

MINUTES OF REGULAR MEETING OF THE BOARD OF DIRECTORS OF
TARRANT COUNTY WATER CONTROL AND IMPROVEMENT DISTRICT NUMBER ONE
HELD IN THE DISTRICT OFFICE ON JULY 2, 1929, AT 10 A.M.

The call of the roll disclosed the presence of all the directors as follows,
viz:

- W. R. Bennett
- E. E. Bewley
- W. K. Stripling
- W. S. Cooke
- C. A. Hickman

At this meeting the following proceedings were had and done, viz:

W. R. Bennett presided in his capacity as President; Director W. K. Stripling acted in his capacity as Secretary.

1. Minutes of prior meetings of the Board of Directors were read and submitted for approval. The minutes so read are as follows, viz:

- (a) Minutes of the Meeting of June 18, 1929.
- (b) " " " " " " 26, 1929.
- (c) " " " " " " 27, 1929.
- (d) " " " " " " 29, 1929.

After consideration of the minutes it was moved by Director Hickman that said minutes, as read, do be adopted and ordered of record. This motion was seconded by Director Cooke. Upon a vote being taken the motion was carried and the minutes of said meetings are hereby ordered of record.

2. A list of vouchers for current accounts of the District now payable were submitted to the Board by Mr. Cheatham. These vouchers are numbered from 1572 to 1589, both inclusive; the total sum of these vouchers is \$2463.94. An itemized statement of said vouchers and the distribution thereof is attached to these minutes as 'Exhibit A', and is made part hereof. After examination of these accounts it was moved by Director Stripling that the accounts and vouchers as presented do be allowed; that the accounts do be paid and that vouchers therefor do be executed and delivered. This motion was seconded by Director Hickman. Upon a vote being taken the motion was carried and it is so ordered.

3. Director Bewley made a motion that the District do sell to the Texas National Bank of Fort Worth, Texas, Preliminary Bonds of the District, Serial Numbers 148, 149 and 150, to have maturity on or before August 1st, 1929; Further, that the President of the District and C. A. Hickman, As Acting Secretary, do execute these bonds as the binding obligation of the District and that the Attorneys and other officers or agents of the District do be directed to do any and all things necessary to effect the intention of this motion. Further that the proceeds of said bonds when sold shall be placed to the credit of the Checking Account of the District. This motion was seconded by Director Hickman. Upon a vote being taken the motion was carried and it is so ordered.

4. Thereupon, Director Bewley did make a motion that Preliminary Bonds of the District, Serial Numbers 148, 149 and 150, when actually sold and delivered to the Texas National Bank, do be at once paid off, taken into possession, mutilated and placed with the District's records. Further, that the voucher of the District, Number 1590, for the sum Three Thousand (\$3,000.00), do be executed and delivered to the Texas National Bank, in order to pay off said bonds. This motion was seconded by Director Hickman. Upon a vote being taken the motion was carried and it is so ordered.

5. Thereupon, there was presented to the Directors of the District a letter written by Daniel W. Mead, Consulting Engineer of Madison, Wisconsin, to John B. Hawley, one of the Engineers for this District, concerning the completeness and adequacy of the Plans and specifications for the District's works as the same are proposed to be constructed. This letter was ordered a part of the minutes of this meeting. It is hereto attached, marked 'Exhibit B', and is made a part hereof.

6. Thereupon, Mr. Freese, as Engineer for the District, presented a copy of the completed plans and specifications for the District's Works, upon which it is proposed to base advertisement for the construction of the District's Works. The Plans and Specifications so submitted were ordered to be placed with the District's records.

7. There was full discussion as to whether or not the District would seek to have Daniel W. Mead, or some other Consulting Hydraulic Engineer of National reputation, to come upon the ground and give to the Directors of the District a written report concerning his findings as to the adequacy, safety and feasibility of the District's works as the same are now proposed to be built. Thereupon Director Stripling moved that the District's Engineers do, at the earliest practicable time, get in communication with Mr. Daniel W. Mead, seeking to know from him when he will be able to come to Fort Worth for actual inspection of the topography and geology of the two areas to be occupied by the District's proposed reservoirs and his opinion concerning the sufficiency of the Plans as proposed to be carried out. Further, to know what charge Mr. Mead would exact for such service. Further, that after having received advice from Mr. Mead the Engineers report back to this Board for its further action. This motion was seconded by Director Bewley. Upon a vote being taken the motion was carried and it is so ordered.

8. Thereupon, it was called to the attention of the Directors of the District that on July 1, 1929, Director W. R. Bennett had written a letter to the Texas National Bank, advising them that the District contemplated tendering to the bank, as the District depository, on or about August 1st, 1929, a sum of money to be approximately One Million Nine Hundred Fifty-One Thousand (\$1,951,000.00) Dollars. Further, that the Bank should be prepared to deliver to the District at the time the money may be tendered security for the deposit, as contemplated by the Statutes of Texas and the contract heretofore executed jointly by said Bank and the District. The Directors gave approval to this letter and a copy of the same is attached to these minutes as 'Exhibit C'.

9. There being no further business, the meeting was declared adjourned.

APPROVED:

W. R. Bennett
As President

C. P. Hickman
As Secretary
acting

VOUCHERS #1572 TO #1589, INCLUSIVE, ALLOWED
AT MEETING HELD ON JULY 2, 1929

<u>NUMBER</u>	<u>ISSUED TO</u>	<u>COVERING</u>	<u>AMOUNT</u>
1572	W. H. Briles	River Gauging	\$10.00
1573	C. R. Crouch	" "	9.00
1574	Glen Kelly	Rain Observing	3.00
1575	Wayne Allen	" "	3.00
1576	Leon Paschal	" "	3.00
1577	Grace Bovelie	" "	3.00
1578	Sidney L. Samuels	Legal Service	416.67
1579	Ireland Hampton	" "	625.00
1580	Ed B. Cheatham	Salary	200.00
1581	Alice McConnell	"	90.00
1582	W. E. Bideker	Fire Ins.-Fur.&Fixt.	20.68
1583	Daily Bond News	Publication for Bond Bids	120.00
1584	E. Weinstein & Sons	Office Expense	.60
1585	Western Union	Telegrams	5.13
1586	Wm. Capps Building Co.	Office Rent	41.50
1587	Ireland Hampton	Amer. Express of Bond Transcript to Chicago	1.01
1588	Southwestern Bell Telephone Co.	Exchange & Toll Service	12.35
1589	American Bank Note Company	Printing of Bonds - 2000	900.00
T O T A L			\$2463.94

DISTRIBUTION OF VOUCHERS #1572 TO #1589, INCLUSIVE

Salaries	\$290.00	Telegrams	\$5.13
Legal Services	1041.67	Printing of Bonds	900.00
River Gauging	31.00	Express Expense	1.01
Office Expense	.60	Publication for Bond Bids	120.00
Office Room Rent	41.50	Fire Ins. Furn. & Fix.	20.68
Telephone & Toll Service	12.35		
T O T A L			\$2463.94

72

CONDITION OF FUNDS JULY 2, 1929

CHECKING ACCOUNT:

Balance June 4th, 1929		\$2376.25
Receipts: Interest on D/B		7.44
		\$2383.69
Disbursements Vo. #1572 to #1589, Incl.		2463.94
Balance July 2nd, 1929.		\$ 80.25 O/D

INTEREST AND SINKING FUND:

Balance June 4th, 1929		\$1737.89
Receipts: Interest on D/B	\$4.57	
Interest on Collectors D/B	45.54	
Taxes, Penalties, Interest	3162.67	3212.78
		\$4950.67
Disbursements		NONE
Balance July 2nd, 1929		\$4950.67

PRELIMINARY BONDS #1 TO #150, INCLUSIVE, AUTHORIZED \$150,000.00

Bonds #1 to #147, Inclusive; RETIRED		\$147,000.00
Bonds #148 to #150, Inclusive: AVAILABLE UNSOLD		3,000.00
T O T A L		\$150,000.00

COMPARISON: DEPOSITORY SECURITY AND DISTRICT'S FUNDS

<u>DEPOSITORY BOND</u>	<u>BOOK BALANCE OF FUNDS</u>
Security as shown by "Exhibit 1" attached to Depository Bond	Checking Account
\$10,000.00	\$80.25 O/D
\$10,000.00	Interest & Sinking Fund 4950.67
	Net Book Balance \$4870.42

DANIEL W. MEAD
CHARLES V. SEASTONE
CONSULTING ENGINEERS
MADISON, WISCONSIN

June 5, 1929

Mr. John B. Hawley
411 Capps Building
Fort Worth, Texas

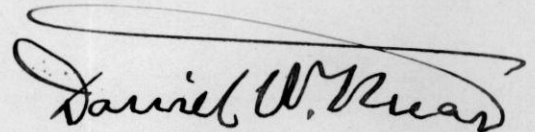
Dear Mr. Hawley:

On April 19 and 20th, I went over plans for the two dams which you propose to build in connection with the Fort Worth flood protection work, and discussed the same with yourself and your associate, Mr. Freese. While I have not had an opportunity to examine the location of these dams, your data seem to be so complete that I feel perfectly confident the plans are entirely proper and satisfactory for the project.

It is impossible for me to come to Fort Worth at this time but if you need my presence after the middle of July, I shall be glad to visit you and go over the matter in greater detail. I feel, however, that your plans are so satisfactory that such an examination is not necessary.

With kindest regards, I am

Very truly yours,



DWM:De

DANIEL W. MEAD

**TARRANT COUNTY WATER CONTROL AND
IMPROVEMENT DISTRICT NUMBER ONE**

BOARD OF DIRECTORS

W. R. BENNETT, PRES.
E. E. BEWLEY, VICE-PRES.
W. K. STRIPLING, SEC'Y
W. S. COOKE
C. A. HICKMAN

OFFICE 418 CAPPS BUILDING

PHONE 3-2848

ED. B. CHEATHAM, OFFICE

FORT WORTH, TEXAS

SIDNEY L. SAMUELS } ATTORNEYS
IRELAND HAMPTON }

HAWLEY AND FREESE
ENGINEERS

June 29, 1929.

**Texas National Bank,
Fort Worth, Texas.**

**ATTENTION MR. W. L. SMALLWOOD,
CHAIRMAN BOARD OF DIRECTORS.**

**In re: Deposit of proceeds of
sale of \$2,000,000 bonds of
Tarrant County Water Control &
Improvement District No. One.**

Gentlemen:

As the official depository of Tarrant County Water Control & Improvement District Number One, you are hereby notified that the District concluded a sale of \$2,000,000 of its bonds at and for the price of \$1,930,000, plus accrued interest on the par value of the bonds from May 15, 1929, to date of delivery.

Under the terms of the sale, the bonds are to be delivered and money paid therefor on or before August 1, 1929, though this date may be varied so that delivery may occur prior to or shortly after the ultimate date hereinabove named.

By virtue of the statute governing such matters, and under the terms of your contract as such depository, the security heretofore given must be increased with acceptable collateral to correspond with the additional deposit which shall amount approximately to \$1,951,000.

Please arrange to meet the new situation that will arise when proceeds of such bond sale are ready for deposit in your institution.

Very truly,

**TARRANT COUNTY WATER CONTROL &
IMPROVEMENT DISTRICT NUMBER ONE,**

By W. R. Bennett

As President.

JOHN B. HAWLEY
M. AM. SOC. C. E.

S. W. FREESE
ASSOC. M. AM. SOC. C. E.

M. C. NICHOLS
ASSOC. M. AM. SOC. C. E.

H. R. F. HELLAND
M. AM. SOC. C. E.

HAWLEY AND FREESE
CONSULTING ENGINEERS
411-17 CAPPS BUILDING
FORT WORTH, TEXAS

75
WATER SUPPLY
WATER PURIFICATION
SEWERAGE
SEWAGE DISPOSAL
IRRIGATION
FLOOD CONTROL

June 27, 1929.

Mr. W. R. Bennett, Pres.,
Tarrant County Water Control and
Improvement District No. I,
Fort Worth, Texas.

Dear Sir:--

We submit herewith complete plans
and specifications for Eagle Mountain and Bridgeport
Dams.

"Notice to Contractors" is on pages
"a" and "b" of the book, and merely requires the filling
in of dates.

We recommend a space of approximate-
ly four (4) weeks between date of advertisement and
reception of bids.

Respectfully,

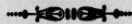
HAWLEY and FREESE,

By John B. Hawley
Engineers.

