

Honorable Board of Trustees of the City of La Mesa,

La Mesa, California.

Gentlemen:

~~We~~ ^{a Corporation} the undersigned, the Cuyamaca Water Company respectfully petition for a permit to lay a water pipe upon El Cajon Avenue, Roosevelt Street, Hayes Street and Lincoln Street, according to the map of location and the specifications herewith accompanying and made a part hereof. Said pipe to be laid on a line fourteen (14) feet north of the center line of said street, and all in accordance with the requirements and specifications of Ordinance No. 6 of the Ordinances of the City of La Mesa, California. The purpose of said pipe is the delivering of water for domestic and irrigation purposes, it being a substitution for the existing water pipe line now operated by the company and serving the towns of La Mesa and East San Diego and the communities fronting on El Cajon Avenue, and if granted ^{said corporation} permission hereby agreed to leave said highways in the same condition as they were before the placing of such pipe, and that ~~we~~ will save harmless the City of La Mesa from any damage or liability by reason of accidents as the result of, or in the course of laying said pipe; and the said petitioners will when necessary and required by the City of La Mesa, acting through its City Trustees remove and take up and relay all pipes so laid by the petitioners or the assigns of said petitioners, and we will leave the roads and highways in as good condition as they were at the time of the taking up of such pipe, and that in the event of the grade of the highways being changed, that the petitioners will take up and replace said pipe so as to conform with the grades established or re-established by said City Council of La Mesa. ~~We~~ will also recompense the City of La Mesa or any property owner within said City who may be damaged in any way through poor or careless workmanship by said petitioners or on account of leaking or bursting of water pipes owned by said petitioners on any of the above mentioned streets. Said petitioners also hereby agreed to furnish the City of La Mesa a profile map of all pipes laid on said streets. You will also find attached hereto a bond for \$300.00 to cover any damages or costs that may be incurred by the City of La Mesa on account of such digging or trenching.

Cuyamaca Water Co.
By [Signature]

Honorable Board of Trustees of the City of La Mesa,
La Mesa, California.

Gentlemen:

The undersigned, the Cuyamaca Water Company, a corporation, respectfully petitions for a permit to lay a water pipe upon El Cajon Avenue, Roosevelt Street, Hayes Street and Lincoln Street, according to the map of location and the specifications herewith accompanying and made a part hereof. Said pipe to be laid on a line fourteen (14) feet north of the center line of said street, and all in accordance with the requirements and specifications of Ordinance No. 6 of the Ordinances of the City of La Mesa, California. The purpose of said pipe is the delivering of water for domestic and irrigation purposes, it being a substitution for the existing water pipe line now operated by the company and serving the towns of La Mesa and East San Diego and the communities fronting on El Cajon Avenue, and if granted permission, said corporation hereby agrees to leave said highways in the same condition as they were before the placing of such pipe, and that it will save harmless the City of La Mesa from any damage or liability by reason of accidents as the result of, or in the course of laying said pipe; and the said petitioner will, when necessary and required by the City of La Mesa, acting through its City Trustees, remove and take up and relay all pipes so laid by the petitioner or the assigns of said petitioner, and it will leave the roads and highways in as good condition as they were at the time of the taking up of such pipe, and that in the event of the grade of the highways being changed, that the petitioner will take up and replace said pipe so as to conform with the grades established or re-established by said City Council of La Mesa. It will also recompense the City of La Mesa or any property owner within said City who may be damaged in any way through poor or careless workmanship by said petitioner or on account of leaking or bursting of water pipes owned by said petitioner on any of the above mentioned streets. Said petitioner also hereby agrees to furnish the City of La Mesa a profile map of all pipes laid on said streets. You will also find attached hereto a bond for \$300.00 to cover any damages or costs that may be incurred by the City of La Mesa on account of such digging or trenching.

CUYAMACA WATER COMPANY
by *[Signature]*

Honorable Board of Trustees of the City of La Mesa,
La Mesa, California.

