent.

Should the procurement of material or the limited time available prevent the consummation of these plans before the beginning of the operating season about April 15, 1943, as an alternate it is proposed that the valve conduits be restored to their condition as of the beginning of the operating season of 1942, and the operating range be limited during 1943, or until such time as major revisions can be made to those openings indicated as most desirable by the model studies. It is further proposed that the 36-inch balanced needle valve in the bypass house below the powerhouse be removed from its present position and installed on the Heart Mountain siphon where it can discharge directly into the Shoshone River. This valve has been used extensively in its present location to release

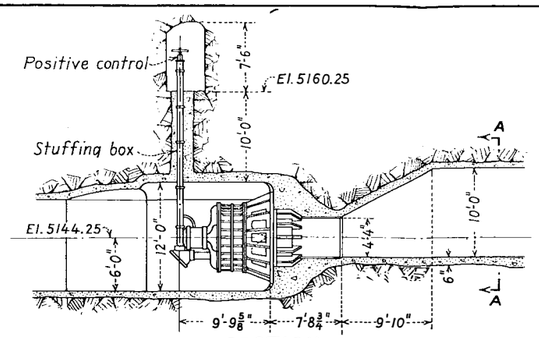
irrigation water in past years, but it can no longer be so used because of the reduction of head on the power plant when operating at full capacity. As a third possibility, it may be possible at least for a year or two to allow a portion of the needed water to flow through the Heart Mountain siphon and canal to the first spillway at North Cottonwood Creek where it can be released into North Cottonwood Creek and thence in to the Shoshone River. This proposal is dependent upon the completion of intermediate structures and the capacity of North Cottonwood Creek. A fourth possibility is to alter the operating schedule of the power plant so that more water can be released by power generation.

There has been considerable correspondence during the past two years between this office and the project on the question of closing the notch in the spillway permanently or with gates to avoid unnecessary waste of stored water by allowing the water to discharge through the notch regardless of the irrigation requirements. This notch was cut in 1922 to a width of 10 feet and a depth of 15 feet for making temporary diversions during the construction of the Shoshone Power Plant and has since been used at every opportunity to discharge water for irrigation thereby saving wear and tear on the two 58-inch balanced valves which are the subject of this report. While it is not intended to discuss the relative merits of closing this notch, it is considered advisable to clarify the point that permanent closure will increase the operating period of these valves by at least 10 percent.

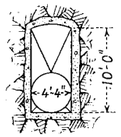
In conclusion, it is believed that too much emphasis cannot be placed on the present condition of these valves. Based on actual inspection, on discussion with the operating personnel, and on the fact that these valves have been operated 27 years without dismantling, they are considered to be in a state of potential, if not actual, breakdown and should be dismantled immediately for major repairs and revisions based on model studies now in progress.