JBH*MC

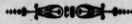
TARRANT COUNTY WATER CONTROL AND
IMPROVEMENT DISTRICT
NUMBER ONE

Fort Worth, Texas
1929



EAGLE MOUNTAIN
— and —
BRIDGEPORT DAMS

SPECIFICATIONS



BOARD OF DIRECTORS:

W. R. BENNETT, President
E. E. BEWLEY, Vice-President
W. K. STRIPLING, Secretary
W. S. COOKE
C. A. HICKMAN

JOHN B. HAWLEY,
S. W. FREESE,
Engineers

INDEX

	Page
Notice to Contractors.....	(a)
General Information	(c)
Alternate Methods	(c)
Method of Making Award.....	(c)
Experience, Equipment and Finance.....	(e)
List of Drawings, Eagle Mountain Dam.....	(f)
List of Drawings, Bridgeport Dam.....	(g)
Proposal	(h)
1. The Construction of Eagle Mountain Dam.....	(h)
2. The Construction of the Bridgeport Dam.....	(j)
Detail Specifications:	
1. Work to Be Done.....	1
2. Clearing and Grubbing.....	1
3. Preparation of Sites	1
4. Material for Embankment.....	1
5. Excavation of River Channel.....	2
6. Method of Constructing Embankments.....	2
(A) Core Trench	2
(a) Core Trench Excavation.....	2
(b) Backfilling of Core Trenches.....	3
(c) Core Trench Excavation and Refilling (Payments)....	3
(B) Wetted and Rolled Embankment.....	4
(C) Puddled Core—Wetted and Rolled Levee Embankment....	4
(D) Hydraulic Fill Embankment.....	5
(E) Dragline Fill Embankment.....	6
(F) Berm for Borrow Pits.....	6
(G) Runways	7
7. Excavation Classifications	7
(a) Earth	7
(b) Loose Rock	7
(c) Solid Rock	7
(d) Spoil Banks	7
8. Rip-Rap	8
8A. Paving	8
8B. Gravel Blanket or Crushed Stone Blanket.....	8
9. Bermuda Grass Sodding.....	9
10. Roadways	9
11. Steel Sheet Piling.....	9
12. Structures	10
(A) Excavation for Structures.....	10
(B) Excavation, Entrance and Tail Ditches.....	11
(C) Construction Tunnels and Service Conduits.....	11
(D) Spillways	11
(E) Flow of Water.....	11
(F) Cast Iron Pipe Laying.....	11
(G) Gate Houses	12
(a) Common Brickwork	12
(b) Stone	12
(c) Roof	12
(d) Sheet Metal Work.....	12
(e) Metal Sash	12
(f) Steel Doors	12
(g) Painting	13

INDEX—(Continued)

	(h) Finish Hardware	13
	(i) Gate Valves in Gate Houses.....	13
	(j) Carpenter and Mill Work, Workmanship and Materials.....	13
	(k) Ventilators	13
	(l) Backfilling Around Gate Houses.....	13
13.	Country Spillway	14
14.	Wood Guard Fence for Roadway on Dam.....	14
15.	Pipe Hand Rails and Link Fabric.....	14
16.	Overhaul	14
17.	Vitrified Pipe Slope Drains.....	14
18.	Tile Drain Under Slopes of Conduits and Flood Gates.....	14
19.	Wooden Foundation Piling.....	15
	(a) Specifications for	15
	(b) Spacing and Driving.....	15
20.	Gate Structures	15
21.	Land and Right of Way.....	16
22.	Concrete and Concrete Materials.....	16
	(a) General Description	16
	(b) Samples	17
	(c) Water-Cement Ratio	17
	(d) 1:14 Concrete Backing.....	17
	(e) Application of Water-Cement Ratio to Fort Worth Aggregates.....	17
	(f) Measuring Moisture in the Aggregate.....	17
	(g) Concrete Proportions and Consistency.....	17
	(h) Control of Proportions.....	18
	(i) Proportions for Concrete.....	18
	(j) Tests of Concrete.....	19
	(k) Portland Cement	19
	(l) Fine Aggregate	19
	(m) Coarse Aggregate	20
	(n) Storage of Aggregate.....	20
	(o) Water	20
	(p) Mixing	20
	(q) Placing and Construction Joints.....	20
	(r) Finishing	20
	(s) Retempered Mortar	21
	(t) Freezing Weather	21
	(u) Forms	21
	(v) Seasoning and Protection of Concrete.....	21
	(w) Finishing Concrete Floors, and Walkways.....	21
	(x) General	21
	(y) Changes in Quantities of Concrete.....	22
	(z) Conduits and Pipes.....	22
23.	Reinforcing Steel	22
	(a) Grade	22
	(b) Shape of Bars.....	22
	(c) Placing and Maintaining Reinforcement.....	22
	(d) Inspection	23
24.	Structural Steel for Buildings.....	23
	(a) Grade	23
	(b) Painting Structural Steel	23
25.	Clearing	23
	(a) Four-inch and Larger Trees.....	23
	(b) Small Trees, etc.....	23
	(c) Brush, Driftwood, etc.....	23
	(d) Clearing, Defined	23
	(e) Light-clearing, Defined	24
	(f) Clearing, Paid for.....	24
	(g) Exceptions to Clearing Provisions.....	24

NOTICE TO CONTRACTORS

Sealed proposals will be received at the office of the Tarrant County Water Control and Improvement District Number One, 418 Capps Building, Fort Worth, Texas, up to 10 o'clock a. m., 1929, for furnishing all materials, apparatus, appliances, tools, equipment and labor necessary to the construction and completion of two earthen dams and their appurtenances, to-wit: The dam located at Eagle Mountain, in Tarrant County, and that at a point about four miles northwesterly from Bridgeport, Wise County, Texas, both dams being on the West Fork of the Trinity River. Upon receipt of all bids, at the hour mentioned, they will be publicly opened, read and considered by the Board of Directors.

Bidders may bid on one or the other, or both dams, as they may elect; a certified check drawn on a Fort Worth, Texas, State or National Bank, payable without recourse to the order of W. R. Bennett, President, in the sum of Seventy-five Thousand (\$75,000.00) Dollars for each dam bid upon, must accompany the proposal, as a guaranty that the Bidder will enter into contract and execute bond and guaranty in the forms provided, within ten (10) days after notice of award to him. Checks of unsuccessful Bidders will be returned within ten (10) days after canvassing bids.

(Certified check on clearing only, each dam, \$5,000.00.)

Proposals without certified checks, as above, will not be considered by the Board.

The successful Bidder must furnish good and sufficient construction bond to the amount of fifty (50%) per cent of the sum bid, on (or in) substantially the form attached to "Form of Contract" included with the Specifications; the obligation of said bond shall extend to a period to be one year next after the acceptance of the work; provided however, that the obligation of the Contractor, and of the bond, after final acceptance of the work, shall be limited to the duty to make alterations, repairs or replacement (any or all) which may be necessary to remedy any defect in the materials furnished by, and, or, work done by, the Contractor. Defects arising from errors in specifications or design shall not be deemed to create any responsibility on the part of the Contractor thereunder. The bond to be given shall be executed by a reliable Surety Company, authorized to do business in Texas, which Company did on April 1st, 1929, have an Agent maintaining an office in Fort Worth, Texas. The bond required shall be subject to approval by the Directors of the District.

All "lump sum" and "unit" prices must be stated in both script and figures.

In case of ambiguity or lack of clearness in stating prices in the proposals, the Board of Directors reserves the right to adopt the most advantageous construction thereof, or to reject the proposal.

Unreasonable (or "unbalanced") unit prices will cause the Board to reject any proposal. Bidders are expected to inspect the sites of the works and to inform themselves of all local conditions.

The Board of Directors reserves the right to reject any or all bids, or to award a separate contract on each dam, (i.e. to different contractors).

The "Standard Form of Agreement Between Owner and Contractor" as adopted by the Texas Section of the American Society of Civil Engineers (1928 revision) will be substantially followed as to Form of Agreement and General Conditions of Agreement.

Copies of plans, specifications, etc., may be secured from the above mentioned Engineers' office upon deposit of One Hundred (\$100.00) Dollars, Eighty (\$80.00) Dollars of which will be returned upon submission of a bona fide proposal on the

work, accompanied by the plans and specifications, or upon the return, intact, of plans and specifications prior to the date for receiving proposals: otherwise the deposit will be retained.

In making awards the Board of Directors will consider the financial responsibility, construction equipment and experience of the several bidders; bidders are requested to submit detailed statements covering these matters with their proposals, for information of the Board.

TARRANT COUNTY WATER CONTROL AND IMPROVEMENT
DISTRICT NUMBER ONE.

Fort Worth, Texas,

....., 1929.

W. R. BENNETT, President.
W. K. STRIPLING, Secretary.
HAWLEY & FREESE, Engineers.

GENERAL INFORMATION.

"Notice to Contractors" calls attention to the essentials of the two-dam project of the Tarrant County Water Control and Improvement District Number One.

The "Notice" provides that bidders shall inform themselves of all local conditions; of these conditions foremost in importance is the hydrology of the Trinity River, a stream subject to periodic overflows of varying degree. Bidders should make a careful study of such river discharge and rainfall records as are available, in the office of the Board's Engineers, the U. S. Fort Worth Weather Bureau, the State Board of Water Engineers and the U. S. G. S. (Water Resources Branch), Austin, Texas, to the end of informing themselves as to flood hazards during and after construction of the works, as the Contractor must assume all responsibility for flood loss and damage.

Certain borings and test pits have been made at the damsites, logs of which are available to bidders at the District Engineers' office. These and the character of materials in the valley and on abutting hillsides should also be studied and examined by bidders. (The boring logs are supposed to be accurate, but are not guaranteed by the District. Bidders are at liberty to make further tests and borings if they so desire.)

County maps, showing highways, railroads, etc., may also be examined at the Engineer's office.

Fort Worth is a railroad center and "material market." Competitive prices on practically all materials necessary to construction of the works can be obtained here. Information as to special features and the manufacturers thereof can be secured from the District Engineers.

ALTERNATE METHODS.

(a) On the Eagle Mountain Dam and the Eagle Mountain Levee, alternate methods of placing earthen materials may be bid upon, viz.: (1) Hydraulic Fill; (2) Wetted and Rolled Embankment; (3) Puddled Core with Wetted and Rolled Levees.

(b) On the Bridgeport Dam and the Bridgeport Levee, alternate methods of placing earthen materials may be bid upon, viz.: (1) Wetted and Rolled Embankment; (2) Puddled Core with Wetted and Rolled Levees.

(c) On the Bridgeport "gap" or "saddle," earthwork in the Gap may be placed either by wagons and teams, trucks and trailers, or by dragline, as the Contractor may elect.

The District Board of Directors expects all Bidders to fully investigate and study all available data and the terrain of the damsites: failure to do so may be deemed sufficient cause for rejection of a proposal.

METHOD OF MAKING AWARD.

Bids will be received for the construction of an earthen dam, earthen levees, concrete structures, clearing of basin, and all appurtenances incidental to the construction of a dam at Eagle Mountain, and to a dam at Bridgeport.

The District Directors reserve the right to award either dam (including appurtenances) separately, to award both dams to the same Contractor, or to reject any and all bids as it may appear most advantageous to the District in their judgment.

In case the two dams be awarded to the same Contractor, he may build both dams simultaneously, or may build the Bridgeport Dam first, but in no case will the District finally accept the Eagle Mountain Dam and relieve contractor of his bond before he has completed the earthwork and concrete structures of the Bridgeport Dam to elevation 850.0.

If the Contractor so desires he will be permitted to make a lump sum deduction from his bid as evidenced by the unit prices in his bid if he be awarded a contract covering both dams, in which event this lump sum deduction will be made from the final estimate as follows:

The monies that would be due Contractor based on the actual quantities of work done at the respective unit prices will be determined. From the sum so determined will be deducted the "lump sum" above. From this amount the monies previously paid Contractor will be deducted. Any other charges the District has against the Contractor will then be deducted. The balance shall be the amount due Contractor.

If one Contractor be awarded both dams, final estimate and payment will be made on each dam (including appurtenances to that project) as it is completed, (except as provided above) and in that event the "lump sum" deduction will be made from the final estimate of the dam first completed, in the proportion that the original bid cost of that dam bears to the original cost of both dams.

The District reserves the right to award the work on either dam exclusive of the clearing, if the District so elects.

EXPERIENCE, EQUIPMENT, AND FINANCE

Each Bidder is required to fill in the following blanks for information of the Board of Directors, in addition to signature on the Proposal.

For Individual Firm or Corporation: Full Name, Name of Each Partner, or Names of Corporation Officials, with domicile.

.....
.....
.....

List of Dam Structures Built With Dates and Approximate Costs:

.....
.....
.....
.....
.....
.....

List of Other Large Public Works Built, with Dates and Approximate Costs:

.....
.....
.....
.....
.....

Equipment Available for this Work:

.....
.....
.....
.....

Financial Rating or Estimated Worth:

.....

Submitted by.....

..... Bidder.

CONTRACT DRAWINGS
EAGLE MOUNTAIN DAM AND LEVEES

- 500-1 Plan and Profile of Dam and Levees.
- 500-2 Topography of Main Damsite.
- 500-3 Topography of Main Damsite.
- 500-4 General Plan of Levee and Spillway.
- 500-5 Topography of Burgess Gap.
- 500-6 Geologic Profile of Damsite.
- 500-7 Geologic Profile of Levee Section.
- 500-8 Typical Sections of Dam.
- 500-9 Conduits. General Plan and Section.
- 500-10 Inlet to Conduits.
- 500-11 Inlet to Conduits.
- 500-12 Outlet to Conduits.
- 500-13 Outlet to Conduits.
- 500-14 Outlet to Conduits.
- 500-15 Gate Wells.
- 500-16 Bridge to Gate House.
- 500-17 Details of Gate House.
- 500-18 Typical Cross Section of Conduits and Details of Valve Chamber.
- 500-19 Schedule of Reinforcement for Conduits.
- 500-20 Schedule of Reinforcement for Conduits.
- 500-21 Service Spillway Plan and Section.
- 500-22 Service Spillway General Plan.
- 500-23 Service Spillway Details of Upstream Wing Wall.
- 500-24 Service Spillway Details of Upstream Wing Wall.
- 500-25 Service Spillway Details of Upstream Counterforts.
- 500-26 Service Spillway Details of Head Walls.
- 500-27 Service Spillway Details of Head Walls.
- 500-28 Service Spillway Details of Headwall Counterforts.
- 500-29 Service Spillway Down Stream Wing Wall.
- 500-30 Service Spillway Gravity Section and Piers.
- 500-31 Service Spillway Details of Highway Bridge.
- 500-32 Service Spillway Schedule of Reinforcing.
- 500-33 Service Spillway Schedule of Reinforcing.
- 500-34 Service Spillway Schedule of Reinforcing.