Gentlemen:

We, the undersigned, the Cuyamaca Water Company respectfully petition for a permit to lay a water pipe upon El Cajon Avenue, Roosevelt Street, Hayes Street and Lincoln Street, according to the map of location and the specifications herewith accompanying and made a part hereof. Said pipe to be laid on a line fourteen (14) feet north of the center line of said street, and all in accordance with the requirements and specifications of Ordinance No. 6 of the Ordinances of the City of La Mesa, California. The purpose of said pipe is the delivering of water for domestic and irrigation purposes, it being a substitution for the existing water pipe line now operated by the company and serving the towns of La Mesa and East San Diego and the communities fronting on El Cajon Avenue, and if granted permission hereby agree to leave said highways in the same condition as they were before the placing of such pipe, and that we will save harmless the City of La Mesa from any damage or liability by reason of accidents as the result of, or in the course of laying said pipe; and the said petitioners will when necessary and required by the City of La Mesa, acting through its City Trustees remove and take up and relay all pipes so laid by the petitioners or the assigns of said petitioners, and we will leave the roads and highways in as good condition as they were at the time of the taking up of such pipe, and that in the event of the grade of the highways being changed, that the petitioners will take up and replace said pipe so as to conform with the grades established or re-established by said City Council of La Mesa. We will also recompense the City of La Mesa or any property owner within said City who may be damaged in any way through poor or careless workmanship by said petitioners or on account of leaking or bursting of water pipes owned by said petitioners on any of the above mentioned streets. Said petitioners also hereby agree to furnish the City of La Mesa a profile map of all pipes laid on said streets. You will also find attached hereto a bond for \$300.00 to cover any damages or costs that may be incurred by the City of La Mesa on account of such digging or trenching.

Cuyamaca Water Co
By Ed Hitchcock

CONTRACT FOR THE CONSTRUCTION OF A DAM

AT THE LA MESA HEIGHTS RESERVOIR

---oOo---

THIS AGREEMENT, Made and Entered into at San Diego, California, on this 26th day of March, A. D., 1917, by and between Ed Fletcher, of San Diego, California, James A. Murray, of Butte, Montana, and William G. Henshaw, of Oakland, California, hereinafter styled the "owners", parties of the first part, and Sharp & Fellows Contracting Company, a corporation, hereinafter styled the "contractors", parties of the second part,

W I T N E S S E T H :

That, WHEREAS, heretofore the said owners have called for bids for the construction of an Eastwood Multiple-arched type dam just below the present dam at the La Mesa Heights Reservoir, in the County of San Diego and State of California, in accordance with certain plans and specifications prepared by John S. Eastwood, of San Francisco, California, and upon the opening of the said bids it was found that the said contractors were the lowest bidders for the said work, and have been awarded the contract for doing the same;

N O W T H E R E F O R E ,

In consideration of the premises, the parties hereto hereby agree as follows, to-wit:

FIRST. The said contractors agree to construct the said dam strictly in accordance with the said plans and specifications therefor, a copy of which said plans and specifications are attached hereto and made a part of this contract, and to furnish at their own cost and expense all the materials required therefor, for the sum of Ninety-Seven Thousand, Nine Hundred Five Dollars and Forty Cents (\$97,905.40).

SECOND. The said contract price above mentioned is based upon the assumption that there will be in the said construction the following quantities of the various classes of work, and for

from the said plans or specifications in either materials, quantities, workmanship, design, or in any other respect, will be recognized unless such departures are ordered in writing by the engineer in charge of the said owners, hereinafter mentioned, and that no act of any agent of the said owners shall be deemed a waiver of the requirements of this contract in this regard.

FIFTH. All of the said work is to be constructed under the supervision of the said John S. Eastwood, hereinafter styled the "engineer in charge", or such person or persons acting under him as he may designate, or such other person or persons as the said owners may hereafter designate in the place and stead of the said John S. Eastwood; and the said engineer in charge shall be the sole judge of whether any materials furnished for the said work shall be in compliance with the said plans or specifications, and as to whether the work is being constructed in a good and workmanlike manner, and he shall have the right to reject any materials by him at any time deemed not to be in compliance with the requirements of this contract, and to order torn out and reconstructed any work by him deemed to have been constructed in an improper or unworkmanlike manner, and his decision shall be final and binding upon the said contractors. It is understood and agreed, however, that any faulty or unworkmanlike construction of any of the said work shall not be considered accepted by the said owners, or assented to by them, by reason of any act, or failure to act, on the part of the said engineer in charge, or on the part of any other person or persons.