PLAN



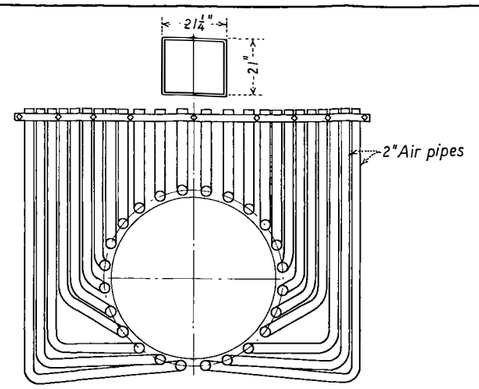
SECTION



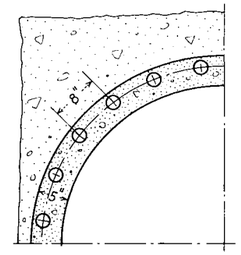
SEC. A-A

ORIGINAL DESIGN AS BUILT IN 1915

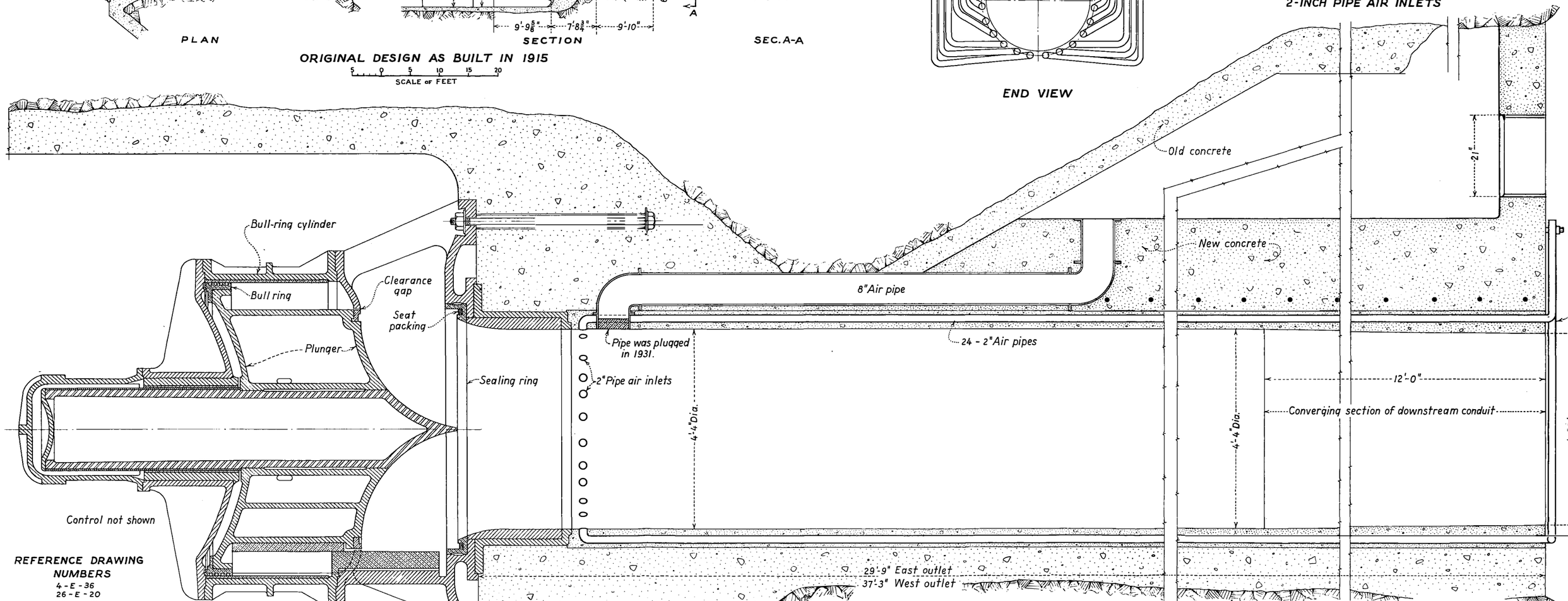
5 0 5 10 15 20
SCALE OF FEET



END VIEW



2-INCH PIPE AIR INLETS



REFERENCE DRAWING NUMBERS

4 - E - 36
26 - E - 20
26 - E - 27
26 - E - 30
26 - E - 52
26 - E - 55
26 - E - 283
13 - W - 429201

SECTION SHOWING REVISIONS MADE IN 1931

0 1 2 3
SCALE OF FEET

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SHOSHONE PROJECT - WYOMING

SHOSHONE DAM

58-INCH BALANCED VALVE OUTLETS ORIGINAL INSTALLATION AND 1931 REVISIONS

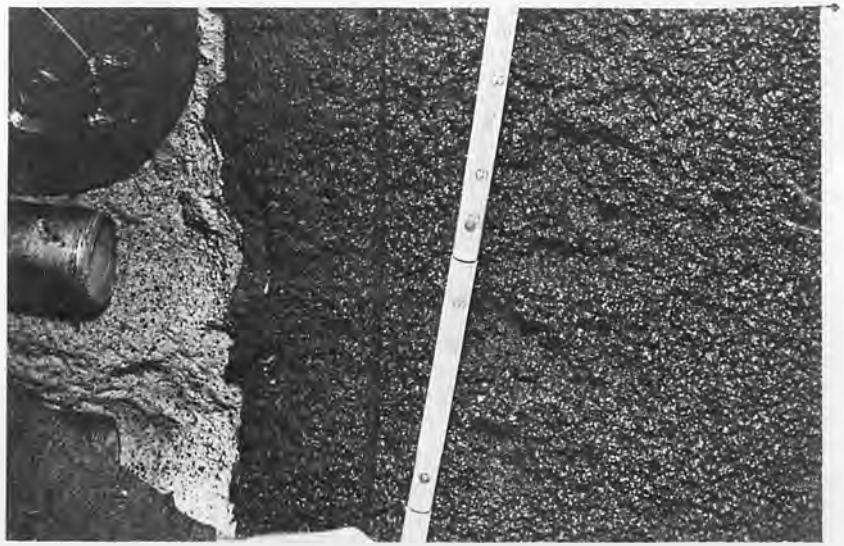
DRAWN: F.C.L. SUBMITTED:
TRACED: R.E.B. RECOMMENDED:
CHECKED: APPROVED:

DENVER, COLORADO. OCT. 30, 1942

A - Outlets of 58-inch balanced valves in south canyon wall.

B - Remains of 2-inch air pipes in vent of 52-inch conduit looking downstream from east valve.

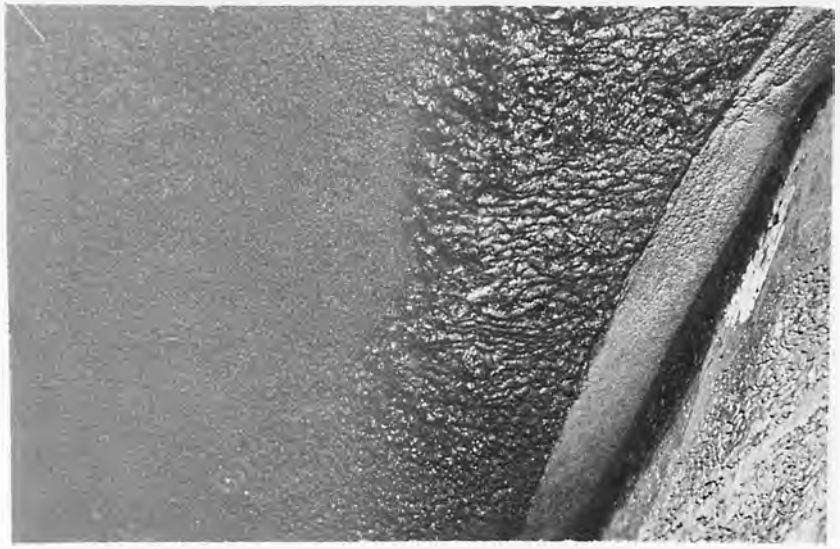
C - Two-inch air pipes laid bare by destruction of concrete downstream from east 58-inch balanced valve.



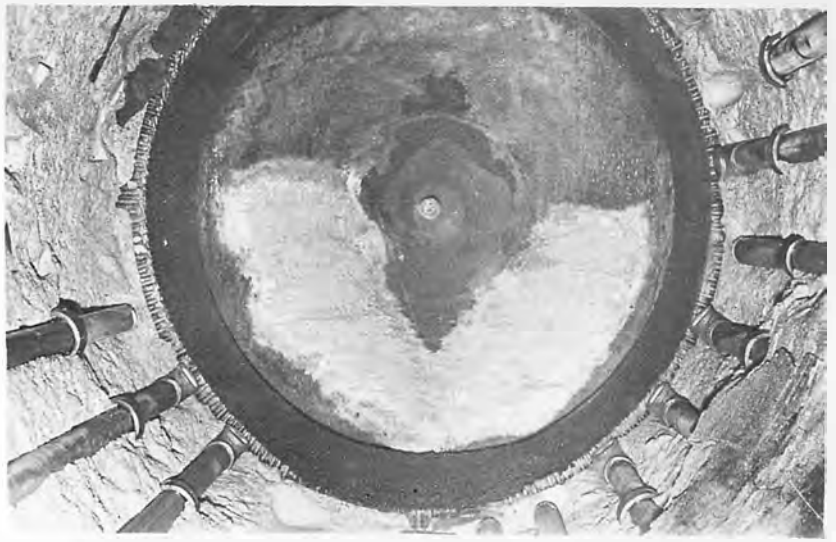
D - Severe pitting due to cavitation on conduit liner immediately below east 58-inch balanced valve.

BALANCED VALVES - LOWER OUTLET TUNNEL - SHOSHONE DAM

FIGURE 2



A - Pitting on metal liner near seat on east 58-inch balanced valve.



B - Remains of 2-inch air pipes in east valve conduit. Extensive welding on needle face is apparent. End of metal liner cut off in 1931 when present installation was completed.

C - Remains of 2-inch air pipes and 8-inch vent and deep hole cut in right side of 52-inch conduit downstream from west 58-inch balanced valve.

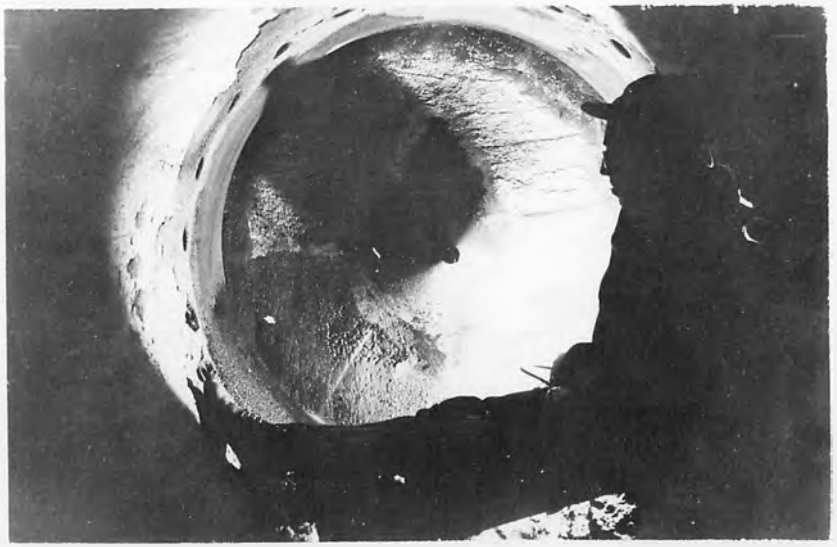
D - Face of needle in west 58-inch needle valve showing extensive welding and exposure of air vent pipes downstream from metal liner.