CONTRACT DRAWINGS
BRIDGEPORT DAM AND LEVEES

- 500-35 Plan and Profile of Dam and Levees.
- 500-36 Topography of Main Damsite.
- 500-37 Topography of Emergency Spillway Site.
- 500-38 Topography of Gap Section.
- 500-39 Topography of Berkshire Levee.
- 500-40 Topography of Berkshire Levee.
- 500-41 Geologic Profiles of Dam and Levees.
- 500-42 Typical Sections of Dam and Levees.
- 500-43 Conduits. Plan and Section.
- 500-44 Inlet to Conduits.
- 500-45 Inlet to Conduits.
- 500-46 Outlet to Conduits.
- 500-47 Outlet to Conduits.
- 500-48 Outlet to Conduits.
- 500-49 Gate Wells.
- 500-50 Bridge to Gate House.
- 500-51 Gate House.
- 500-52 Typical Cross Section of Conduits and Details of Valve Chamber.
- 500-53 Schedule of Reinforcement.
- 500-54 Schedule of Reinforcement.
- 500-55 Service Spillway Plan and Section.
- 500-56 Service Spillway General Plan.
- 500-57 Service Spillway Gravity Section and Piers.
- 500-58 Service Spillway Details of Upstream Wing Wall.
- 500-59 Service Spillway Details of Upstream Counterforts.
- 500-60 Service Spillway Details of Head Wall.
- 600-61 Service Spillway Details of Head Wall.
- 500-62 Service Spillway Details of Head Wall Counterforts.
- 500-63 Service Spillway Details of Downstream Wing Wall.
- 500-64 Service Spillway Details of Highway Bridge.
- 500-65 Service Spillway Schedule of Reinforcement.
- 500-66 Service Spillway Schedule of Reinforcement.
- 500-67 Service Spillway Schedule of Reinforcement.

PROPOSAL

for the

CONSTRUCTION OF EAGLE MOUNTAIN DAM AND ITS APPURTENANCES,
AND OF BRIDGEPORT DAM AND ITS APPURTENANCES

Fort Worth, Texas,....., 1929.

To the Board of Directors,

Tarrant County Water Control and Improvement District Number One,
Fort Worth, Texas.

Gentlemen:

Pursuant to the foregoing Notice to Bidders, the undersigned Bidder hereby proposes to do all the work and furnish all necessary labor, tools, equipment, materials, apparatus and appliances, and to complete all the work upon which he bids, as provided by the attached specifications and shown on the plans, and binds himself on acceptance of his proposal to execute a contract and bond, according to the accompanying forms, for performing and completing the said work within the time stated for the following prices, to-wit:

I. THE CONSTRUCTION OF EAGLE MOUNTAIN DAM.

<i>Item.</i>	<i>Quantity.</i>	<i>Price.</i>
1. Wetted and Rolled Embankment, 484,000 cu. yds.		
	@.....	(\$.....) dollars per cu. yd.
2. Core Trench Excavation, 150,000 cu. yds.		
	@.....	(\$.....) dollars per cu. yd.
3. Hydraulic Fill Embankment, 2,360,000 cu. yds.		
	@.....	(\$.....) dollars per cu. yd.
4. Puddled Core, Wetted and Rolled Embankment, 2,360,000 cu. yds.		
	@.....	(\$.....) dollars per cu. yd.
5. Dragline (or team) Embankment, 10,000 cu. yds.,		
	@.....	(\$.....) dollars per cu. yd.
6. Rip-rap Paving, 56,200 cu. yds.		
	@.....	(\$.....) dollars per cu. yd.
7. Gravel Blanket, 22,000 cu. yds.		
	@.....	(\$.....) dollars per cu. yd.
7a. Crushed Stone Blanket, 22,000 cu. yds.		
	@.....	(\$.....) dollars per cu. yd.
8. Bermuda Grass Sodding, 30 acres,		
	@.....	(\$.....) dollars per acre.

9. Gravel Roadways, 5,200 cu. yds.
 @..... (\$.....) dollars per cu. yd.
10. Steel Sheet Piling, driven (in place),
Alternate A.
 Straight Section, Type....., weight per sq. ft.....lbs.
 (a) Lengths up to 40 ft. 72,000 sq. ft.
 @..... (\$.....) dollars per sq. ft.
 Arch Section, Type....., weight per sq. ft.....lbs.
 (b) Lengths 40 to 60 ft. 83,000 sq. ft.
 @..... (\$.....) dollars per sq. ft.
 (c) Lengths 60 to 100 ft. 3,000 sq. ft.
 @..... (\$.....) dollars per sq. ft.
- Alternate B.*
 Straight Section, Type....., weight per sq. ft.....lbs.
 (d) Lengths up to 40 feet 72,000 sq. feet.
 @..... (\$.....) dollars per sq. ft.
 Arch Section, Type....., weight per sq. ft.....lbs.
 (e) Lengths 40 to 60 ft. 83,000 sq. ft.
 @..... (\$.....) dollars per sq. ft.
 (f) Lengths 60 to 100 ft. 3,000 sq. ft.
 @..... (\$.....) dollars per sq. ft.
11. Earth Spoil Bank, 10,000 cu. yds.
 @..... (\$.....) dollars per cu. yd.
12. Loose Rock Excavation, 5,000 cu. yds.
 @..... (\$.....) dollars per cu. yd.
13. Solid Rock Excavation, 5,000 cu. yds.
 @..... (\$.....) dollars per cu. yd.
14. For furnishing all labor and necessary material, including pipes, gates valves, and appurtenances, and completing the gate house on Eagle Mountain Dam, the sum of (\$.....) dollars.
15. "2,500-lb." Concrete, 12,100 cu. yds.
 @..... (\$.....) dollars per cu. yd.
16. "1,500-lb." Concrete, 13,650 cu. yds.
 @..... (\$.....) dollars per cu. yd.
17. "1-14" Concrete, 500 cu. yds.
 @..... (\$.....) dollars per cu. yd.

18. Wooden Guard Fence on Dam, 7,800 linear feet, in place,
@..... (\$.....) dollars per lin. ft.
19. Pipe Handrail and Link Fabric, 920 linear feet, in place,
@..... (\$.....) dollars per lin. ft.
20. Eight-inch Vitrified Pipe Slope Drains, 4,100 linear feet, in place,
@..... (\$.....) dollars per lin. ft.
21. Grouted Paving Inlets for Slope Drains, 40 cu. yds.
@..... (\$.....) dollars per cu. yd.
22. Six-inch Tile Drains Under Structures, 6,000 linear feet, in place,
@..... (\$.....) dollars per lin. ft.
23. Wooden Foundation Piling, 11,500 linear feet, in place 19 (a), 19 (b),
@..... (\$.....) dollars per lin. ft.
24. Three "Tainter," radial gates (drawings and specifications attached hereto),
complete erected, the lump sum of....
..... (\$.....) dollars.
- 24a. Three "Caterpillar" gates (Phillips & Davies, drawings and specifications at-
tached) complete, erected, the lump sum of
..... (\$.....) dollars.
25. Portland Cement (22k) 32,200 barrels,
@..... (\$.....) dollars per bbl.
26. Reinforcing Steel (for all structures other than gate houses), 1,390,000 lbs.,
@..... (\$.....) dollars per lb.
27. Clearing (25d), 2,500 acres,
@..... (\$.....) dollars per acre.
28. Light Clearing (25e), 2,500 acres,
@..... (\$.....) dollars per acre.
29. Dewatering River Channel—if ordered by the Engineer, the lump sum of
..... (\$.....) dollars.
30.
31.
32.
33.

II. THE CONSTRUCTION OF BRIDGEPORT DAM

<i>Item</i>	<i>Quantity</i>	<i>Price</i>
1. Wetted and Rolled Embankment, 1,390,000 cu. yds.		@..... (\$.....) dollars per cu. yd.
2. Core Trench Excavation, 115,000 cu. yds.		@..... (\$.....) dollars per cu. yd.
3. Puddled Core, Wetted and Rolled Levee Embankment, 1,390,000 cu. yds.		@..... (\$.....) dollars per cu. yd.

4. Dragline (or team) Embankment, 10,000 cu. yds.
@..... (\$.....) dollars per cu. yd.
5. Rip-rap Paving, 25,000 cu. yds.
@..... (\$.....) dollars per cu. yd.
6. Gravel Blanket, 9,600 cu. yds.
@..... (\$.....) dollars per cu. yd.
7. Crushed Stone Blanket, 9,600 cu. yds.
@..... (\$.....) dollars per cu. yd.
8. Bermuda Grass Sodding, 15 acres,
@..... (\$.....) dollars per acre.
9. Gravel Roadways, 4,400 cu. yds.
@..... (\$.....) dollars per cu. yd.
10. Steel Sheet Piling, driven (in place).
Alternate A.
Straight Section, Type....., weight per sq. ft.....lbs.
(a) Lengths up to 40 ft. 10,500 sq. ft.
@..... (\$.....) dollars per sq. ft.
Alternate B.
Straight Section, Type....., weight per sq. ft.....lbs.
(b) Lengths up to 40 ft. 10,500 sq. ft.
@..... (\$.....) dollars per sq. ft.
11. Earth Spoil Bank, 10,000 cu. yds.
@..... (\$.....) dollars per cu. yd.
12. Loose Rock Excavation, 5,000 cu. yds.
@..... (\$.....) dollars per cu. yd.
13. Solid Rock Excavation, 5,000 cu. yds.
@..... (\$.....) dollars per cu. yd.
14. For furnishing all labor and necessary material, including pipes, gate valves, and appurtenances, and completing the gate house on Bridgeport Dam, the sum of
..... (\$.....) dollars.
15. "2,500-lb." Concrete, 12,500 cu. yds.
@..... (\$.....) dollars per cu. yd.
16. "1,500-lb." Concrete, 12,800 cu. yds.
@..... (\$.....) dollars per cu. yd.
17. ~~2~~ "14" Concrete, 500 cu. yds.
@..... (\$.....) dollars per cu. yd.
18. Wooden Guard Fence on Dam, 6,300 linear feet, in place,
@..... (\$.....) dollars per lin. ft.
19. Pipe Handrail and Link Fabric, 920 linear feet, in place,
@..... (\$.....) dollars per lin. ft.

- 20. Eight-inch Vitrified Pipe Slope Drains, 2,200 linear feet, in place,
@..... (\$.....) dollars per lin. ft.
- 21. Grouted Paving Inlets for Slope Drains, 30 cu. yds.
@..... (\$.....) dollars per cu. yd.
- 22. Six-inch Tile Drains Under Structures, 5,200 linear feet, in place,
@..... (\$.....) dollars per lin. ft.
- 23. Wooden Foundation Piling, 6,000 linear feet, in place, 19 (a), 19 (b),
@..... (\$.....) dollars per lin. ft.
- 24. Two "Tainter," Radial Gates (drawings and specifications attached hereto),
complete, erected, the lump sum of
..... (\$.....) dollars.
- 24a. Two "Caterpillar" Gates (Phillips & Davies, drawings and specifications at-
tached) complete, erected, the lump sum of
..... (\$.....) dollars.
- 25. Portland Cement, (22k), 31,600 barrels,
@..... (\$.....) dollars per bbl.
- 26. Reinforcing Steel (for all structures other than gate houses), 1,540,000 lbs.
@..... (\$.....) dollars per lb.
- 27. Clearing, (25d), 3,000 acres,
@..... (\$.....) dollars per acre.
- 28. Light Clearing (25e), 3,000 acres,
@..... (\$.....) dollars per acre.
- 29. Dewatering Rivel Channel (if ordered by the the Engineer), the lump sum of
..... (\$.....) dollars.
- 30.
- 31.
- 32.
- 33.

The undersigned Bidder agrees to begin work within twenty (20) days after there shall be given to him written notice therefor by the Owner or its Engineer, and to complete the Eagle Mountain Dam within.....working days thereafter, or the Bridgeport Dam within.....working days there- after, if awarded one dam only; or to complete both dams within..... working days thereafter, if awarded both dams.

Enclosed with this Proposal is a certified check for Seventy-five Thousand (\$75,000.00) Dollars, (or) two certified checks for Seventy-five Thousand (\$75,- 000.00) Dollars each, which it is agreed shall become forfeit to the Tarrant County Water Control and Improvement District Number One, if in case this Proposal or either section thereof shall be accepted by its Board of Directors within ten (10) days of the date hereof, the undersigned shall fail to execute a contract and bond with and to said District under the conditions of this Proposal; otherwise, said check shall be returned to the undersigned upon demand.

Address:
.....Bidder.
.....

DETAIL SPECIFICATIONS

1. WORK TO BE DONE.

The work to be done comprises furnishing all materials, apparatus, appliances, equipment, tools and labor necessary to the construction and completion of—

(a) The Eagle Mountain Dam and appurtenances, and including clearing, located in the valley of the West Fork of the Trinity River, in Tarrant County, Texas, at a point about ten miles northwesterly from the Court House in the City of Fort Worth; and

(b) The Bridgeport Dam and appurtenances, and including clearing, located in the valley of the West Fork of the Trinity River, in Wise County, Texas, at a point about four miles northwesterly from the business centre of the City of Bridgeport.

All work shall be done according to these Specifications and the General Conditions of the "Standard form of Agreement Between Owner and Contractor" as adopted by the Texas Section of the American Society of Civil Engineers, 1928 Revision, and the plans attached hereto and made a part hereof; complete and ready for service.

The Contractor shall so conduct construction work as to best protect all features thereof from flood damage, and it is understood that the Contractor assumes all hazard of damage from rises of the river and from all other causes.