SIXTH. It is further agreed that the said contractors shall construct the said dam with Riverside-Portland cement, provided the same meets with the requirements of the said specifications.

SEVENTH. It is further agreed that, notwithstanding any requirements of the said plans, the said dam is to be when completed at least thirty-four (34) feet higher than the highest point on the top of the present dam at the said place.

EIGHTH. It is understood that the said contractors in the construction of the said work care to have the necessary rights of ingress and egress, and all necessary water, without charge, for construction and camp use, together with the Necessary ground for camp and plant, provided, however, that such camp or plant shall not be so located as to pollute the water of the said reservoir.

NINTH. It is further agreed that the said contractors are to carry sufficient liability insurance so that the said owners shall not be liable for injury to or the death of any person or persons by the said contractors employed in the construction of the said dam.

TENTH. The said contractors are to commence the said work within ten days from the date of this contract, and are to prosecute the same continuously and diligently thereafter, Act of God, strike or delays over which the Sharp & Fellows Contracting Company have no control excepted, and are to fully complete same on or before January first, 1918, time being of the essence of this agreement in this regard. In case of failure to complete said dam on or before January 1, 1918, said Sharp & Fellows Contracting Company agree to pay to Messrs. Murray, Fletcher and Henshaw, as liquidated damages, the sum of Fifty Dollars (\$50.00) per day for each and every working day after January 1, 1918 until said dam is fully completed, according to plans and specifications herewith attached.

ELVENTH. Payment is to be made by the said owners to the said contractors for the said work as follows: On the tenth day of each month during the progress of the said work, the said engineer in charge is to furnish in writing to the said contractors an estimate of the quantities of the various classes of work done during the preceding month, and thereupon the said owners shall pay to the said contractors 75% of the cost thereof at the unit prices

hereinbefore mentioned. The balance of 25% of the contract price is to become due and payable thirty-five (35) days after the completion and acceptance by the said owners of the finished work, and upon the furnishing to them of satisfactory proof by the said contractors that all bills for labor and materials used have been fully paid.

TWELFTH. The said contractors are to furnish the said owners with a satisfactory surety bond in the sum of Fifty Thousand Dollars (\$50,000.00) conditioned that they will faithfully keep and perform each and every term and condition of this contract and that they will save the said owners harmless from all damage, trouble and expense by reason of any failure on their part to pay for any materials or labor used in the construction of the said work, or by reason of any failure on their part to construct the same in a good and workmanlike manner, and this contract shall not be deemed binding upon the said owners until the said bond shall have been so furnished.

IN WITNESS WHEREOF, the parties hereto have hereunto set their hands on the day and date in this agreement first written, and the said Sharp & Fellows Contracting Company by C. A. Fellows, its President, pursuant to a resolution of the Board of Directors of said company authorizing him to execute contracts for and on behalf of the said corporation.

E. Fletcher

William G. Henshaw

By E. Fletcher Asst
THE SHARP & FELLOWS CONTRACTING COMPANY,

By C. A. Fellows
Its President.

STATE OF CALIFORNIA,

COUNTY OF SAN DIEGO.

} ss.

On this 26th day of March, A. D., 1917, before me, the undersigned, a Notary Public in and for the County of San Diego and State of California, personally appeared Ed Fletcher and James A. Murray, known to me to be the persons whose names are subscribed to the foregoing instrument, and acknowledged to me that they executed the same, and personally appeared C. A. Fellows, known to me to be the president of the corporation described in and that executed the within instrument and also known to me to be the person who executed it on behalf of the corporation therein named, and he acknowledged to me that such corporation executed the same.

Witness my hand and the seal of my said office on the day and date in this certificate first written.


Notary Public in and for the County
of San Diego and State of California.