BALANCED VALVES - LOWER OUTLET TUNNEL - SHOSHONE DAM

FIGURE 3

A - Severe pitting of metal liner and concrete in crown of conduit immediately downstream from west 58-inch balanced valve.

B - Extent of erosion in east valve on December 17, 1941, showing 2-inch pipes uncovered in crown and left side of conduit.



C - Two-inch pipe openings in conduit on December 17, 1941.

D - Extensive welding on face of needle and leakage through needle - December 17, 1941.

BALANCED VALVES - LOWER OUTLET TUNNEL - SHOSHONE DAM

FIGURE 4

Specifications No. 1681-D

UNITED STATES

DEPARTMENT OF THE INTERIOR

BUREAU OF RECLAMATION

\- - -

Invitation for Bids

Schedule, Specifications, and Drawings

\- - -

REPAIR PARTS

FOR

58-INCH BALANCED VALVE

AT

SHOSHONE DAM

\- - -

SHOSHONE PROJECT, WYOMING

Bids will be received at the office of the Bureau of Reclamation, Denver, Colorado, until 2 p.m., January 11, 1943.

(PRICE $0.50)

CONTENTS

Standard Form No. 30
Approved by the President
June 10, 1927

STANDARD GOVERNMENT FORM OF INVITATION FOR BIDS
(Supply Contract)

Specifications No. 1681-D

Denver, Colorado, December 22, 1942.

SEALED BIDS, in single, 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. 31) 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 lefthand corner with the name and address of the bidder and the date and hour of opening and addressed to the purchasing agency named below:

DEPARTMENT OF THE INTERIOR,
BUREAU OF RECLAMATION,
DENVER, COLORADO.

Guaranty will be required with each bid in an amount not less than ten percent of the total price bid.

Performance bond will be required in an amount not less than 50 percent of the estimated aggregate payments to be made under the contract.

All prospective bidders are hereby notified that, before any bid submitted in response to this invitation is considered for award, the Government may require the bidder to submit a statement of facts in detail as to the previous experience of the bidder in performing similar or comparable work and of the business and technical organization and financial resources and plant of the bidder available and to be used in performing the contemplated work. The Government expressly reserves the right to reject any bid on which the facts as to business and technical organization, plant, financial, and other resources, or business experience, compared with the work bid upon, justify such rejection.

Bidders are hereby notified that successful bidders will be required to execute the following certificate on vouchers or invoices covering payments under the contract and that the execution of such certificate on sheets other than the original voucher or invoice will not be acceptable:

> "I certify that the above bill is correct and just; that payment therefore has not been received; that all statutory requirements as to American production and labor standards, and all conditions of purchase applicable to the transactions have been complied with; and that State or local sales taxes are not included in the amounts billed."

SPECIAL CONTRACT PROVISIONS

The following special contract provisions will be included in the contract under the above-described specifications, which will be prepared on the standard Government form of contract for supplies (Standard Form No. 32):

TERMINATION FOR BREACH. In the event any of the provisions of this contract are violated by the contractor or any subcontractor, the contracting officer may terminate the contract by written notice to the contractor, and purchase similar supplies in the open market or otherwise, and the contractor and his sureties shall be liable to the Government for any excess cost occasioned the Government thereby.

REGULATIONS RELATIVE TO OVERTIME WAGE COMPENSATION

The following executive orders Nos. 9240 and 9248 apply to the work to be performed under these specifications:

EXECUTIVE ORDER 9240

Regulations Relating to Overtime Wage Compensation

WHEREAS many labor organizations have already adopted the patriotic policy of waiving double time wage compensation or other premium pay for work on Saturday, Sunday, and holidays, as such, for the duration of the war; and

WHEREAS it is desirable and necessary in the prosecution of the war, and to insure uniformity and fair treatment for those labor organizations, employers, and employees who are conforming to such wage policies that this principle be universally adopted:

NOW, THEREFORE, by virtue of the authority vested in me by the Constitution and the statutes, as President of the United States and as Commander in Chief of the Army and Navy, it is hereby ordered:

I. That the following principles and regulations shall apply for the duration of the war to the payment of premium and overtime wage compensation on all work relating to the prosecution of the war:

A. No premium wage or extra compensation shall be paid to any employee in the United States, its territories or possessions, for work on Saturday or Sunday except where such work is performed by the employee on the sixth or seventh day worked in his regularly scheduled workweek and as hereinafter provided.

(1) Where because of emergency conditions an employee is required to work for seven consecutive days in any regularly scheduled workweek, a premium wage of double time compensation shall be paid for work on the seventh day.

(2) Where required by the provisions of law or employment contracts, not more than time and one-half wage compensation shall be paid for work in excess of eight hours in any day or forty hours in any workweek or for work performed on the sixth day worked in any regularly scheduled workweek.

B. No premium wage or extra compensation shall be paid for work on customary holidays except that time and one-half wage compensation shall be paid for work performed on any of the following holidays only:

New Year's Day
Fourth of July
Labor Day
Thanksgiving Day
Christmas Day

and either Memorial Day or one other such holiday of greater local importance.

II. All Federal departments and agencies shall conform the provisions in all existing and future contracts negotiated, executed, or supervised by them to the policies of this order. All such departments and agencies shall immediately open negotiations to alter provisions in existing contracts to conform them to the requirements of this order.

III. Nothing in this order shall be construed as requiring a modification of the principle that every employee should have at least one day of rest in every seven days. The continuous operation of plants and machines in prosecuting the war does not require that employees should work seven consecutive days.

IV. Nothing herein shall be construed as superseding or in conflict with the provisions of the statutes prescribing the compensation, hours of work, and other conditions of employment of employees of the United States.

V. All Federal departments and agencies affected by this order shall refer to the Secretary of Labor for determination questions of interpretation and application arising hereunder.

VI. The provisions of this order shall become effective October 1, 1942.

Franklin D. Roosevelt.

The White House,
September 9, 1942.