2. CLEARING AND GRUBBING AT DAMSITES AND OTHER EMBANKMENTS.

The Contractor shall clear the site of the dam, other embankments and spillway structures of all trees and brush. All trees and brush shall be removed from the site or shall be burned. All roots, stumps, etc., shall be grubbed out, and the holes filled with selected earthen materials, well puddled.

All embankment sites, spillway sites and borrow pits shall be cleared and grubbed at Contractor's expense (*i. e.*, will be paid for in the unit price bid for Embankment).

3. PREPARATION OF SITES.

Where the surface of the site is covered with vegetable matter or loamy top soil, same shall be removed to an average depth of six (6") inches and reserved for the Bermuda grass sodding and shall be placed later on the top berm and downstream slope of dam and measured and paid for as "Embankment" only.

No roots or trash will be allowed in embankment. Prior to placing any embankment material, the area upon which it is to be placed shall be roughened by plowing with furrows parallel to the longitudinal axis of the embankment.

4. MATERIAL FOR EMBANKMENT.

Embankment shall be made of acceptable material from excavations or from borrow pits located upon land provided by the Owner. The location and limits of all borrow pits shall be approved by the Engineer. No frozen material shall be placed in any portion of the embankment, nor shall any material be placed on a frozen surface.

Where the hydraulic fill method is used for the main embankment, the hydraulicked material shall be obtained from borrow pits above the dam, and shall contain such proportions of earth, sand, clay and gravel as will be approved by the Engineer. No overhaul will be allowed on embankment material for either dam, or levee.

5. EXCAVATION OF RIVER CHANNEL.

The river channel (and banks) at both Eagle Mountain and Bridgeport sites contains several feet of silt; such material shall be excavated by the Contractor and placed in dam embankment if of suitable character for that purpose; if thus used it shall be measured and paid for as "Wetted and Rolled," "Puddled Core-Wetted and Rolled Levee" or "Hydraulic Fill" embankment as the case may be; in case it is unfit for embankment use in the opinion of the Engineer, it shall be placed in spoil banks, 300 feet free haul, center of gravity to center of gravity, and paid for as "spoil bank" at price bid therefor, with an additional three (3c) cents per 100 foot station-yard overhaul for any excess distance (beyond 300 feet). Due to difficulties in securing reliable primary cross sections of the river channel the method here outlined will be used in estimating the quantities excavated therefrom, no excavation price being allowed.

The river channel shall be refilled with selected earthy materials, puddled into place as specified for refilling core trenches, and such refilling will be paid for at price bid for "Wetted and Rolled Embankment," "Puddled Core-Wetted and Rolled Levee Embankment," or "Hydraulic Fill Embankment," as the case may be, *i. e.* as the main dam embankment may be constructed at that site.

If required by the Engineer, the river channel shall be dewatered so as to allow examination and inspection of its bottom and banks, prior to placing embankment materials therein. Materials excavated from banks and channel may be used for "plugging" or "cofferdamming" the ends of the excavation if suitable for that purpose; if so utilized such excavated materials will be measured and paid for at "spoil bank" price. In case other earthy materials are used for cofferdamming, they also will be paid for as "spoil bank".

Pumping apparatus shall be furnished and operated by the Contractor at his expense. Payment for the dewatering of the river channel at each damsite will be made at "lump-sum" price bid.

The dewatering of river channel, other than "spoil banks" above mentioned, at each site will be paid for at the lump-sum price bid.

6. METHODS OF CONSTRUCTING EMBANKMENTS.

Embankments shall be constructed by the methods set forth above as may be selected by the Engineer, or by such approved modification of these methods, depending upon the character and quality of materials actually found, as will secure a stable, compact and impervious dam.

6-A. CORE TRENCH.

6-A-a. Core Trench Excavation.

A core trench shall be excavated approximately under the center of the dam, to the depths and of dimensions shown on the drawings. The depths and side slopes, however, may be changed by the Engineer to meet the conditions disclosed as the excavations progress. The intention will be to construct an open trench under the dam in which steel piling where needed shall be driven as shown on the plans.

Where a hard and impervious stratum is found underneath the surface at a greater depth than indicated for core trench on plans (minimum depth of core trench to be not less than twenty (20) feet below original surface at Eagle Mountain Dam, nor less than thirty (30) feet at Bridgeport Dam) the core trench may be excavated to this stratum and a puddle backfill placed. The District reserves the right to require the core trench to be excavated as stated, and puddled in lieu of the use of the sheet piling that may be shown upon the drawings.

In any case the core trench shall be backfilled with puddled materials as described below.

The unit prices bid for core trench excavation include the cost of all labor, material, equipment, explosives, dewatering, etc., necessary to perform the work.

The side slopes of the core trench shall be as shown on the drawings or they may be changed by the Engineer to meet conditions actually found. Steeper slopes may be ordered in case the material will stand without undue sliding or sloughing.

The excavation from core trenches shall be deposited on downstream side thereof or as may be directed by the Engineer and shall be spread in lifts so far as possible within the slope stake limits of the embankment and form a part of same. All core trench excavation placed in the embankment shall be placed as specified under "Wetted and Rolled Embankment". Materials unfit for embankment shall be placed in a spoil pile.

All boulders and masses of hard rock suitable for rip-rap or paving shall be placed in suitable piles outside of slope stake limits, where directed by the Engineer; such rock shall be regarded as the property of the Contractor and may later be used for dry rubble, slope or other paving, if sound and suitable for such use.

Core trenches shall be kept open after excavation so that sheet piling may project from 4 to 6 feet up in the trench, to be later encased and puddled in the core material. Any slides from the sides of the core trench shall be removed by the Contractor before backfilling begins without additional cost to the Owner; except the Contractor will be paid the contract price for core trench excavation for removing slides from the core trench, which in the opinion of the Engineer occurred because the slopes originally ordered were too steep for the character of material at such points; provided such slides were not due to the core trench being left open too long, or to not being dewatered or to other causes for which the Contractor was responsible.

Core trench excavation wherever deposited, shall be paid for as excavation only and not as embankment or backfilling.

6-A-b. *Backfilling of Core Trenches.*

All core trenches shall be backfilled with clay or with such other selected material as may be approved by the Engineer. Clayey materials excavated from trenches, if suitable for the purpose, may be used in backfilling core trenches. The trenches shall be first filled with water and the material shall be dumped into the water from a drag line or other bucket or by "bull dozing" over the sides, hydraulic fill, or by other approved methods. All roots, brush and other vegetable matter, and all stones in excess of 4 inches in diameter, shall be removed from the material before depositing in the trench.

Backfilling shall be paid for at the unit price bid for the adjacent (overlying) embankment which will include the cost of all labor, equipment, water and material including the necessary handling of the material. In case material excavated from core trench is used directly in the backfilling of same, it will be paid for at unit price bid for "Core Trench Excavation" only.

6-A-c. *Core Trench Excavation and Refilling (Payments).*

Test borings and pits indicate that materials excavated from core trenches will be largely suitable either for refilling the trenches or for use in embankment construction; some, however, will be unfit for such uses, and will be placed in spoil banks, which latter will be located not to exceed three hundred (300) feet center of gravity to center of gravity from point of excavation.

(a) Should all materials excavated from any section of core trench be used directly to refill trench; or

(b) Should the excavated materials be used partly in trench refill and partly in downstream part of embankment; or

(c) Should the excavated materials be partly used as (a), partly as (b), and partly put into spoil bank as above mentioned, in any of such cases the excavated materials will be paid for on the basis of volume excavated only, and at the unit price bid for "Core Trench Excavation".

As to core trench refilling with selected materials from borrow pits:—

The unfilled or partly refilled (by core trench materials) core trench will be cross-sectioned and its cubic content up to the prepared ground surface, (the bottom of the dam embankment) computed and paid for at the unit price for construction of the main dam embankment, either "Wetted and Rolled Embankment", "Puddle Core-Wetted and Rolled Levee Embankment" or "Hydraulic Fill Embankment" as the case may be.

No core trench material will be paid for in both excavation and refill, or in excavation and embankment.

6-B. WETTED AND ROLLED EMBANKMENT.

After the subgrade shall have been properly prepared, as above, the placing of embankment materials shall proceed as follows: Upon the wetted subgrade, suitable earthy materials shall be placed in horizontal layers, practically level and full width of embankment, not exceeding one (1) foot in thickness, loose, levelled by road grader or other approved means. Each layer shall be thoroughly wetted by hose streams or sprinkling carts, until of proper consistency for rolling. (The Engineer will insist on thorough wetting, but not enough to "bog down" teams, wagons, scrapers, or rollers.) Rolling shall be done on alternate areas, so as to keep the roller constantly busy. The roller shall pass over every part of each layer that can be transversed by it as many times as may be necessary to thoroughly compact the layer.

The roller shall be of such size and weight as to give a compression of approximately 250 pounds per linear inch. It shall bear square shouldered corrugations (with slight taper) at least three (3) inches deep and not to exceed four (4) inches wide. The roller shall be gas or steam driven.

After the loose materials have been wetted to the approval of the Engineer, the layer shall be rolled and re-rolled until thoroughly compacted. Should any layer be overwetted, dry earthy material shall be added and rolled into same to proper consistency. In case the surface of any layer becomes hard and smooth, by reason of delays, wagon travel, improper rolling, or other causes, the Contractor shall roughen it by light plowing prior to placing the succeeding layer.

The surface of each layer must be thoroughly wetted before the succeeding layer is placed thereon.

Near well house and other places inaccessible to roller, it will be impossible to compact earthy materials with roller. In all such places the materials shall be properly wetted and thoroughly compressed with iron tampers, weighing not less than thirty (30) pounds for a "tamping face" of fifteen (15) square inches. The Engineer may require these areas to be filled by depositing selected material in water, and thorough puddling by hand bars.

An addition of two (2%) per cent shall be made to the height of embankment at any point to compensate for shrinkage and settlement. Measurements for payment will be made to such higher level.

No overhaul will be allowed.

6-C. PUDDLED CORE-WETTED AND ROLLED LEVEE EMBANKMENT.

"Puddled Core-Wetted and Rolled Levee Embankment" shall be constructed with puddled core between two levees constructed by the "Wetted and Rolled Embankment" method described elsewhere in these specifications.

The downstream levee shall be constructed of the more pervious material to be found in the borrow pits. It shall be constructed by the "Wetted and Rolled Embankment" method, as specified above.

The upstream levee shall be constructed of more impervious material than that entering into the downstream levee, and also shall be constructed by the "Wetted and Rolled Embankment method as specified above.

The "puddled core" shall be constructed of "selected fines" from the borrow pit. These fines shall be deposited in live water.

The "selected fines" shall be deposited by dragline or other method in loads of not to exceed three cubic yards. A head of water at least three (3') feet shall be maintained on the puddled core section. The levee shall be carried not less than three feet, nor more than eight feet above the water surface in the puddled core section. Fines shall be so selected and manipulated in placing in the core, as to deposit the finer materials in the middle and to prevent stratification or the deposition of sand or gravel in horizontal layers, throughout the core.

The upper fifteen (15') feet of dam may be constructed entirely by "Wetted and Rolled Embankment" method at the option of Contractor.

Core width at any point shall be equal to height of dam above that point.

Cross berms or levees may be used at reasonable intervals. Such cross embankments shall be deposited and built up in such a manner as to meet the approval of the Engineer. Otherwise they shall be removed. Cross berms shall be plowed lightly or worked thoroughly with shovels to insure a good bond to the irrigated fill.

An addition of two (2%) per cent shall be made to the height of embankment at any point to compensate for shrinkage and settlement. Measurements for payment will be made to such higher level.

No overhaul on embankment built by this method will be allowed.

6-D. HYDRAULIC FILL EMBANKMENT.

This method consists of obtaining material having suitable proportions of sand, gravel and clay from borrow pits in the river valley above the dam and delivering same by means of a dredge pump under pressure through pipes onto the embankment. The material shall be discharged from the pipes at the outer edges of the dam, and so distributed that the coarser gravel and sand remain there while the suspended clay and finer materials are carried into the "core-pool" at the center of the dam, thus forming an impervious core.

The outer slopes shall be carried up well in advance of the central core, by method approved by the Engineer. The width of the outer levees and the depth and width of the "core-pool" will largely control the gradation of materials and shall at all times be subject to the direction of the Engineer. It is of the greatest importance that stratification of the core shall be avoided and the utmost care and diligence shall be used to prevent "shoaling" of the coarser material across same. The delivery and manipulation of materials shall be so regulated as to procure the best distribution of materials and to keep the water surface of the core-pool as nearly uniform in width as possible. The bottom of the core-pool shall also be kept level longitudinally to prevent undue flow of silt to one end.

Operations shall be so conducted as to produce a puddled core of uniform width at any elevation and of such slopes as the material used will permit, and to raise both sides of the embankment evenly. Should the embankment be built in more than one section, that portion at the end of the core of the first section built, shall be entirely removed and the core material of the second section con-

nected therewith in such manner as to form a continuous and perfect puddled impervious core. The utmost precaution must be taken to secure a uniform joining of the sections throughout.

The Contractor shall dispose of all surplus water from the core-pool by pumping, siphons, wells or other approved methods. Before the completion of the work the wells or other outflow devices shall be carefully removed or filled with suitable materials and after the manner approved by the Engineer.

Should the use of a series of settling ponds be permitted they shall be of convenient lengths, separated by temporary cross dams of sufficient thickness to withstand the pressure against them, and built of selected material and puddled by hand or by some equally efficient method, to the satisfaction of the Engineer. As the sluiced material is worked against the temporary cross dam and raised in the embankment, the stratification between it and the cross dam shall be broken by the use of shovels or other suitable tools.