DESCRIPTIVE AND DETAIL SPECIFICATIONS

of the

MURRAY DAM

at

OLD LA MESA DAM

CUYAMACA WATER COMPANY

describing the

EASTWOOD-MULTIPLE-ARCHED DAM

--oOo--

GENERAL SPECIFICATIONS.

LOCATION OF STRUCTURE.

The structure is to be located at the site shown on the blue print map of the proposed site, about 6 miles from the City of San Diego, California, as shown on the drawings of the same accompanying these specifications. The location is the selection of the Chief Engineer of the owners of the property upon which the said dam is to be constructed, and will be on the lines laid down on the Plan Drawings.

GENERAL DESCRIPTION OF THE STRUCTURE.

This dam is to be a structural dam of the type known as The Eastwood Multiple-arched type, in which design, arches are used for the water face deck and buttresses are used for the support of the same, designed especially to meet the conditions prevailing at this site, and so designed as to be completed to a height of 110 feet, to contour elevation of 200. It will consist of 29 arches supported by 29 buttresses. The structure is to be founded on a solid rock foundation, the cut-off wall at the front edges of the arch ring foundation to be cut into sound rock for a tight cut-off and the buttress foundations to be sound rock, roughened and notched. The siphon spillway, of over 1000 second feet capacity is to be located on the north end, as shown on the plans, the outlet gates to be located as near the present creek channel as possible, between buttresses 8 and 9 of the completed structure, and at an elevation of 65 feet above the present outlets of the old dam.

GENERAL DIMENSIONS.

The general dimensions of the proposed 110 feet section for Murray dam are as follows:-

Slope of crown line of arches, 1 to 1, 45°

Slope of back edges of buttresses, .28 to 1

Spans, 30 feet from center to center of buttresses.

Arc of extrados, angle of arch, 120° of sloping part.

Radius of extrados of arches, 17.31 feet.

Radius of extrados of arches, vertical head, 15.32 feet.

Radius of intrados of arches, varied with thickness.

Arch rings are monolithic heavily reinforced.

The thickness of the arch walls are 1 foot at the top, increasing to a thickness of 2.36 feet at the bottom, this giving a direct loading of 325# per square inch with the water at elevation 200.

The buttresses are to have the same loading at the edge where they meet the arches, and less as base is approached due to the taper, the thickness at the top being 1.0 feet, and at the base 4.09 feet.

STRUT-TIE MEMBERS.

The buttresses are supported and tied together by the use of reinforced strut-tie beams, built as part of the buttress, the reinforcement being continuous from end to end and run into the bed rock at the ends, making the buttress walls the equivalent of short columns and giving them great rigidity and stiffness.

SPELLWAY.

The siphon spillway, similar to many now in service, is to consist of 5 sections having a capacity of over 1000 c.f.s. as shown on the detail drawings and located on the north end of the structure between buttresses 2 and 3.

The location can be as desired by the engineer of the owners, the span chosen being that nearest the right height to give the required capacity.

EXCAVATIONS FOR FOUNDATIONS.

The excavations of the overburden to reach the foundations are to be so made as to enable good sound supporting bedrock to be reached for the buttress foundations and to permit the cut to be made for the cut-off walls of the arch ring walls into sound and tight bedrock. In rock excavation for the foundations, only small and light shots shall be used where blasting is necessary, the shots being so placed as to disturb as little as possible the surrounding ground. The bed rock must be cleaned of all spalls or loose fragments before placing concrete. The arch ring foundations can be excavated as a trench in all parts as an open cut having the general outline of the elliptic plan of the arch rings, giving the cut such slopes as the materials will lay on, as an angle of repose. The excavations for the buttresses are best made as trenches for all depths, the cuts being wide enough to permit erecting forms inside of them.

FORMS FOR CONCRETE.

As the type of structure is somewhat unusual in its shapes, the forms are designed as a part of the dam to give the contractor the advantage of past experience in their construction, and to remove all uncertainty as to the best forms to adopt. The forms are of wood, those for the buttresses being of panels made to reset and use over and over, all so designed as to fit in any part as well as of such sizes and shapes as to give a complete cover for the wall in the handiest units and shapes. The

forms for the undersides of the arch rings are made up as a frame work of liners, giving the exact shape for the arch, these being made into a frame upon which is bent to shape lapped 1/2 x 6 inch boards, making a foundation from which to space the panels used for the outside forms for the arches. The use of these forms is not arbitrary but are recommended as the result of actual experience in building and will, if used, make the form work as simple as for a straight wall.