EXECUTIVE ORDER 9248

Amending Executive Order No. 9240 Entitled "Regulations Relating to Overtime Wage Compensation"

By virtue of the authority vested in me by the Constitution and the statutes, it is ordered that Section V of Executive Order No. 9240 of September 9, 1942, entitled "Regulations Relating to Overtime Wage Compensation," be, and it is hereby, amended to read as follows:

"All Federal departments and agencies affected by this order shall refer to the Secretary of Labor for determination questions of interpretation and application arising hereunder. In any industry or occupation in which the Secretary finds that a wage stabilization agreement approved by a Government department or agency is operating satisfactorily, or in any industry or occupation in which the Secretary finds that the nature and exigencies of operation make such action necessary or advisable for the successful prosecution of the war, the Secretary may determine that any or all of the provisions of this order shall not apply to such industry or occupation or to any classes of employees therein."

Franklin D. Roosevelt.

The White House,
September 17, 1942.

Standard Form No. 31

STANDARD GOVERNMENT FORM OF BID
(Supply Contract)

ORIGINAL) Indicate which
DUPLICATE) by erasure
TRIPLICATE)

Opening Date for this Bid

2 p.m., January 11, 1943

To Department of the Interior,
Bureau of Reclamation,
Denver, Colorado.

Place .....

Date .....

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.....

percent; 20 calendar days.....percent; 30 calendar days.....percent; or as stated in the schedules.

(Time in connection with discount offered, will, in the case of all bids, be computed from the date of delivery at destination, whether or not inspection and acceptance are at the point of origin, or from the date correct bill or duly certified voucher is received, or from the time the contract is formally executed, whichever is later. Discount will be computed on the gross amount stated.)

.....
(Witness to signature)

.....
(Full name of bidder)

.....

.....
(Address)

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."

REPAIR PARTS
FOR
58-INCH BALANCED VALVE
AT
SHOSHONE DAM

SHOSHONE PROJECT, WYOMING

- - -

Bids will be considered on the following schedule, but no bid will be considered for only a part of the schedule.

SCHEDULE

Item No.	Articles or services	Amount
1	Repair parts for one (1) 58-inch balanced valve, complete in accordance with the attached specifications and drawings, delivery f.o.b. cars at Cody, Wyoming, within _____ calendar days after date of receipt of notice of award of contract, for the lump sum of _____ (words) _____ dollars	$_____

GUARANTY

It is hereby guaranteed that in the event award is made to the undersigned, all articles, materials, and supplies furnished will conform to the article "Domestic articles" of the contract, except as noted below:

.....

.....

.....

.....

The cost of the articles, materials, and supplies listed above will be ..... percent of the total cost of all of the articles, materials, and supplies furnished.

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 percent 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. 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 10 percent for superintendence, general expense, and profit. The actual necessary cost will include all expenditures for material, labor (including compensation insurance and social security taxes), 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 appropriations 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 appropriations.

5. PATENTS AND/OR COPYRIGHTS. The contractor shall hold and save the Government, its officers, agents, servants, and employees, harmless from liability of any nature or kind, including costs and expenses, for or on account of any copyrighted or uncopyrighted composition, secret process, patented or unpatented invention, article, or appliance manufactured or used in the performance of this contract, including their use by the Government, unless otherwise specifically stipulated in this contract.

6. PROTESTS. If the contractor considers any work demanded of him to be outside the requirements of the contract, or considers any record or ruling of the contracting officer or of the inspectors to be unfair, he shall immediately upon such work being demanded or such record or ruling being made, ask for written instructions or decision, whereupon he shall proceed without delay to perform the work or to conform to the record or ruling, and, within ten (10) days after the date of receipt of the written instructions or decision, he shall file a written protest with the contracting officer, stating clearly and in detail the basis of his objections. Except for such protests or objections as are made of record in the manner herein specified and within the time limit stated, the records, rulings, instructions, or decisions of the contracting officer shall be final and conclusive. Instructions and/or decisions of the contracting officer contained in letters transmitting drawings to the contractor shall be considered as written instructions or decisions subject to protest or objection as herein provided.

SPECIAL CONDITIONS

7. The requirement. It is required that there be furnished and delivered, complete in accordance with these specifications and the drawings listed in paragraph 8 hereof, repair parts for one 58-inch balanced valve now installed at the Shoshone Dam, Shoshone project, Wyoming. The repair parts will be installed by the Government. Shop painting of the materials will not be required.

8. Drawings. The following drawings are made a part of these specifications:

58-inch Balanced Valve
December 1942, Repairs

1. 26-D-1605 - Assembled section.
2. 26-D-1606 - Conduit liner, needle seat and tip, and manifold.
3. 26-D-1607 - Manifold box drain pipe, list of parts, and materials.

Certain starred dimensions shown on the details of the needle seat, part No. 3 and of the needle tip, part No. 4, may have to be changed slightly to suit the dimensions of the installed valve for which the parts are intended, to permit the field assembly of the needle seat and the needle tip with the valve. It is expected that, for any starred dimension, the variation between the starred dimension and the final correct dimension will not exceed one-sixteenth of an inch, plus or minus. It is expected that field measurements of the balanced valve will be made and the correct dimensions determined before the castings have been completed, and the contractor will be furnished with a revised drawing showing the exact dimensions of the needle seat and the needle tip before the castings are machined. The contractor will not be held responsible for the correctness or sufficiency of the design furnished by the Government or for the incorporation of any patented or unpatented invention, article, or appliance in the design, but shall check the drawings carefully and advise the contracting officer of any errors or omissions discovered. The contractor shall prepare all necessary shop drawings covering the materials to be furnished under these specifications and shall be responsible for the correct fitting of all parts. Approval by the contracting officer of the contractor's shop drawings will not be required. Unless otherwise specifically provided for in the schedule or 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, and anything shown on the drawings and not mentioned in the specifications, or called for in the specifications and not shown on the drawings, shall be furnished the same as if called for or shown in or on both. The contractor will be furnished such additional copies of the specifications and drawings as may be required for carrying out the work.

Contact prints of the original drawings from which the attached reductions were made will be furnished to the contractor for construction purposes, upon request.

9. Comparison of bids. Whenever applicable, equalizing elements or factors not specifically mentioned or provided for herein, such as the cost of inspection (including salaries, travel, and subsistence expenses), or any other element or factor in addition to that of price which would affect the final cost to the Government, will be taken into consideration in making award of contract.

10. Delivery point. Bids shall be submitted on the basis of delivery f.o.b. cars at Cody, Wyoming, and the cost of transportation on commercial bills of lading from the shipping point or points to Cody, Wyoming, shall be paid by the contractor and included in the lump-sum price bid in the schedule.

11. Federal tax. The price bid in the schedule shall include any Federal tax heretofore imposed by the Congress which is applicable to the materials to be furnished. If any sales tax, processing tax, adjustment charge, or other taxes or charges are imposed or changed by the Congress after the date set for opening bids, and made applicable directly upon the production, manufacture, or sale of the supplies to be furnished, and are paid by the contractor on the articles or supplies furnished, then the price stated in the schedule will be increased or decreased accordingly, and any amount due the contractor as a result of such change will be charged to the Government and entered on vouchers (or invoices) as separate items.