Hydraulic fill material shall be taken only from borrow pits approved by the Engineer. No pit shall be made in the valley below the dam. On the upstream side no material shall be taken within 500 feet of the toe of the dam.

The same care shall be used to prevent "shoaling" of the coarser material across the core trench as herinbefore provided for the main core. The width of the main core above ground level shall be not less at any elevation than the height of the embankment above such elevation, unless otherwise approved by the Engineer.

The cost of installation of all equipment and of all labor and materials used and necessary for the proper construction of the embankment, including the clearing and grubbing of borrow pits, and plowing and other preparation of the underlying foundation of embankments shall be included in the price bid per cubic yard for embankment.

An addition of two (2%) per cent shall be made to the height of embankment at any point to compensate for shrinkage and settlement. Measurements for payment will be much to such higher level.

6-E. DRAGLINE FILL EMBANKMENT.

"Dragline Fill" will be permitted in the gap or saddle section at Bridgeport Dam. This shall be built up in the manner usually employed in levee work for reclamation districts. No boulders will be permitted in the fill. All rocks over eight inches in longest diameter will be classed as boulders.

An addition of ten (10%) per cent shall be made to the height of embankment at any point to compensate for shrinkage and settlement. Measurements for payment will be much to such higher level.

6-F. BERMS FOR BORROW PITS.

No borrow pit shall be opened nearer than two hundred (200) feet of the upstream toe nor nearer than one hundred fifty (150) feet of the downstream toe of the Bridgeport Dam.

No borrow pit shall be opened nearer than five hundred (500) feet of the upstream toe of Eagle Mountain Dam—if hydraulic fill process is used, and not nearer than two hundred (200) feet if "Wetted and Rolled Embankment" or the "Puddled Core-Wetted and Rolled Embankment" process is used; downstream borrow pits may be opened at Eagle Mountain Dam—under either of the latter two processes, not nearer than one hundred (100) feet to toe of slope, and not deeper than elevation 610.00.

At Bridgeport levee and saddle fills, borrow pits may be located on either or both sides not nearer than fifty (50') feet to toe of slopes; at Eagle Mountain levee, not nearer than 100 feet.

Borrow pit slopes shall be not steeper than 1 vertical to 4 horizontal on pit-side nearest the embankment.

6-G. RUNWAYS.

In case the Contractor finds it necessary to construct runways for carrying earthen materials to any level of the embankment, such runways must be constructed outside the line of finished slopes of Earthen Embankment. On either face of the embankment the runways must be removed to subgrade. In no case will any yardage be allowed Contractor for either construction or removal of runways.

7. EXCAVATION CLASSIFICATIONS.

Materials excavated from spillways or core trenches shall be classified as follows:

(a) *Earth*. All loam, sand, gravel, "rock soil", clay, marl, or any combination of such materials capable of being loosened by plowing with a plow team of six good mules, or capable of being excavated by 75-H.P. steam shovel will be classified as earth, but will be paid for in "Wetted and Rolled Embankment" only (excepting core trench excavation, which shall be paid for as such; see Section 6A above). Loose rock (rock loosened and loaded by methods described above) incorporated in the dam shall be distributed through the earthy materials of downstream half of the Dam as directed by the Engineer.

(b) *Loose Rock*. The term Loose Rock, as a name for excavated material, shall be used to include all soft shales or other soft or loose rocks which can be removed without the use of explosives, even though explosives may be used to facilitate the work; also all boulders or other sorts of rock of more than one cubic foot and less than one-half cubic yard; indurated material of all kinds which cannot be plowed or moved by steam shovel as in (a), but which requires loosening by explosives and can then be removed by scraper; mixtures of any or all materials which in the opinion of the Engineer, it is impracticable to classify as (a) Earth, or (c) Solid Rock, either because of the character of the material, or because of the method used in its removal.

(c) *Solid Rock*. All ledge rock that, in the opinion of the Engineer, requires drilling and blasting for its economical removal, will be classified as Solid Rock. Solid Rock used in 15" slope rip-rap will be paid for under that head only.

Crushed stone from adjacent hills may be used in the blanket under rip-rap. This stone shall be crushed to not larger than 2" maximum size, and shall be crusher run. Payment for stone so used shall be for stone blanket only.

(d) *Spoil Banks*. Any earthen materials excavated from any excavation for a structure, that are deemed unfit for use in embankments, core trench filling, or refill around building walls, structures, etc., shall be placed in spoil banks, where they will be measured and paid for, per cubic yard, as "spoil bank".

Spoil banks will be located not to exceed three hundred (300) feet centre of gravity to centre of gravity from points of excavation; their surfaces shall be evened and smoothed as directed by the Engineer.

Loose rock materials removed from any excavation for a structure, deemed by the Engineer to be unfit for embankment or other use shall be placed in spoil banks located where directed by the Engineer, at a distance not greater than three hundred (300) feet from the centre of gravity of excavation, to centre of gravity of the spoil bank. Loose rock spoil will be paid for at price bid per cubic yard, measured in spoil bank, less 30 per cent for voids; if, however, it is feasible to cross-section the loose rock excavation so as to secure accurate quantities the excavation will be measured and computed in that manner.

(There will be no classification of borrow-pit materials.)

All surplus solid rock, removed from any excavation for a structure, that is, all solid rock not suitable for rip-rap paving, or in excess of need for rip-rap paving, will be placed in "rock spoil banks" located at points not more than three hundred (300) feet centre of gravity to centre of gravity, designated by the Engineer, and will be paid for by the cubic yard based on 50 per cent voids in the "rock spoil bank", that is to say, if the gross measurement of a "rock spoil bank" should be one hundred (100) cubic yards, payment will be made for fifty (50) cubic yards of solid rock. If, however, it is feasible to cross-section the rock cut so as to secure accurate solid rock quantities, rock excavation will be measured and computed in that manner.

8. RIP-RAP

8-A *Paving.* On both dams and for either of the embankment methods the inner or upstream face of embankment above the foot of paving shall be built to an excess thickness of eight (8") inches on 1 to 2 slopes and six (6") inches on 1 to 3 slopes (at right angles to the slope,) beyond subgrade, so as to allow for "trimming down" to a firm solid subgrade for rip-rap paving, and such excess material may be re-used in embankment; such trimming down shall be included in cost of rip-rap, as Contractor will be paid for Embankment as measured to the subgrade only. When finished, berm and slopes shall closely conform with elevations and slopes (corrected for shrinkage) shown on plans.

On Eagle Mountain Dam the inner, or water slopes of embankment shall be paved with sound "one man" stones of 12-inch minimum, 18-inch maximum and 15-inch average thickness, quarried from hills adjacent to dam, if found there in proper quality.

Rip-rap shall be placed with longest dimension perpendicular to slope.

Rip-rap shall be of sound limestone (or gryphea conglomerate if sound and of lime matrix) and shall be hand placed with joints averaging not more than one (1") inch width, with maximum width of two (2") inches. The joints of the face of the paving shall be filled with tightly driven spalls.

At Bridgeport Dam, sound limestone rock of the vicinity may be used, dimensions and workmanship as for Eagle Mountain Dam.

Samples of rock proposed to be used for rip-rap shall be submitted to the Engineer for approval before placing on dam.

Although an average thickness of fifteen (15") inches of rip-rap is required, and while its surface in general must conform to "finished lines" indicated on plans, a "tolerance" of three inches above or below true "finished lines" will be permitted, "over" and "under" areas to be well scattered.

8B. *Gravel Blanket or Crushed Stone Blanket.*

The upstream slope of the embankment after being brought to a true and uniform surface, shall be covered with a blanket of gravel to a depth of six (6") inches loose measurement at right angles to the surface of the embankment. Pit run gravel may be used if approved by the Engineer, but such gravel shall be of such coarseness that not less than forty per cent shall be retained on a three-fourths inch mesh screen and sixty per cent upon a one-fourth inch mesh screen. The Contractor will be paid for gravel blanket, upon the basis of its being six (6") inches thick loose, at the price bid per cubic yard, which shall include all costs incident to the securing, handling and placing of same in a satisfactory manner.

As an alternate, a crushed stone blanket may be placed under rip-rap on the upstream slope of dam. At Eagle Mountain Dam this stone may be crushed from "shell-rock" taken from adjacent hills. The blanket shall be crusher run, 2" maximum size, and placed 6" loose. Payment for stone so used will be under "Stone Blanket".

9. BERMUDA GRASS SODDING.

The top berm of dams and levees (except such parts as are gravelled), downstream slopes and berms shall be "sodded" with Bermuda grass. All strips or blocks of sod shall be cut from a dense, vigorous growth of Bermuda grass and from such soil as will withstand handling without dropping off and leaving roots bare. Generally sod taken from a sandy soil will not be satisfactory. Dried out sod will be rejected.

A row of continuous sod not less than 5 inches wide and 2 inches thick shall be placed along the top edge of each slope and along the outer edge of each berm; then starting from such rows, other similar and parallel rows shall be placed ten (10) feet apart, measured down the slope. Where berms intervene, the rows below the berm shall be started 10 feet below the row on edge of berm.

In the space between the rows of continuous sod there shall be rows of "tufts" or blocks of sod not less than three (3") inches square and two (2") inches thick, set at 2 foot centres, both ways, so as to "break spaces" in the rows immediately above and below, *i. e.*, "staggered" with tufts above and below. All sod shall be set in trenches or holes deep enough to permit at least one (1") inch of cover after backfilling and spreading surplus material on the slopes. All sod shall be tramped or tamped into place.

The Contractor may, at his option and for his protection, at any time after an embankment has been constructed and the slope dressed to the prescribed grade, sod such slope, where sodding is shown or ordered.

The placing of sod on any slope at any time shall in no way relieve the Contractor of his obligation to maintain either the slope or the sod until final acceptance of the structure by the Owner.

Payment for sodding will be for the number of acres of slope and berm actually sodded as above prescribed, surface measured. Unit price per acre shall include the cost of furnishing, planting, covering and maintaining the sod. (Watering if necessary.)

10. ROADWAYS.

A gravel roadway will be constructed across the Main Dam at Eagle Mountain and at Bridgeport. The roadway will be placed in two courses of six (6") inches loose each.

The gravel shall be a good grade of road gravel containing between 15% and 30% clay.

The maximum size in base course shall be $2\frac{1}{2}$ inches. Maximum size in finish course shall be $1\frac{1}{4}$ inches. The width of pavement shall be 20 feet. The subgrade shall be carefully prepared and rolled. The gravel shall be sprinkled and rolled to the approval of the Engineer. Road gravel will be paid for on the basis of loose measurement, per cubic yard.

11. STEEL SHEET PILING.

(a) *Alternate A.* All steel sheet piling shall be "Carnegie" or "Lackawana" or other approved make, web and flange minimum of $\frac{3}{8}$ " thickness; weight per square foot not less than 30.9 pounds. It shall have a positive interlock capable of withstanding a pull of 9,500 lbs. per inch without failure, and so designed as to permit a 15 degree change in direction. Sections, if straight, shall equal Carnegie M-107, M-104, or Lackawana SP-15. Sections, if arch web, shall equal Carnegie M-106 or Lackawana DP-166. Section modulus of the arch web piling shall not be less than 8.86 per foot (not interlocked).

Piles over 40 feet in length shall be arch web type as described above. If, however, the driving is such as to permit straight piles to be driven, the Engineer may permit straight piles to be used for longer lengths than 40 feet.

(b) *Alternate B.* As an alternate either in whole or in part, piling shall be "Carnegie" or "Lackawana", or "J. & L." arch web, web and flange minimum of $\frac{3}{8}$ inch thickness, weight per square foot not less than 25.0 lbs. It shall be so designed as to permit a 15 degree change in direction. Piling shall be "J. & L." C-27, "Carnegie" M-109 (if furnished with web and flange minimum of $\frac{3}{8}$ inch, and meeting interlock test), or Lackawanna" DP-165 (flange minimum of $\frac{5}{16}$ inch acceptable). All sections shall have a positive interlock capable of withstanding a pull of 7,000 lbs. per inch without failure. Section modulus per foot shall be not less than 6.70, not interlocked.

(c) *Splicing.* As some lengths greater than 60 feet, possibly as long as 95 feet, will be required at Eagle Mountain Dam, splicing must be resorted to; splices shall be made by means of two flitch plates of same thickness as web of pile, or with one flitch plate and one channel, the plate of same thickness as web of pile, and channel approximately 20 lbs. per linear foot. Length of plate and channel shall be about 2 feet 3 inches, width about 10 inches. There shall be twelve $\frac{3}{4}$ inch bolts, square heads and hexagonal nuts to each splice; bolt holes shall be properly slotted.

All details of splice shall be submitted to and approved by the Engineer, prior to use.

In the construction of spliced piles, such lengths of component piles as will give "staggered" location of splices, shall be used.

(d) *Driving.* All steel piling shall be driven by steam hammer. If required a water jet shall be used.

Piling shall be securely interlocked from top to bottom, and driven truly plumb in line and grade indicated on plans.

Contractor shall furnish and "use" tapered piles for straightening up the line of piles. These piles shall be properly fabricated by splitting a pile, and bolting, riveting, or welding plates of proper thickness to the split pile. These shall be used whenever, in the opinion of the Engineer, they are needed to straighten up the line.

In the core trench the tops of piles shall extend into the "puddled" materials 4 feet to 6 feet, as directed by the Engineer. Any pile not properly driven shall be "pulled" and a new one driven.

Should stratigraphic changes at any point necessitate soundings in advance of the driving, the Contractor shall make same under the clause "Extra Work".

No boulders have been encountered in test borings. However, should such be found on driving steel sheet piling, the Contractor shall pull sufficient piling already driven to enable a curved offset to be made around the boulder and back to "line". The necessary additional cost will be allowed as "Extra Work."