INTENTION OF GENERAL SPECIFICATIONS.

. It is the purpose of these general specifications to cover in a general way all such matters relating to the construction of the structure as will lead to greater economy and better work in the structure, but there is no intent to make them rigid or arbitrary. The detail specifications to follow will contain the requirements for the work to be done. Full supplementary instruction and field drawings of details and methods to advance the work to the best advantage will be furnished, as well as plans for plant layout and methods of procedure.

OUTLET WORKS.

The outlet gates are shown to consist of a pair of 24" valve gates, set in front of a pair of 24" butterfly gates, connected to a short piece of lapwelded tubing, provided with a flange to which to bolt the butterfly gates, the valve gates being bolted to the flange of the butterfly gates, the connections to the service mains to be made by the owners. All of these to be of a standard make for the required pressure, and built

in place in the dam. The pipes through the dam can be set at the time the arch face is built and concreted in, the gates set after the dam is completed and the bypass closure is to be closed.

ADDITIONAL OUTLET WORKS.

Additional outlet works to consist of three service gates placed in a bay to be at elevations 25 feet, 45 feet and 65 feet below the crest of the dam, and discharging into a pool formed between a pair of buttresses are to be placed as directed by the engineer in charge for the owners.

UNWATERING

The unwatering of the site and the by passing of the natural flow of the stream is to be provided in general by a low coffer dam upstream from the site, the water being passed in a flume over the workings, the seepage being pumped into the flume. When the walls are up to the level of the stream bed a flap gate is to be put into one of the arches to close an opening to be left to pass the water temporarily, this flap gate being so arranged as to shut off the water, when it can be passed through the permanent gates, till the space behind the flap gate is filled with concrete, making the permanent closure.

MURRAY DAM.

UNIT STRESSES IN THE STRUCTURE.

Detail specifications for an Eastwood Multiple-arched Dam.

SECTION 1.

In the designs of this dam the following unit stresses have been considered as the maximum allowable and all parts are designed and constructed that these limits cannot be exceeded

when the structure is finally completed to the contour at elevation 200, and is full of water to that level.

Loading on foundations, maximum 17.5 tons per square ft.
 Buttresses in compression, 325# per square inch.
 Arched deck in direct compression, 325# per square inch
 Foundation bases in direct shear, 125# per square inch
 Steel reinforcement, 14000# per square inch.

All of the above named stresses are the maximum in the final completed structure.

REINFORCEMENT.

Steel for reinforcement shall be in shapes and sizes called for on the detail plans and in the specifications and shall be of deformed bars, preferably corrugated bars.

The reinforcement for the arch ribs is to be of deformed steel rods as shown on the Reinforcement sheet of the drawings. At the bases of the arches there are to be inserted steel bars to join the arch rings to the cut-off walls and also to reinforce the front in a longitudinal line at this point.

The steel shall show the following physical and chemical proportions:

Ultimate tensile strength,	not less than	80,000 lbs per sq. in.
Yield Point	" " "	50,000 " " "
Elongation in 8 inches	" " "	10 per cent
Phosphorus	" more	" 0.06 " "
Sulphur	" " "	" 0.06 " "
Manganese	" less	" 0.40 " "

All bars must be free from seams, flaws and cracks and have a workmanlike finish, and before being used in concrete it shall be cleaned free from all scale, dirt, paint and oil.

All secondary reinforcement such as wire, or ties shall be of the best quality obtainable.

REINFORCED CONCRETE.

PROPORTIONING AND MIXING.

SECTION 2.

1. In all buttresses and footings a concrete having a mix of 1-2 1/2-5 shall be used.
- 2/ In the arch rings and all strut-tie beams and the gate settings a 1-2-4 mix shall be used.

VOLUMETRIC-MEASUREMENTS.