12. Delivery--urgency of. Time of delivery is important, and complete delivery f.o.b. cars at Cody, Wyoming, is desired within ninety (90) calendar days after date of receipt by the contractor of notice of award of contract. Bidders are requested to state, in the blank provided therefor in the schedule, a definite period of time within which complete delivery will be made. Delays due to National Defense orders made effective subsequent to the date of the bid will be considered to be delays caused by acts of the Government. In accordance with the provisions of preference rating order P-46 of the War Production Board, as amended October 10, 1942, priority AA-2x is applicable to the materials to be furnished under these specifications.

13. Payment. Within thirty (30) calendar days after receipt by the Bureau of Reclamation, Denver, Colorado, of proper invoices and bills of lading, properly receipted, covering complete shipment of the materials, or within thirty (30) calendar days after all of the materials have been received at the railway destination, checked, and accepted by the contracting officer, whichever is later, payment will be made of the amount due under the contract: Provided, That, if the Government, through no

fault of the contractor or of the materials, is delayed beyond a period of thirty (30) calendar days in the acceptance of the materials, after date of receipt of the final shipment of the materials at the railway destination, payment of the amount due under the contract will be made at the end of said 30-day period. Earlier payment may be made if a discount is allowed as provided for in the standard Government form of bid (Standard Form No. 31).

CONSTRUCTION

14. Workmanship and defective work and material. All work shall be performed and completed in a thorough, workmanlike manner and equal to the best modern practice in the manufacture and fabrication of materials and apparatus of the type covered by these specifications, notwithstanding any omissions from these specifications or drawings. The dimensions shown on the drawings shall be adhered to closely, and the work shall be of high grade and carefully performed to the satisfaction of the contracting officer. The contractor shall guarantee all materials and workmanship furnished by him to be free from injurious defects. He shall replace, free of cost to the Government, any defective materials or workmanship discovered during erection and shall pay the actual cost to the Government, as determined by the contracting officer, of the correction in the field of any errors for which he is responsible.

15. Inspection and tests. All materials furnished and all work performed shall be subject to rigid inspection, and no material shall be shipped until all tests, analyses, and final inspection have been made or certified copies of reports of results of tests and analyses or manufacturer's guaranties shall have been accepted. As soon as practicable after receipt by the contractor of notice of award of contract, the contractor shall furnish the Government inspector five copies of each mill or shop order for materials purchased by the contractor for use in the manufacture or fabrication of the materials or apparatus to be furnished under these specifications and which will require inspection at points other than at the contractor's plant before shipment. The copies of the orders shall state the place at which the materials are to be manufactured. All such mill or shop orders shall quote the requirements of these specifications for the material to be furnished. Unless otherwise specifically provided herein, all metals covered by these specifications shall be furnished in accordance with the requirements of Federal specification QQ-M-151a, "General Specifications for Inspection of Metals," which specification covers certain requirements which are common to all detail specifications for metals and provides means of determining whether the technical requirements of the detail specifications and drawings are being met. Test specimens and samples for analysis shall be properly boxed and prepared for shipment, if required. Acceptance of materials or the waiving of the inspection thereof shall

in no way relieve the contractor of the responsibility for furnishing materials meeting the requirements of these specifications.

16. Patterns. The price bid in the schedule shall include the cost of all necessary patterns. Patterns will remain the property of the contractor. Care shall be taken to avoid sharp corners or abrupt changes in cross section, and ample fillets shall be used. The dimensions and thicknesses of castings shown on the drawings are minimum dimensions and thicknesses. The manufacturer shall add such draft and increases in pattern thicknesses as will conform to his standard foundry practice, and as may be necessary to insure that all thicknesses of metal in the finished castings will be not less than the thicknesses shown on the final drawings. As stated in paragraph 8, certain dimensions of the needle seat and of the needle tip, as shown on the drawings, may have to be changed, and the dimensions of the patterns for the needle-seat casting and for the needle-tip casting shall be such as will permit the castings to be tinned and bored to the final correct dimensions.

17. Machine finish. Where finished surfaces are specified on the drawings, the type of finish, where not otherwise specified, shall be that most suitable for the part to which it applies and shall be smooth, average, or rough as defined herein. Where a smooth finish is specified or required, the machine work shall be performed in such a manner as to produce smooth surfaces practically free from toolmarks and chatter marks. Pronounced toolmarks or other defects on such surfaces will be cause for rejection of the part. Where an average surface is specified or required, smooth surfaces shall be produced but slight toolmarks will be allowed. Where a rough finish is specified or required, rough machining sufficient only to produce a plane surface true to dimensions will be allowed. In general, a smooth finish will be required for all surfaces in sliding contact, an average or commercial finish for surfaces in permanent contact where a tight joint is required, and a rough finish for all other machined surfaces.

18. Welding. Surfaces to be welded shall be clean and free from scale, rust, paint, and other foreign matter. All welding shall be performed by the electric-arc method, by a process which will exclude the atmosphere from the molten metal. Welds shall be made as specified on the drawings and in accordance with the conventional welding symbols of the American Welding Society. Where fillet welds are used, the lapped sections shall fit closely and shall be held together while the welds are being made. Welds shall have complete penetration and freedom from imperfections. Particular care shall be taken in alining and separating the edges of plates to be joined by butt welding, so that complete penetration and fusion at the bottom of the joint will be assured. The finish of all welded joints shall be reasonably free from grooves, craters, depressions, and other irregularities. Wherever possible, all joints shall be welded in the flat position. All pinholes, cracks, and other defects shall be repaired by chipping or machining the defects to sound

metal and rewelding. After welding is completed, all weld spatter shall be removed.

19. Conduit liner. Steel plates for the shell of the conduit liner shall be mild-steel plates three-quarters of an inch thick and shall be suitable for welding. The plates may be new plates or used plates free from defects. The size of the plates shall be optional with the contractor: Provided, That not more than one circumferential welded seam and not more than four longitudinal welded seams will be permitted in the completed conduit liner. The plates for the conduit liner shall be cut accurately to shape and size, with the edges to be joined by welding properly formed to suit the selected type of welding and to allow thorough penetration of the weld metal. All butt joints shall be beveled or grooved for double welding. Cut surfaces on the edges of the plates shall expose sound metal free from laminations, surface defects caused by shearing or gas-cutting operations, or other injurious defects. Where the edges of the plates have been flame-cut, they shall be uniform and true and shall be free from loose scale and slag accumulations before being welded. The plates shall be bent or rolled to true circular sections, with the curvature continuous from the edges of the plates. Particular care shall be taken in matching the edges of adjoining plates at all longitudinal and circumferential joints, to insure that the inner surface of the plates at all welded joints are in continuity within a maximum allowable offset at any point of one-sixteenth of an inch. All welded seams on the interior surface of the liner shall be ground flush with the surface of the liner. The upstream flange shall be cut from plate or rolled from bar stock and shall be fabricated in not more than four segments welded together with joints staggered from the horizontal joints in the pipe. After being welded to the shell of the liner, the flange shall be faced and drilled. Angle stiffener rings shall be fabricated in not more than four sections per ring, and the sections shall be butt-welded into solid rings. The joints of the angle stiffeners shall be staggered with the horizontal joints in the pipe.