(e) *Test Certificates.* Test Certificates of chemical analysis, tensile tests, and interlock tests shall be furnished by Contractor at his expense with each carload of piling.

(f) *Payments.* Payment will be made for steel sheet piling at the unit price bid per square foot in place which shall include all material and labor necessary or incidental thereto. Bids will be received on steel sheet piling in place up to 40 feet, between 40 and 60 feet and all over 60 feet. District reserves the right to accept all of Alternate A or all of Alternate B, or to accept part of Alternate A and part of Alternate B.

12. STRUCTURES.

12-A. *Excavation for Structures.*

The excavation for construction tunnel and flood gate structure shall be placed in the embankment if suitable for that purpose. The excavation will be paid for as embankment if so placed, or as "spoil bank" if not suitable for embankment.

All rough excavation for concrete or structures shall not be taken out closer than six (6") inches of finished grade. The foundations, slopes, back walls, etc., shall not be trimmed to grade until Contractor is ready to pour the concrete. No additional compensation will be allowed for this six (6") inches of "fine" grading.

12-B. *Excavation, Entrance and Tail Ditches.*

Contractor shall excavate entrance ditches to and tail ditches from the construction tunnels, and from the flood gate structures. This excavation will be paid for as "spoil bank" or as embankment as the case may be. It shall be placed in embankment if suitable for that purpose, free haul 300 feet; if haul exceeds 300 feet the excess distance beyond 300 feet will be paid for as overhaul as provided in Section 5, Page 2 hereinabove.

12-C. *Construction Tunnels and Service Conduits.*

A twin construction tunnel will be constructed at each main dam. The discharge curves for these tunnels are shown in the drawings. It is expected that these tunnels will care for normal flood flows during construction.

After the dam is completed, gate valves will be installed to control the discharge. Curves showing discharge after gate valves are installed are included in the plans. It is expected to regulate the flow of water from Bridgeport Lake to Eagle Mountain Lake to Lake Worth through these service conduits.

Stop planks may be used to raise water level during certain stages of construction—the Contractor assuming all liability and responsibility for flood hazard or damage.

12-D. *Spillways.*

At Eagle Mountain a floodway opening of 100 feet will be maintained. The structure will be a concrete gravity section to base of gates. If required, 21 pounds per square foot steel sheet piling will be driven at upstream toe of gravity section, and at toe of apron on downstream side.

The gate structure will consist of radial gates or caterpillar gates. The gates will be operated by hoists located as shown in the plans. The hoists shall be suitably geared for hand operation, and for electric operation—when electricity shall become available.

Where soil conditions require it, wood foundation piles will be driven under the gravity section.

The flood structure of Bridgeport Dam is similar in all respects—except is but sixty (60') feet in length.

A concrete bridge will be constructed across spillways at both dams.

12-E. *Flow of Water.*

Contractor shall take care of the flow through the structures during period of construction at his own expense. In case the bed of the stream is left open until the rest of the earthwork is finished, the filling in of the gap shall be done in such a way as to insure its bond with the completed earthwork to the satisfaction of the Engineer. In case a construction culvert (except as shown) of any kind be used same shall be backfilled with 1:3:6 concrete. (No additional compensation for concrete backfill will be allowed).

Particular attention is called to the fact that the water level must be kept below the subgrade on which rip-rap is to be placed. This will be insisted upon.

12-F. *Cast Iron Pipe Laying.*

All cast iron pipe shall be laid with hemp gasket and soft pig lead joints in an acceptable workmanlike manner. Where indicated on the plans the pipe shall be flanged, faced and drilled, American Society of Mechanical Engineers Standard drilling.

Cast iron pipe and fittings shall be sand cast in vertical molds, and shall meet the latest specifications of the American Water Works Association.

Pipe shall be Class B, fittings shall be Class D.

12-G. Gate Houses.

Gate houses will be erected over the valves in the service conduits. Contractor shall allow \$30.00 per thousand for face brick. Over and unders will be added or deducted from the lump sum bid for "gate houses".

Gate houses will be paid for at "lump sum" bid. Gate houses for payment to commence at floor elevation.

(a) *Common Brickwork.* All common brick work used to be hard burned and of approved make. Lay all face brick in a full bed of mortar well slushed, and with $\frac{1}{2}$ inch joints. Build in all frames, lintels, etc., as work goes up. Lay all brick in mortar composed of 1 part Portland cement, 1 part hydrated lime and 5 parts sand.

(b) *Stone.* All stone trim shall be white cast cement stone. Box and protect stone and clean down at completion of building. Point stone with white cement after setting.

(c) *Roof.* Roof shall be of reinforced concrete as shown on the plan, all properly flashed and downspouted with a tar and gravel "Barrett Twenty Year Specification" covering, with 20 year guaranty Bond, direct to the District. Care shall be taken to obtain a smooth surface on the underside. All form marks on underside shall be removed by carborundum.

(d) *Sheet Metal Work—Extent.* The Contractor shall furnish, and place, complete, flashing and counter-flashing, gutters, leaders and down spouts. This includes all metal flashing around all walls, vent pipes and openings of flat and pitch roofs, the gutters, leaders and flashing at eaves.

Flashing. All flashing and counter-flashing shall be of 16-ounce copper. For walls an opening in the flat roofs, flashings of felt will be provided under tar and gravel roofing, but counter-flashing of copper shall be provided to a height of at least eight (8") inches above the roof. Counter-flashing shall be at least eight (8") inches above the roof. The counter-flashing shall be set into the joints of the brickwork or into reglets, and secured with lead and pointed with cement mortar. Flashing along the eaves and hips of pitched roofs above the gutter shall extend up the roof for a distance of at least eight (8") inches. All flashing shall be done in conformity with the necessary requirements for the tar and gravel roofing.

Gutters. Gutters shall be of 16-ounce copper, with soldered joints, shaped as shown on the drawings, firmly secured and braced in the proper shape. They shall be pitched toward the leaders.

Downspouts. The downspouts shall be of 20-ounce copper, rectangular in sections, four inches by three inches, connected to the gutters by suitable goose-necks and heads. The downspouts shall be provided at the bottom with six (6') feet of four (4") inch extra heavy cast iron soil pipe, and shall be connected with soil pipe into nearest channel. All downspouts shall be provided with approved copper wire baskets or strainers at the top (of "capacity area").

(e) *Metal Sash.* Metal sash shall consist of Bayley-Springfield, glazed D. S. A. glass, metal sash, which shall be installed in accordance with the manufacturer's instructions. Ventilators shall be chain operated from the floor. Bayley-Springfield center pivoted screened ventilators (type C. P. S.) shall be furnished. Suitable catches and locks shall be furnished.

(f) *Steel Doors.* All doors, frames, jambs, etc., shall be of steel. Doors shall be constructed in a workmanlike manner, and shall be Gross Metal Products Co., Minneapolis, Minn., Type B. D. (solid metal door), or equal. Frames shall be set

plumb and well braced, all frames being securely fastened to the brickwork or concrete. Thresholds or sills of pressed steel of suitable pattern shall be provided on all exterior doors.

(g) *Painting.* All steel sash shall have two coats of S. and W. paint or its equal, put on in a neat and workmanlike manner. All metal work such as flashing, sash, doors, etc., shall have three coats of S. and W. paint or its equal.

All woodwork shall have three coats of S. and W. paint or its equal, put on in a neat and workmanlike manner after all nail holes and imperfections have been filled up.

Inside of all masonry shall be painted with two coats of S. and W. water-white paint or its equal.

(h) *Finish Hardware.* Contractor shall allow fifty (\$50.00) dollars for finish hardware (each house) to be selected by the Engineer. This shall include all finish hardware. Contractor to furnish all heavy hardware, such as nails, bolts, etc. Hardware shall be Yale or equal.

(i) *Gate Valves in Gate Houses.* Gate valves shall be installed in a thoroughly workmanlike manner. Gate valves shall be A. W. W. A., iron body, double disc, bronze mounted, 150 pounds working pressure, non-rising stems, Eddy, Rensselaer, or equal, to open by turning to the left. The valves in well head shall be non-rising stem with floor stand and mechanical indicator provided on extension stem. Threaded portion of spindle shall be cold rolled bronze. Guides for extension stem shall not exceed 10' center to center.

Floor stands shall be Rodney Hunt S-4024N with 3½ inch manganese bronze stem. Stem guides or brackets shall be spaced 10'0" center to center. Thrust bearings of stand shall be ball. Crank shall be 15 inches. Stand shall be indicator type. Threads shall be bronze.

(j) *Carpenter and Mill Work, Workmanship and Materials.* All carpenter and mill work shall be carried out in a neat and workmanlike manner, with closed, well fitted joints. All nails, bolts, dowells and screws shall be provided and properly used to secure first-class and substantial results. All lumber shall be satisfactory to the Engineer and of a quality fully adapted to the purpose for which it is to be used. All ordinary lumber shall be No. 1 common. All woodwork shall be adequately protected from damage from any cause during the construction of the work. When necessary it shall be properly primed before being placed.

Screens. All windows shall be equipped with outside and inside removable screens, substantial frames, with 14-mesh copper or bronze wire cloth. Outside doors, and those of all other brick buildings, shall be equipped with screen doors, substantial frames, and wire cloth of same description as for windows. Screens shall be of a close-fitting type. Screens shall be installed on all buildings covered by this contract. Screens shall have metal frames. Screens shall be Melba or equal.

(k) *Ventilators.* Three Swartwout ball bearing ventilators shall be furnished and installed in each gate house. Ventilators shall be 18", 18-ounce copper, and provided with outside louvres.

Bases shall be Swartwout 24-ounce copper.

Ventilators shall be installed and flashed in a workmanlike manner.

(l) *Backfilling Around Gate Houses.* In cases where the methods specified for building embankments around, or adjacent to structures, are not sufficient to produce satisfactory results, special backfilling may be required by the Engineer, to be made of selected clay or other approved material, and placed in a manner that will secure a compact, water tight fill against the structure. Backfilling material shall be deposited in water, or puddled, where practicable; otherwise it shall be deposited in layers about six (6") inches thick, well wetted and hand tamped or rolled, to secure a compact contact with the structure before the next layer is placed.

Payment for special backfilling around gate houses and shaft will be at the unit price bid per cubic yard for the earth work in the Main Embankment.

13. *COUNTRY SPILLWAY (BRIDGEPORT).*

Bridgeport Country spillway will be excavated at place designated on plans. Concrete retaining walls and grouted rip-rap will be built along the sides of the country spillway. Where the spillway is not in suitable rock, grouted rip-rap and concrete aprons will be built. Payment for this will be at the unit prices bid for that class of work.

Any rock found in spillway suitable for rip-rap shall be used for that purpose. Payment will be made only as rip-rap, or rock spoil bank.

All Bridgeport excavated material (except rock used for rip-rap) shall be placed in "spoil bank" and paid for at price bid under that head.

14. *GUARD FENCE FOR ROADWAY ON DAM.*

There shall be built on the down stream side of the gravel roadway a Hi-way Guard fence 3'0" wide of length and between points designated by the Engineer, as per plan shown on the drawings. Such fence shall be built of 6"x6" creosoted (12 lb. treatment) pine posts placed as shown, with a line of chain link fabric (Hi-way Guard), as manufactured by Page Fence Association. All posts shall be capped with 7"x10" sheets of No. 26 galvanized iron.

Payment shall be made for Hi-way Guard fence on the basis of the unit price bid per linear foot, which shall include the cost of all materials and labor.

15. *PIPE HAND RAILS AND LINK FABRIC.*

Hand rails of 2 inch (diameter) galvanized wrought iron pipe (Byers or Reading) shall be built on the headwalls and slope walls of the conduits, flood-gate structures, and walkway to gatehouses, as shown on the drawings, or as may be required by the Engineer.

On the inside of this railing shall be placed a line of galvanized chain link fabric two and one-half (2½) feet in width, as shown on the plans, and fastened to pipe railing with appropriate clamps. Such chain link fabric (Hi-way Guard) as is manufactured by the Page Fence Association of Chicago, Ill., shall be used, or similar fabric of equal quality, as may be approved by the Engineer.

Payment will be made for pipe hand rails on the basis of the unit price bid per linear foot of railing, which shall include the cost of all materials and labor, including the chain link fabric hereinabove referred to.

16. *OVERHAUL.*

No overhaul will be paid upon any construction or materials except by specific approval in writing by Engineer.

17. *VITRIFIED PIPE SLOPE DRAINS.*

Vitrified pipe drains, eight (8) inches in diameter, shall be placed upon the downstream slope of the embankment, as shown by drawings. Such pipe shall be standard strength U. S. sewer pipe and shall be laid with jute and cement mortar joints approved by the Engineer, in a trench upon the slope 24 inches in depth. Proper grouted paved inlets and outlets shall be built as per plans provided. Inlets shall have gratings installed, made of bars of reinforcing steel properly placed to serve as trash racks.

Payment shall be made for slope drains at the price bid per linear foot of pipe and and for grouted paving at the price per cubic yard, which shall include the cost of all labor, material and other items, except cement and reinforcing steel.

18. *TILE DRAIN UNDER SLOPES OF CONDUITS AND FLOOD GATE.*

The Contractor shall install lines of six (6) inch No. 1 tile drains under the concrete of the lower slopes of the conduits and flood gate structure, as shown on

the plans. Payment shall be made for such tile at the price bid per linear foot which shall include all costs of materials and labor, including the obtaining and placing of the necessary gravel in which the tile is imbedded. The excavation for the tile drains shall be included and paid for as "floodgate structure excavation". The gravel shall be screened and have a diameter in excess of one-fourth inch.