3. Before beginning work of placing concrete, volumetric measurements shall be made to determine the exact proportions required of each element of aggregate to meet these results and from time to time, should there be any change in the quality of the aggregates, volumetric measurements should be made to meet the changes necessary to keep the quality of the concrete to the required standard of quality.

QUANTITIES OF MATERIALS.

4. In general these mixtures shall be substantially based on gravel or broken stone with 40% of voids and a barrel of 3.8 cubic ft. or 380 lbs of Portland Cement. The quality of the materials for concrete shall all be of the best, and no inferior material shall be permitted in the structure, even though it has been accepted by the engineer in charge.

Mixture	Cement	Sand	Rock	Concrete
1:2 1/2:5	1 bbl	9.5 c.f.	19.0 c.f.	23.0 c. f.
1:2 :4	1 bbl	7.6 c.f.	15.2 c.f.	18.0 c. f.

Sand and stone shall be measured when packed not more closely than by throwing it in the usual way into boxes.

MIXING.

5. The concrete shall be mixed in machine mixers and machines shall be so arranged that the materials, including the water, can be precisely and regularly proportioned in batches, which will produce a concrete of uniform consistency and color with the stones and water thoroughly mixed and incorporated with the mortar.

6. The cement, sand and stone ballast, all being perfectly clean shall be placed in the machine in the specified proportions, and be thoroughly mixed. Clean water shall then be added and the mixing continued until the mass is uniform throughout. All materials must be accurately weighed or measured and the quantities used in each batch carefully checked throughout the entire progress of the work.

CONSISTENCY.

7. The resulting concrete mixture shall be of such consistency as to move freely and be sloppy and soft when deposited. It shall be in every instance what is generally known as "wet concrete". However, care must be exercised to not add an excess of water and thereby cause separation of cement from the aggregate. Each batch must be deposited in place as quickly as possible after mixing and the entire mass must have primary set within twenty-four hours. Concrete which has commenced to set before being deposited will not be permitted to remain in the work.

DEPOSITING.

8. All concrete shall be deposited wet and sloppy and shall be thoroughly spaded and puddled to remove air and until all the interstices between the stones are thoroughly filled with the mortar. When deficiency of moisture is indicated it shall be supplied

by sprinkling. Each batch must be puddled and properly in place before another batch is deposited in the forms. All exposed surfaces of finished and unfinished work shall be kept moist by sprinkling with water under pressure at short intervals. The contractors shall install for this purpose a pipe line along the line of the dam with bibs for attaching hose. No walking or handling of materials on concrete is to be permitted until it has thoroughly and completely hardened and all finished work shall be protected as may be necessary by canvas or plank. Layers shall be formed with square ends and not sloped or tapered.

FINISHING.

9. The concrete shall be placed by skilled workmen and all stones shall be well worked back from the face of forms by spading so as to produce a smooth surface and so that no stone shall approach the face of the work.

GROUTING.

10. When new work is joined to old work or to concrete already set, the joints shall be scarified and all loose material on the surface flushed out of the forms with water under pressure, the surface then slushed with grout of neat cement, or if still wet from the washing with neat cement, dusted on the wet surface. The surface must not be grouted or dusted unless concrete is to be immediately laid on it, the grouting in all cases to immediately precede the laying of concrete.

LAYING.

11. Concrete shall be laid continuously in so far as possible and each layer incorporated with the one previously

laid. Whenever it becomes necessary to place fresh concrete upon old concrete surface, the old surface shall be cleaned of all dirt, scum and laitance and thoroughly wetted and flushed before depositing the grout and fresh concrete.

JOINTS.

12. The construction must be as nearly monolithic as possible, but if it is necessary to place the concrete in sections, key blocks in the form of an inverted truncated pyramid for ease of removal without disturbing the surrounding concrete of proper size and arrangement shall be imbedded in the concrete where the work is stopped so that the joining work may later be properly connected to it. Vertical joints shall not be permitted in buttress walls or arch ring walls except as shown on the plans. The front edges of the buttresses where they are to be later joined to the new work for the completed structure shall be provided with the joining reinforcement as shown on the plans and shall also be provided with key blocks fastened to the inside of the forms and imbedded in the horizontal portions of the steps to key the parts of the walls together.