20. Air-inlet manifold. The Government will furnish a spotting template, which shall be used to locate the twelve 1-1/2-inch tapped holes in the upstream flange of the air-inlet manifold.

MATERIALS

21. Federal specifications. Copies of Federal specifications referred to herein may be procured from the Superintendent of Documents, Government Printing Office, Washington, D. C., at a price of five cents each.

22. Materials. All materials used in the construction of the repair parts shall conform to applicable Federal specifications, as specified on the drawings. Where materials are specified on the drawings but are not specifically covered by detail specifications, the contractor shall furnish high-class commercial grades of materials or articles that are satisfactory to the contracting officer.

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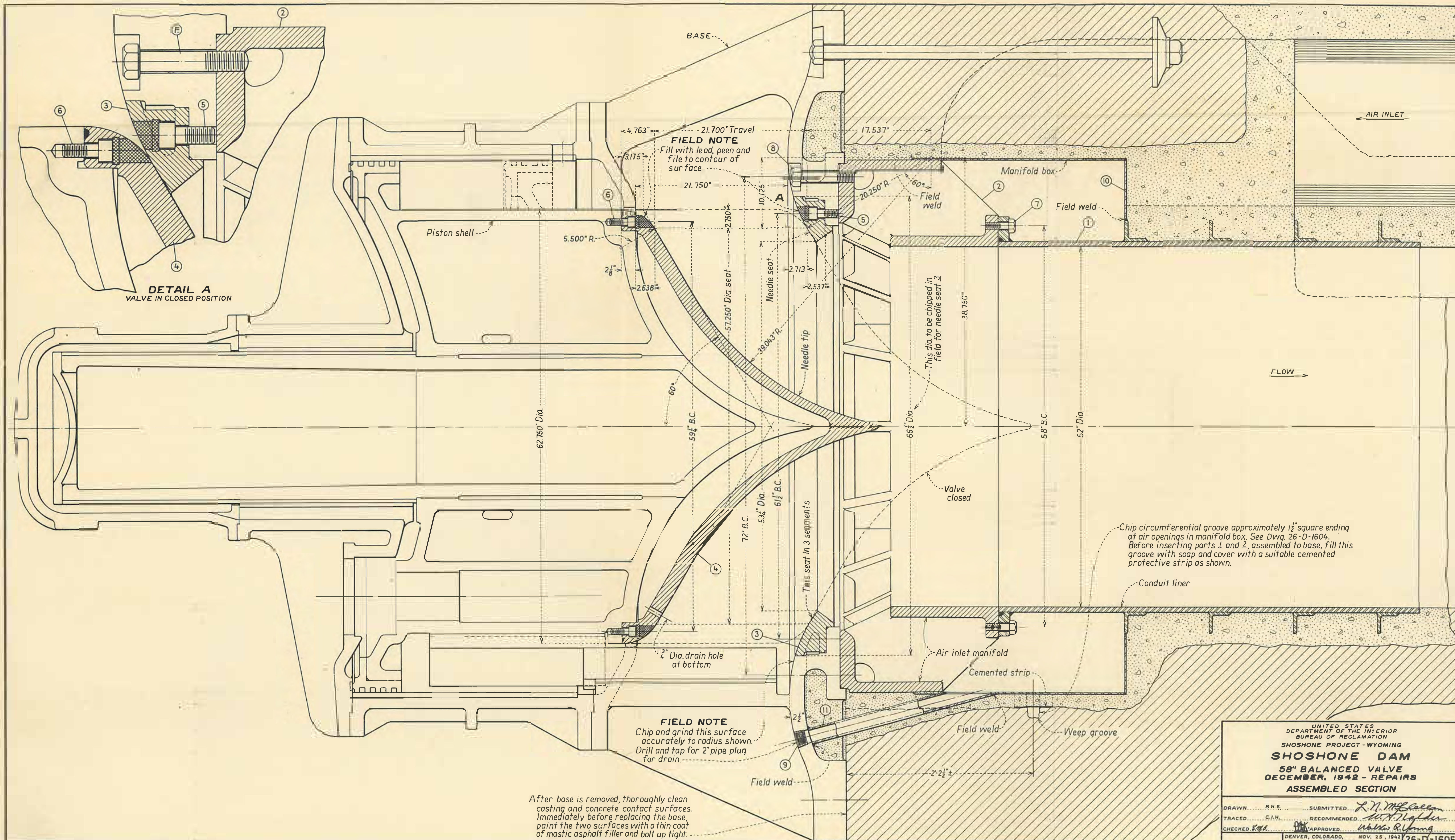
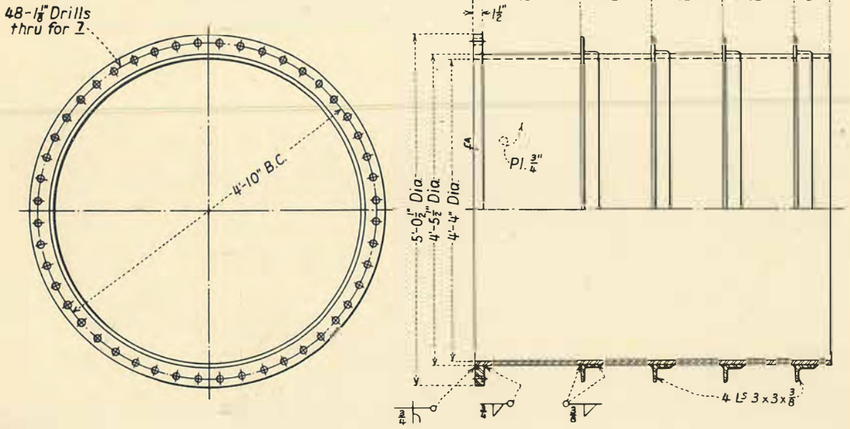
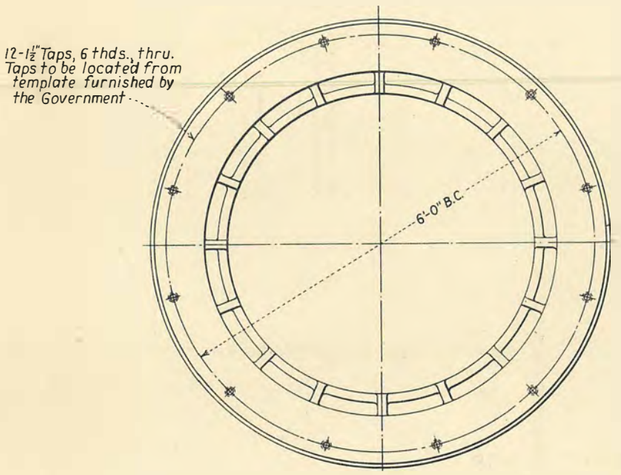
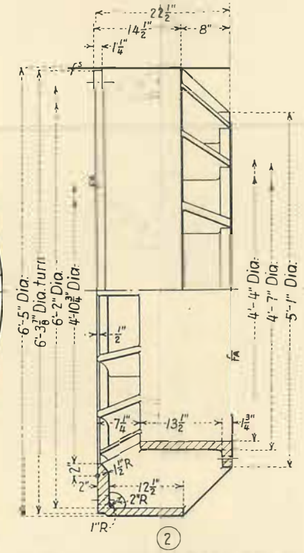