19. WOODEN FOUNDATION PILING.

(a) The masonry section and abutments of conduits and floodgate structures will be constructed on non-treated short leaf pine pile foundations, if required. Piles will vary from 25 to 35 feet in length and shall be 12 to 14 inches in diameter at the butt.

A line drawn from center of butt to center of tip shall lie within the pile.

Unless otherwise allowed, piles shall be cut while "sap is down," and must be peeled shortly after cutting; all knots shall be trimmed close to body of the pile.

Annual rings shall be not less than six (6) per radial inch.

(b) *Spacing and Driving.* All piles shall be spaced as shown on plans, unless deviations from plans are ordered by the Engineer, in writing. All piling shall be driven vertically. If necessary to prevent "brooming" the Contractor shall provide and use rings, bands, or caps of suitable design at his expense.

Should the ground through which piles are to be driven be so hard as to require metal points on the piles, the Owner will furnish said points to the Contractor, free of charge, and will pay the Contractor an agreed "extra" for "shoeing" such piles as are "shod".

Piles shall be driven to "practical refusal", which is here understood to mean driven to such depth that the last five blows of a 3,000 pound hammer freely falling fifteen (15') feet upon the unbroomed head of a pile shall not produce an average penetration greater than one-half ($1\frac{1}{2}$ ") inch for each blow. For other weights of drop hammers falling from twelve (12') feet to fifteen (15') feet, and for steam hammers, the penetration for "practical refusal" as above defined may be determined from the following formulæ:

(a) Gravity Hammers:

$s = WH/30,000 - 1.0$; average for each of last five blows:

(b) Steam Hammers:

$s = WH/30,000 - 0.1$; average for each of last twenty blows, where s =penetration in inches; W =weight of falling hammer in pounds; H =fall of hammer in feet.

After driving to "practical refusal", all piles shall be squarely cut off to elevations shown on plans.

Payment. Wooden foundation piling will be paid for at the unit price bid per foot for piling in place.

20. GATE STRUCTURES.

Bids will be taken separately for the furnishing and erection of gates and hoisting equipment. Bidders on the gates and hoists shall furnish detail plans, designs, loadings assumed, and complete specifications.

Three gates and hoists shall be furnished at Eagle Mountain and shall be 25 feet wide by 31 feet high. Two gates and hoists shall be furnished at Bridgeport and shall be 20 feet wide by 35 feet high.

All hoists shall be stationary.

An allowance of 100% for shock and impact shall be made.

Steel stresses shall not exceed 16,000 pounds per square inch.

Bids will be considered on Tainter (radial) gates, and on Caterpillar (Phillips and Davies) gates. A steel housing shall be provided for the hoists. Doors shall be installed on all four sides. Hoists shall be electrically operated, and shall be geared and equipped for hand operation.

Bidder shall furnish on each project one extra hoist with full length cable, except miscellaneous angles, etc. Complete set of accessories shall be furnished.

General Contractor may bid on this item, but the District reserves the right to award this item to another bidder.

Fabricators and erectors are requested to bid this item to the District direct, and also to bid with the bidders on the General Contract.

Bidders are expected to examine the general plans, and make their design conform to the concrete structure to be erected.

All equipment shall have one shop coat of red lead and oil, and two field coats of Detroit Graphite No. 30 Black.

The metal forming the structural steel for the gates must be of open hearth mild steel having an elastic limit of not less than 38,000 lbs. per square inch, or a tensile strength of not less than 60,000 lbs. per square inch, and shall show an elongation of not less than 2 inches in the standard eight (8") inch test piece, and a reduction of area of not less than fifty (50%) per cent in the net area of the fractured section.

The test specimen shall bend cold through 180° without cracking on the outside of the bent portion as follows: For material $\frac{3}{4}$ inches or under in thickness, around a pin the diameter of which is equal to the thickness of the specimen; for material over $\frac{3}{4}$ inches, to and including $1\frac{1}{4}$ inches in thickness, around a pin the diameter of which is equal to $1\frac{1}{2}$ times the thickness of the specimen; and for material over $1\frac{1}{4}$ inches, around a pin the diameter of which is equal to twice the thickness of the specimen.

The steel shall conform to the following requirements as to chemical composition:

Phosphorus	Sulphur
{ Acid—not over 0.06 per cent.	Not over 0.06 per cent.
{ Basic—not over 0.04 per cent.	

Certificates of test on all structural steel, by some reputable testing laboratory, must be furnished the Engineer by the Contractor prior to the use of the material in the work.

21. LAND AND RIGHT OF WAY.

The Owner will furnish to the Contractor the land upon which the dam and its appurtenances shall be built, including the necessary borrow pits, spoil banks, material yards and camp sites for employees and secure to the Contractor full and convenient ingress and egress to the work. Such camps and material yards, including offices and other houses and facilities as may be built by the Contractor, shall be so located, arranged and situated as shall be approved by the Engineer, and shall be removed and grounds left in neat and presentable condition upon completion of the works, by the Contractor, at his expense.

22. CONCRETE AND CONCRETE MATERIALS.

(a) *General Description.* All concrete shall be composed of cement, fine aggregates, coarse aggregates, and water of the qualities hereinafter specified, and mixed in proportions described by the Engineer. The cement will be paid for as a separate and distinct item. The proportions of all ingredients may be varied by the Engineer to suit the requirements of the various structures, and the Contractor shall make no claim for extra payment because of such variations in mixture, the contract unit price for each item being understood to apply to any mixture which may be specified. It is acknowledged that different sands, stones and gravels may give widely different strength tests, and for this reason, and to ac-

commodate the mixture to the detail requirements of the work, the Engineer may order the proportions modified from time to time as may be necessary to obtain the best results.

Except in special cases, the proportions by volume are expected to range between 1 part by volume of cement, 2 of fine aggregate, and 4 of coarse aggregate for the richer mixtures, and 1 of cement, 3 of fine aggregate and 6 of coarse aggregate for the leaner mixtures.

Concrete will be proportioned by the water cement ratio.

Large stones may be embedded in the concrete at the option of the Contractor, whenever in the opinion of the Engineer, the introduction thereof will be no detriment to the quality of the work.

(b) *Samples.* Samples of both fine and coarse aggregates which the Contractor proposes to use shall be submitted to the Engineer for approval a sufficient time in advance of use to allow for the necessary tests for determining the suitability of the material for the use contemplated, and for determining the exact proportions required under the various items.

(c) *Water-Cement Ratio.* Concrete shall be proportioned to give the necessary workability without exceeding the following quantities of mixing water:

2500 lb. concrete @ 28 days, 6.75 U. S. gals. water per 94 lb. sack of cement.

1500 lb. concrete @ 28 days, 8.25 U. S. gals. water per 94 lb. sack of cement.

These water-cement ratios are the maximum permissible. The mixes shall be proportioned for somewhat lower ratios so that with the normal fluctuations from batch to batch these ratios will not be exceeded. Moisture held by the aggregate must be included in computing the above water-cement ratio.

The water cement ratio specified shall not be changed except by the Engineer.

(d) *1:14 Concrete Backing.* In special cases a concrete for filling or backing will be used. This concrete will be composed of one (1) part Portland Cement as hereinafter specified, and fourteen (14) parts clean, well graded "pit-run" gravel and sand. (Water-cement ratio not to be used.)

(e) *Application of Water-Cement Ratio to Fort Worth Aggregates.* The Engineer has on file a typical mix, using aggregates commonly used in Fort Worth, based on the above specifications.

This information will be furnished as illustrative and is not to be construed as actual field mixes.

(f) *Measuring Moisture in the Aggregate.* Moisture in the aggregate shall be measured by a method satisfactory to the Engineer, which will give results within one pound for each one hundred (100) pounds of aggregate.

(g) *Concrete Proportions and Consistency.* The proportions of aggregate to cement for concrete of the water-cement ratio specified shall be such as to produce concrete that can be puddled readily into the corners and angles of the form and around the reinforcement without excessive spading and without segregation or undue accumulation of water or laitance on the surface. In no case shall concrete be placed which shows a slump (with standard slump cone), greater than 7" nor less than 3". For the purposes of this contract, all concrete shall be considered as having a consistency of from 6" to 7" slump. With the permission of the Engineer, the Contractor may in certain classes of work, use a slump of 3" to 4". The proportion of fine and coarse aggregate shall be such that the requirements of the following table are complied with:

Maximum Size of Coarse Aggregate	Ratio of coarse aggregate to fine aggregate on basis of dry and rodded volumes.	
	Minimum	Maximum
3/4"	0.6	1.5
1" and over	1.0	2.0

In no case shall the amount of coarse material be such as to produce harshness in placing or honey-combing in the structure when forms are removed. The surface and corners of the members shall be smooth and sound throughout.

(h) *Control of Proportions.* The methods of measuring materials shall be such that the proportions of water to cement can be closely controlled during the progress of the work and easily checked at any time by the Engineer or his representative.

To avoid unnecessary or haphazard changes in consistency the aggregates shall be obtained from a source which will insure uniform quality and grading during any single day's operation and they shall be delivered to the work and handled in such manner that variations in moisture content will not interfere with the steady production of concrete of reasonable degree of uniformity. All sources of supply shall be approved by the Engineer.

(i) *Proportions for Concrete.* The Contractor will be permitted to use coarse aggregate with a maximum size of 2" for 2500 lb. concrete and 3" for 1500 lb. concrete except in walls or slabs 4" thick maximum size of aggregate shall be 3/4"; walls or slabs 6" thick maximum size of aggregate shall be 1 1/4", and in walls or slabs 8" thick maximum size of aggregate shall be 1 1/2". For the purpose of regulating the proportions the following table shall be used in determining the maximum permissible proportions of aggregate, mixed dry and rodded, per sack of cement, and also the maximum grading factor of mixed aggregate permissible for given maximum size of aggregate.

2500 lb. CONCRETE

Slump 6" to 7"

Maximum Size Aggregate	Parts Mixed Dry and rodded per sack of cement	Grading Factor Mixed Aggregate
3/4"	3.80	5.05
1"	4.00	5.35
1 1/2"	4.40	5.75
2"	4.90	6.10

2500 lb. CONCRETE

Slump 3" to 4"

3/4"	4.70	4.95
1"	5.10	5.30
1 1/2"	5.50	5.65
2"	6.00	6.05

1500 lb. CONCRETE

Slump 6" to 7"

3/4"	5.70	4.85
1"	6.20	5.25
1 1/2"	6.80	5.55
2"	7.20	5.90
	8.10	6.35

1500 lb. CONCRETE

Slump 3" to 4"

	6.80	4.75
3/4"	7.40	5.10
1"	8.00	5.45
1 1/2"	8.80	5.85
2"	9.60	6.20

It is understood that the Engineer may require all concrete to be run at a slump of 6" to 7".

(j) *Tests of Concrete.* Frequent tests may be required by the Engineer throughout the work to determine the quality of concrete. These tests shall be made by an independent Testing Laboratory satisfactory to the Engineer. Cost of inspection will be borne by Contractor (Contractor shall include in his bid \$250.00 for this purpose), and will in general be made on 6" and 12" concrete cylinders, loaded in compression at 7 and 28 days, in accordance with the Standard Method of Making and Storing Specimens of Concrete in the Field (Serial Designation C31-27 and C39-27) of the American Society for Testing Materials. Cylinders tested at 7 days shall show strengths of 1700 lbs. per square inch for 2500 lb. concrete and 1000 lbs per square inch for 1500 lb. concrete. This relation may be varied later based on actual tests of concrete going into the structure. The final determination of mix will be based on 28 day tests.

(If the services of the Testing Laboratory cost an amount greater than \$250.00, Contractor will receive additional payment to cover the additional cost. If the services cost less than \$250.00, the District shall be credited with the saving.)

The Contractor shall co-operate in every way to the end that concrete of the desired quality be obtained. He shall provide such housing as may be required for testing equipment and storage of test specimens.

The Contractor if he desires may, at his expense, have tests made of cylinders as a check on the tests made by the ~~City~~ District

(k) *Portland Cement.* Portland Cement shall conform to the Standard Specifications and Tests for Portland Cement of the American Society for Testing Materials (Serial Designation: C9-26).

Test certificates from an independent Laboratory satisfactory to Engineer shall be furnished, stating that the cement meets the specifications hereinabove described.

It is further expected that cements shall show at least 90 lbs. per square inch increase in tensile strength of the standard mortar briquette at 28 day over 7 day test.

The Contractor shall furnish test certificates with each carload of cement at his expense. Test certificates of laboratory of Company furnishing cement will not be acceptable. In case of "rush" emergency work the Engineer will consider the cement satisfactory if seven-day one to three sand briquette tests, initial and permanent setting tests, fineness tests, and "dry" and "boiled" pat tests are duly certified by the laboratory as complying with standards. All cement shall be stored in dry buildings with floors well above the ground.

(l) *Fine Aggregate.* Fine aggregate shall consist of natural washed and screened sand having clean, hard, strong, durable, uncoated grains. Aggregates containing soft, friable, thin, flaky, elongated or laminated particles totaling more than 3%, or containing shale in excess of 1½%, or silt and crusher dust finer than the No. 100 standard sieve in excess of 2% shall not be used. These percentages shall be based on the weight of the combined aggregate as used in the concrete. When all three groups of these deleterious substances are present in the aggregates, the combined amounts shall not exceed 5% by weight of the combined aggregate. The sand shall be of such sizes that it shall all pass a ⅜" sieve. At least 95% shall pass ¼" sieve. At least 15% shall be retained on the No. 8 sieve, and the fineness modulus or grading factor shall not exceed 3.20.