CONSTRUCTION OF BUTTRESSES.

13. The buttresses and all walls are tapered uniformly from top to bottom to give the required thickness, and the wall is to be carried up with such lifts as are convenient, but in all cases must be left when ceasing work on a buttress wall so that the rear or downstream end of the wall is higher than the front by means of temporary boards placed across the forms to create steps or keys, each rising higher as the rear of the buttress is approached.

ARCH RING CONSTRUCTION.

14. The buttresses and their front joint should be built first, or kept at least a good distance ahead of the arch ring construction, preferably completed to the full height after which the arch rings are built in place. The forms for the under side can be carried to a considerable distance above the place where the work is being done or completed to the top of the completed buttresses, the walls then being placed by using panel forms for the outside forms, braced to the inside forms. The steel for reinforcing the arch rings should be put in place before erecting the outside panels where the walls are thin. The outside panel forms must be properly spaced from the inside forms to give the required thickness of the arch wall at the various levels. All of these dimensions will be given in field drawings.

REMOVAL OF FORMS.

15. Forms shall not be removed before the concrete is sufficiently set. Buttress forms shall in no case be removed while the concrete is taking its set, and in not less than 24 hours after placing, for buttress forms, not less than 12 hours for outside panel forms for arches, and for inside arch forms not less than seven days from the date of laying.

Reinforcing bars must not be jarred or moved while the concrete is taking its set.

FORMS.

16. All concrete masonry shall be built in place in wooden forms of sufficient strength, properly tied and braced together so as to be practically unyielding. The forms must have close joints and for outside walls to be of lumber dressed on the side exposed to the concrete so as to produce a smooth surface on all showing faces. The forms shall be coated with a heavy oil before using, and where used over, as in the case of panels, must be cleaned of adhering concrete before being reused. All forms shall be thoroughly wet before placing concrete against them. The forms for the arch rings need not be dressed lumber. All concrete is to be dense and have a smooth exterior surface and any cracks or spalling shall be repaired.

EXPOSED SURFACES.

17. All exposed surfaces of concrete in the superstructure, or that portion above the natural surface of the ground and exposed to view, shall be given special attention in laying in order to produce smooth surfaces in true planes uniform in structure and appearance. The corners of all finished edges, as that of the strut-tie beams, are to be clipped by inserting a fillet in the corners of all forms for such parts of the work.

EXPOSED REINFORCEMENT.

18. All exposed reinforcement, must be coated with a grout of cement after the work is completed to prevent rusting by exposure to the elements.

DETAILED SPECIFICATIONS CONSTRUCTION.

---000---

BUTTRESSES.

1. Buttresses are to be built of 1-2½-5 mix concrete, and shall be built with such lifts as are most convenient but at ^{the} ~~each~~ termination of the pouring for any day the rear or downstream end is to be left higher than the front, and proper keys provided in the wall at the point of cessation of work. The foundations shall be prepared by removing all spalls, fragments, chips, shavings, or any foreign matter of any kind from the bedrock, washing it clean with a hose under pressure, dusting the surface with dry cement or slushing it with cement grout as may be directed, and placing the concrete immediately on this prepared surface. The forms for the buttress bases at the foundation should be of a framework of studs nailed to a plate to bring the top to a level to begin the use of a panel buttress forms, leaving the boards of the forms off at the bottom to permit the spread of the concrete to form the proper footing for the buttresses. At the end of each pouring, beveled wooden blocks of convenient size are to be imbedded in the fresh concrete by pressing down into it till they are flush with the top, which are to be removed before beginning work on the surface, the surface roughened and all loose material of any kind

washed out of the forms, till the surface is clean, then grouted or dusted and pouring immediately commenced. The strut-tie beam forms shall be built at the same time as the buttress forms, and all steel shown on the detail drawings wired in place in them before pouring them. These forms must be braced firmly to the buttress forms to prevent sagging.

ARCH RINGS.