DETAIL A
VALVE IN CLOSED POSITION
BASE
FIELD NOTE
Fill with lead, peen and file to contour of surface
21.700" Travel
4.763"
17.537"
21.750"
3.175"
10.125"
2.750
5.500" R.
2.638
2.713
2.537
20.250" R.
60°
Piston shell
Manifold box
Field weld
Field weld
AIR INLET
57.250" Dia seat
Needle seat
Needle tip
39.043" R.
This dia to be chipped in field for needle seat 3
38.750"
62.750" Dia.
59¼" B.C.
66½" Dia.
58" B.C.
52" Dia.
FLOW
Valve closed
72" B.C.
53¼" Dia.
61½" B.C.
This seat in 3 segments
Chip circumferential groove approximately 1½" square ending at air openings in manifold box. See Dwg. 26-D-1604. Before inserting parts 1 and 2, assembled to base, fill this groove with soap and cover with a suitable cemented protective strip as shown.
Conduit liner
¾" Dia. drain hole at bottom
Air inlet manifold
Cemented strip
FIELD NOTE
Chip and grind this surface accurately to radius shown. Drill and tap for 2" pipe plug for drain.
Field weld
Weep groove
Field weld
2'-2½" ±
After base is removed, thoroughly clean casting and concrete contact surfaces. Immediately before replacing the base, paint the two surfaces with a thin coat of mastic asphalt filler and bolt up tight.
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SHOSHONE PROJECT - WYOMING
SHOSHONE DAM
58" BALANCED VALVE
DECEMBER, 1942 - REPAIRS
ASSEMBLED SECTION
DRAWN B.H.S. SUBMITTED
TRACED C.I.H. RECOMMENDED
CHECKED APPROVED
DENVER, COLORADO, NOV. 25, 1942
SHEET 1 OF 3
26-D-1605

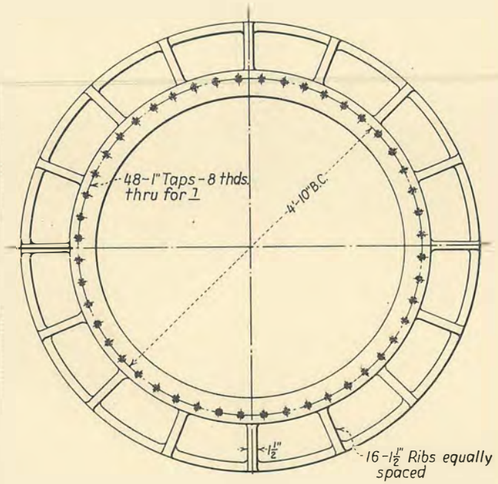


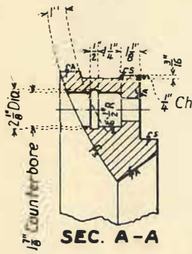
① **CONDUIT LINER**
STEEL
ONE REQUIRED - MARK 1605-1
Welds may be placed longitudinally and circumferentially in pipe shell at option of contractor

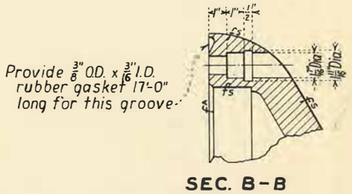


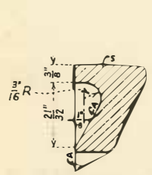


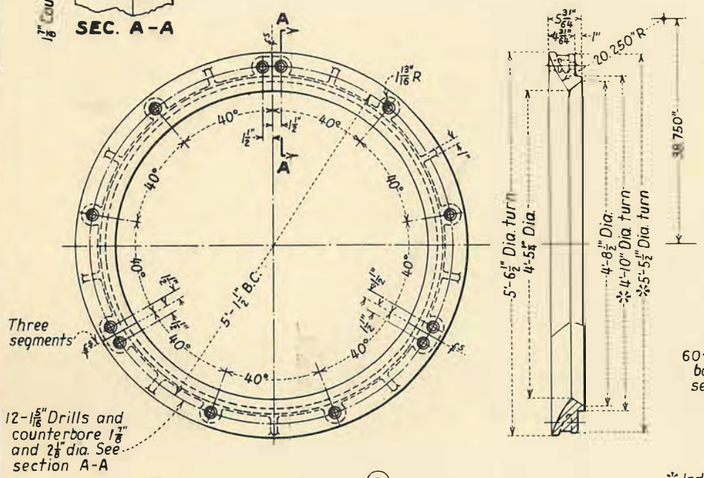
② **AIR INLET MANIFOLD**
GRAY IRON
ONE REQUIRED - MARK 1605-2



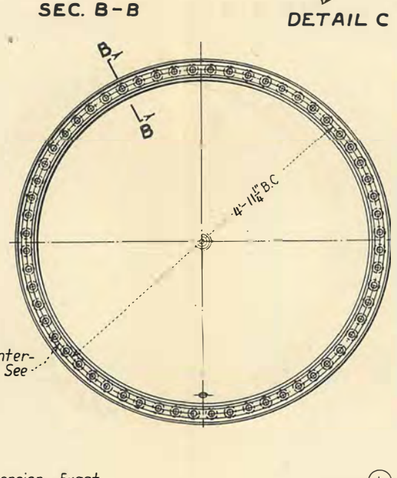




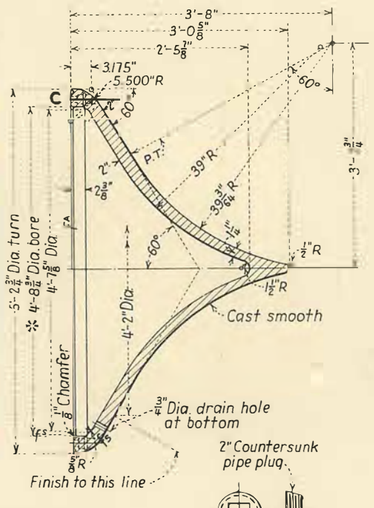




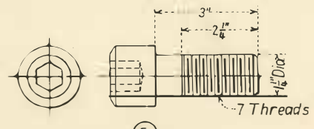
③ **NEEDLE SEAT**
GRAY IRON
ONE REQUIRED (THREE SEGMENTS) - MARK 1605-3



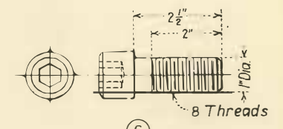
✲ *Indicates nominal dimension. Exact figure to be supplied later from field measurements*