Aggregates shall not contain strong alkali or organic material which gives a color darker than the standard color when tested in accordance with the Standard Method of Test for Organic Impurities in Sands for Concrete (Serial Designation: C40-22) of the American Society for Testing Materials. All fine aggregate shall be thoroughly washed and screened.

(m) *Coarse Aggregate.* Coarse aggregate shall consist of sound, washed and screened gravel or clean crushed stone, having clean, hard, strong, durable, uncoated particles free from injurious amounts of soft, friable, thin, elongated, or laminated pieces, alkali, organic or other deleterious matter. Coarse aggregate shall not have more than 10% finer than the No. 4 sieve and the maximum size shall not exceed 2" for 2500 lb. concrete or 3" for 1500 lb. concrete.

Maximum size is defined as being the next larger screen than the one on which 15% is retained. Crushed stone shall be free from dust and balls of clay.

Large Stones: Where permitted, clean, sound, non oil-bearing stones of acceptable size may be imbedded in the concrete, provided they can be thoroughly incorporated in the mass and surrounded by an acceptable thickness of concrete. Such stones at the moment of placing in the concrete shall be clean, wet, and free from frost, and shall be well bedded by joggling. Projecting parts of such stones shall be cleaned and wet again, if required, before being covered with concrete. Larger stones shall not be placed without first having been inspected by the Engineer.

(n) *Storage of Aggregate.* Aggregate shall be so stored as to avoid inclusion of foreign materials. Frozen aggregate, or aggregate containing lumps of frozen materials, shall be thawed before using.

(o) *Water.* All water for concrete shall be clean and free from strong acids, alkalis, oil or organic materials. The mixer is to be equipped with suitable water measuring device so that the determined quantity of water may be measured and a uniform amount used per batch.

(p) *Mixing.* All concrete shall be mixed by mechanical "batch" mixer, one minute after addition of all aggregate, cement and water. Mixer shall be equipped with interlocking time device insuring full one minute mix as specified. (The Contractor's attention is called particularly to the statement that a 1-minute mix will be insisted on, in the mixer.) Under no circumstances will "sloppy" concrete be tolerated. (The Engineer will permit the handmixing of concrete on suitable platform for parts of the work where it would be onerous to arrange for machine mixing.)

(q) *Placing and Construction Joints.* After proper mixing, the concrete shall be placed without undue delay (not over fifteen minutes) by methods which will prevent the separation or loss of the ingredients, and well spaded around reinforcing bars and against forms. It shall be deposited as nearly as practicable in its final position to avoid rehandling or flowing. Under no circumstances shall concrete that has partially hardened be deposited in the work. Spading shall be done in such thorough manner as to leave surface of concrete, at forms, smooth and free from voids. Construction joints shall be located as directed by the Engineer. Keyed joints will in general be insisted upon at construction joints.

When concrete is conveyed by chuting, the plant shall be of such size and design as to insure a practically continuous flow in the chute. The slope of the chute shall be such as to allow the concrete to flow without separation of the ingredients. The delivery end of the chute shall be as close as possible to the point of deposit. When the operation is intermittent, the spout shall discharge into a hopper. The chute shall be thoroughly flushed with water before and after each run; the water used for this purpose shall be discharged outside the forms.

(r) *Finishing.* All concrete shall be reasonably true and even, free from pockets, excessive depressions or projections. Unless otherwise specified, the forms of all vertical surfaces that will not eventually be covered with earth (and of such other surfaces as may be directed by the Engineer), shall be removed as soon as the safety of the work will permit (usually in not less than 24, nor more than 48 hours), and the whole surface then rubbed with a wooden "float" and clean water until form marks have been removed, leaving the surface plane, smooth and uniform. In addition to this "float" treatment, the exposed surfaces

of concrete walls shall be rubbed off with carborundum float, dipped in thin grout composed of water and neat Portland cement.

(s) *Retempered Mortar.* All beams, girders, slabs and columns shall be made at one pouring. In the case of walls and footings, pouring may be done in sections of size and shape approved and permitted by the Engineer. Where fresh concrete is to be poured against concrete which has hardened, the surface of the latter shall be cleaned, moistened and covered with a coat $\frac{1}{2}$ inch thick of "1 to 2" Portland cement mortar "retempered", without addition of water, three times in four hours. This latter applies to the joining of new to old concrete and should there be a flow of water past such joint, same shall be made watertight by the application of asphalt paint, followed by hot asphalt of suitable consistency. The filling of any pits, recesses left by nuts or bolts, or of any irregularities of concrete surfaces, shall be done with "retempered mortar".

(t) *Freezing Weather.* When depositing concrete at freezing or near freezing temperatures, the concrete shall have a temperature of at least 50° F., but not more than 120° F. The concrete shall be maintained at a temperature of at least 50° F. for not less than 72 hours after placing or until the concrete has thoroughly hardened. When necessary, concrete materials shall be heated before mixing. Dependence shall not be placed on salt or other chemicals for the prevention of freezing. No frozen materials, or materials containing ice, shall be used. Manure shall not be applied directly to concrete when used for protection.

(u) *Forms.* Forms for concrete may be of steel or wood. If steel, they shall be of such design and thickness and so braced as to be rigid and to hold true against buckling; shall be well cleaned and oiled (with mineral oil) prior to each using.

Wooden forms shall be of substantial character, sufficiently strong, properly tied by galvanized wires or by form bolts, braced and anchored in place to withstand shocks due to construction, and to prevent distortion or buckling; must be tight and well fitted to prevent leakage of cement.

All girders and beams shall be "cambered" one quarter ($\frac{1}{4}$ ") inch for each five (5') feet of span.

(v) *Seasoning and Protection of Concrete.* All concrete surfaces shall be kept moist by sprinkling, or by burlap and sprinkling, for a period of seven (7) days, as directed by the Engineer, and all uncovered surfaces protected from deformation or abrasion until thoroughly hardened. No form shall be removed without permission of the Engineer. Upon removal of forms, all tielines shall be "cut back" into the concrete to a depth of one-half ($\frac{1}{2}$) inch, and the "pit" smoothly filled with "1 to 2" rettempered mortar described in "(q)" above; similarly in case of form bolts. In case forms are re-used they shall be thoroughly cleaned before re-erection.

(w) *Finishing Concrete Floors, and Walkways.* Floors in structures of all sorts shall be poured monolithically and shall receive a $\frac{3}{4}$ inch finishing coat of 1:2 Portland cement mortar, applied before the concrete has attained its permanent set, well trowelled and suitably flagged. Flagging shall be approximately five (5') feet each way. Floors shall be 2500 lb. concrete.

All walkways shall be finished as described above, viz., finishing coat of $\frac{3}{4}$ inch of 1:2 mortar.

(x) *General.* The water-cement ratio specification is based upon the work of the Portland Cement Association and the method to be followed in the actual design of the mix shall be that described in Bulletin "Design and Control of Concrete Mixtures", Second Edition, January 1927.

All terms hereinabove used shall take the definition and meaning as described in this Bulletin.

(y) *Changes in Quantities of Concrete.* Where plans are changed in such manner as to cause an increase or decrease in the quantities of concrete, steel or forms, the unit prices in the contract shall be used to compute the additional or reduced compensation. The lump sum bid for the structure complete shall include all costs of labor and material contemplated by the plans and specifications, but the unit price bid for additions and deductions to cover changes shall govern such additions and deductions and the price bid for such concrete does not include the cost of forms or reinforcing steel. In order that no doubt will exist in the bidder's mind, the following illustrations are given:

First: An extra beam is added. The Contractor will be paid:

- (a) For additional concrete
- (b) For additional forms
- (c) For additional steel,

all at unit prices bid for additional or extra units.

Second: A beam 40 feet long and 12 inches wide and 3 feet deep, containing 500 pounds of steel, is changed to one 40 feet long, 12 inches wide and 2 feet deep, containing 400 pounds of steel.

The Contractor's estimate will be reduced as follows:

- (a) 80 square feet forms
- (b) 40 cubic feet=1 13/27 cubic yards concrete
- (c) 100 pounds steel,

all at the unit price bid for additional or extra units.

On all questions involving additions and deductions, the Contractor must get written authority from the Engineer before such change is made and such authority must state how the compensation is to be determined.

(z) *Conduits and Pipes.* Before pouring any concrete, all conduits and pipes shall be put in place and kept above the reinforcement, dipping down into the sockets at junctions, and the Contractor shall see that all the necessary conduits, plugging boxes, etc., have been installed before the concrete is poured.

23. REINFORCING STEEL.

(a) All reinforcing steel shall meet A. S. T. M. specifications for new billet steel A15-14. Steel shall be structural grade. Intermediate grade will be acceptable if it meets the bending tests for structural grade. Steel shall be "open hearth" or "Bessemer".

Rail steel may be used for bars $\frac{3}{4}$ inch and smaller. Rail steel shall meet A. S. T. M. Specifications A16-14.

(b) *Shape of Bars.* All square bars shall be cold twisted or otherwise deformed, and all round bars deformed. All bars shall be thoroughly cleaned before placing, and kept clean until concrete is poured around them.

(c) *Placing and Maintaining Reinforcement.* The steel shall be placed in the forms exactly as shown on the plans. It shall be maintained in place in the beams by blocks of one to two mortar properly grooved to hold the bars from lateral displacement, or by any other effective means; and instances where two or even three layers of reinforcement are shown, approved spacing blocks shall also be placed between each layer, spaced sufficiently close together to prevent appreciable sag of the bars. The slab reinforcement shall be raised off the forms by means of small concrete blocks of same mixture as mentioned above and shall be wired to the

longitudinal bars to maintain the proper spacing. It is very important that the length of bars, spacing and points of bend in same be maintained as shown on the plans. Where splicing is necessary, the bars shall be lapped at least forty (40) diameters, but no bar shall be spliced at the points of maximum tension.

At all corners and at the junction of walls and floors the reinforcement must tie together so the strength of the junction shall equal the strength of the wall or floor, with bonds and laps of at least forty (40) diameters.

Stirrups in each beam shall be wired to at least two longitudinal bars in order to prevent displacement during the pouring. Stirrups shall be bent around the longitudinals both at the top and the bottom of the beam where such longitudinal bars exist so that each end of the stirrup rod is firmly anchored to the longitudinal rods.

(d) *Inspection.* All reinforcing steel (after placing) is to be inspected and approved by the Engineer and not until this inspection has been made and approval obtained, may the work of pouring proceed. All reinforcing steel shall be tested and approved by an independent Testing Laboratory at Contractor's expense. Such certificates of test shall be sent to Engineer.

24. STRUCTURAL STEEL FOR BUILDINGS.

(a) Structural steel shall conform to latest specifications of American Society for Testing Materials for Open Hearth New Billet Steel—Structural Grade, A. S. T. M. A9-24.

(b) *Painting Structural Steel.* All structural steel inside buildings (not exposed to weather) shall be given one shop coat of red lead and boiled linseed oil, and one field coat of Detroit "Graphite" and boiled linseed oil. All exposed structural steel shall be given one shop coat of red lead and boiled linseed oil, and two field coats of Detroit "Graphite" and boiled linseed oil.

25. CLEARING.

The entire areas to be covered by the lakes to be created by the Eagle Mountain and Bridgeport Dams, with the exceptions noted below, shall be cleared of all trees, brush, shrubs, etc., up to an elevation one (1') foot higher than "spillway level" in each case, as follows:

(a) All trees four (4") inches to one (1') foot in diameter at a point one (1') foot above the ground, shall be cut off at an elevation not greater than one (1') foot above the ground:

All trees larger than one (1') foot in diameter at a point one (1') foot above the ground, shall be cut off at an elevation above the ground not greater than such diameter, that is to say, a tree sixteen (16") inches in diameter may be cut off sixteen (16") inches above the ground and similarly with larger diameters, but no tree shall be cut off at an elevation greater than two (2') feet above the ground.

(b) All brush and shrubs, and trees less than four (4") inches in diameter at a point one (1') foot above the ground, shall be cut off at an elevation not greater than eight (8") inches above the ground.

(c) All trees, brush and shrubs thus cut, and all woody debris and branches and all logs and driftwood and such logs and driftwood as may stand upon the lake areas during the course of construction ~~as may stand upon the lake areas during the course of construction~~ of the dams up to the time of their completion and final acceptance, shall be placed in suitable heaps or piles, dried and burned, excepting such woody material as the Contractor may elect to take away for his own use or for sale.

(d) "Clearing" will include all areas having trees four (4") inches and larger in diameter, together with the brush, shrubs, logs and driftwood growing or lying

among them, providing however that there be more than twenty-four (24) trees of four (4") inch or greater diameter per acre;

(e) "Light-clearing" will include all areas having trees four (4") inches and larger in diameter, with the brush, shrubs, logs and driftwood growing and lying among them, providing however, that there be less than twenty-five (25) trees of four (4") inch or greater diameter per acre.

(f) Clearing will be paid for as Clearing, and Light-clearing, at prices bid for these classes, respectively.

(g) *Exceptions to Clearing Provisions.* There are many areas eventually to be inundated by the Eagle Mountain and Bridgeport lakes to levels that will more than cover tree-tops; the District Directors may elect to leave such areas uncleared. There are also many areas within the inundated areas, that are or have been in cultivation, and are covered by the "stubble remains" of crops or by brush, shrubs or weeds that may not, in the opinion of the Engineers, require clearing; also some areas bearing light brush and small trees so sparse as to not require clearing; such areas shall not be cleared by the Contractor. (It is possible that the Owner may decide, before completion of the dams, to burn the brush, shrubs, weeds, etc., on the areas just above described; in such event the Engineers will arrange with the Contractor for the work of such burning, at some agreed price, or as "extra work".)