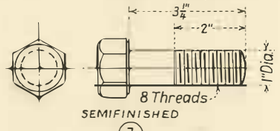
④ **NEEDLE TIP**
GRAY IRON
ONE REQUIRED - MARK 1605-4



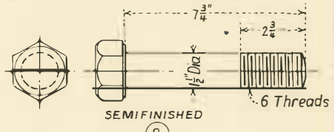
⑤ **CAP SCREW**
STEEL
12+2 REQUIRED - MARK 1605-5
Used with part 3



⑥ **CAP SCREW**
STEEL
60+6 REQUIRED - MARK 1605-6
Used with part 4



⑦ **BOLT**
STEEL
48+5 REQUIRED - MARK 1605-7
Used with parts 1 and 2



⑧ **BOLT**
STEEL
12+1 REQUIRED - MARK 1605-8
Used with part 2

FINISH MARKS

SYMBOL	TYPE OF FINISH
125 / 125	Average
63 / 63	Smooth

⑨ **PIPE PLUG**
CAST IRON
ONE REQUIRED - MARK 1605-9

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SHOSHONE PROJECT - WYOMING

SHOSHONE DAM
58" BALANCED VALVE
DECEMBER, 1942 - REPAIRS
CONDUIT LINER - NEEDLE SEAT AND TIP - MANIFOLD

DRAWN E.W.O. SUBMITTED L.N. McClellan
TRACED E.W.C. RECOMMENDED W.W. Madden
CHECKED E.W.O. APPROVED Walter R. Young
DENVER, COLORADO, NOV. 25, 1942.
SHEET 2 OF 3
26-D-1606

* MISCELLANEOUS MATERIALS : Where materials are specified on the drawings, but are not further covered by detailed specifications, the contractor shall furnish high class commercial grades of materials that are satisfactory to the contracting officer.

† Plates, flange and angles to be of mild steel suitable for welding.

‡ Provide one wrench for socket head cap screw 5 and two wrenches for socket head cap screw 6.

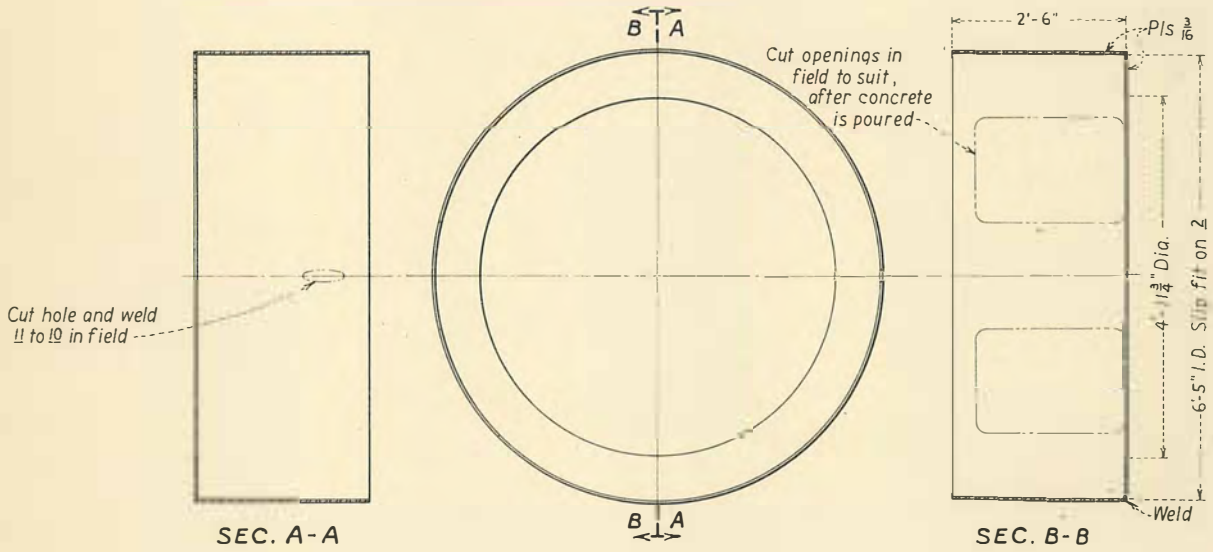
LIST OF PARTS - ONE VALVE

DRAWING NUMBER	PART NO.	NO. REQ'D	DESCRIPTION	MATERIAL CLASSIFICATION
26-D-1606	1	1	Conduit liner	Steel †
"	2	1	Air inlet manifold	Gray iron
"	3	1	Needle seat	Gray iron
"	4	1	Needle tip	Gray iron
"	5	12+2	Cap screw	Steel * ‡
"	6	60+6	Cap screw	Steel * ‡
"	7	48+5	Bolt	Steel *
"	8	12+1	Bolt	Steel *
"	9	1	Pipe plug (Csk.)	Cast iron *
26-D-1607	10	1	Manifold box	Steel †
"	11	1	Drain pipe	Steel *

MATERIALS - SPECIFICATIONS AND MINIMUM PHYSICAL PROPERTIES

MATERIAL	ULTIMATE TENSILE TRENGTH#/□"	YIELD POINT TENSION#/□"	% ELONG. IN 2"	% RED. IN AREA	SPECIFICATION. NUMBER	REMARKS
Gray iron casting	30,000	—	—	—	◉ QQ-I-652	Class 30

◉ Federal specification



(10)

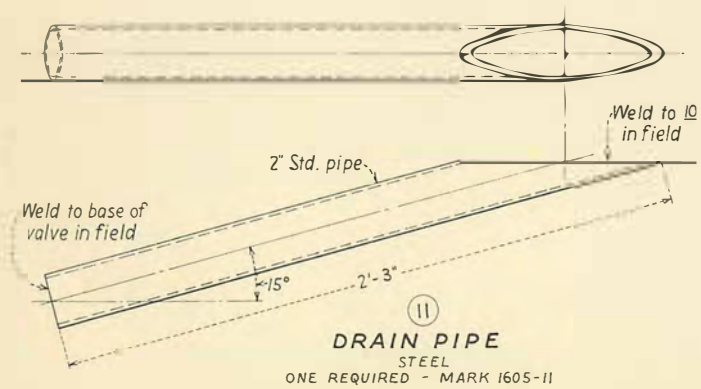
MANIFOLD BOX

STEEL

ONE REQUIRED - MARK 1605-10

NOTE

All parts shall be marked or tagged with the mark number shown with each detail, as 1605-10.



(11)

DRAIN PIPE

STEEL

ONE REQUIRED - MARK 1605-11

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

SHOSHONE PROJECT WYOMING

SHOSHONE DAM

58" BALANCED VALVE

DECEMBER, 1942 - REPAIRS

MANIFOLD BOX - DRAIN PIPE - LIST OF PARTS - MATERIALS

DRAWN E.W.O. SUBMITTED L.N. McClellan
TRACED L.R.G. RECOMMENDED W.H. Hayden
CHECKED E.W.O. APPROVED Walker R. Young

DENVER, COLORADO NOV 25, 1942
SHEET 3 OF 3

26-D-1607