2. The deck or water face of the dam shall be built of 1-2-4 mix concrete placed very wet and very carefully placed. The cut-off wall is to be placed carefully in a trench of such depth as will place all of it in sound rock that is free from seams, the trench being perfectly clean before concrete is laid in it, and the reinforcing bars shown on the reinforcement sheet placed in it, bent to an angle to fit the slope of the arch ring wall at the point placed. The concrete in the cut-off wall is to be continued up and constitute the base of the arch ring and is a part of it. The arch ring shall be cast in longitudinal lifts of about 6 feet, the wall being so provided with keyblocks as to be continuous and have no longitudinal joints.

The inside forms are to be supported on liners cut to the required radius for the point placed all of which are given in the field drawings, these liners resting on the projecting ledge of the buttress. These liners are placed 7' 10" apart to make use of even length studs of

16 feet cut to fit between the liners, making a frame of studs upon which the $\frac{1}{2}$ " x 6" boards are bent and nailed. Collar braces to stiffen the liners are put on at the time of erection, the liners being assembled to fit the required radius on a platform in the carpenter yard. The reinforcement is placed on the inside forms and separated from it by means of briquettes of mortar of such dimensions as to space it properly from the forms and in the proper place in the walls.

The outside forms are to consist of panels as shown on the detail sheet showing arch forms and details. These panels are to be held in place by means of dowel pins and over all a cable of light weight provided with turnbuckles and hooks at the ends to hold the row of panels in place, the ends of the cable fastening to wire loops placed in the filler of the buttresses when the buttresses are poured. This arrangement obviates the tying of the outside form to the inside by means of wires left in the wall which are objectionable as cause of weeping leaks where the water follows them.

STRUT-TIE BEAMS AND FOOT WALK.

3. All strut-tie beams, including the one used for a foot walk are to be continuous from end to end of the structure till they terminate in the bedrock at the ends into which the reinforcing rods are to be run and concreted in place.

The strut-tie beams are to be reinforced with rods

running continuously through the buttress walls, from end to end and all of these are to be tied to the cross-reinforcement placed in the buttresses at the junction forming roots to distribute the stresses in the buttresses. The beams are so spaced as to give the structure absolute rigidity. The strut-beams are to be built at the same time and as a part of the buttresses.

FIELD JOINTS.

4. Field joints in the arch rings shall be thoroughly roughened by picking and the feather edges of the top and bottom of the walls broken away and cleaned out before continuing the concreting. Great care must be taken to secure a right joint between both inside and outside forms and old concrete at the top of lifts in order that no leakage of cement may take place at this joint, as it is essential that all surfaces, both inside and outside be as nearly perfect as it is possible to make them.

FINISHING SURFACES.

5. All surfaces in the interior of the dam, such as the underside, deck, sides of buttresses shall be made as smooth as possible by the use of close, well made forms, but no special finishing is required after forms are removed except that any rough or porous spots shall be thoroughly cleaned and filled with a mortar to match in color and texture the concrete and be floated over with ~~xxxxxxxxxxxxxxxxxxxx~~ a wooden float to resemble the

remainder of the walls. The outside surface of the deck shall be cleaned and thoroughly painted with neat cement wash as soon as possible after the outside forms are removed.

FOOT WALK RAILING.

6. A wrought iron pipe railing is to be set in the foot walk provided by the widening of one of the strut-tie beams, one side to have posts set in the top of the walks and on the other the rail to be set into the side of the beam and run through the edge of the buttresses. The railing is to be painted to the satisfaction of the engineer.

OUTLET WORKS.

7. The outlet works are to consist of a trash screen made of light railroad rails set into the concrete of the block of concrete constituting the bell mouth of the outlet pipes set on the arch in the reservoir, the rack being vertical to make it self clearing. The outlet pipes are to be of 24" lapwelded tubing, peaned at the upstream end and flanged to fit a standard butterfly gate on the downstream end. These pipes should be dipped in asphaltum, and repainted when in place in the structure by the owners. The butterfly gates to be of standard make for the required pressure, to have bronze vanes and flange bored to fit the flange on outlet pipe, the other side to be bored to fit the standard 24" valve gate to be placed in front of it. The valve gate to be

provided with a short piece of pipe bent to form a choker, unless the pipe is connected to a main, in which case it is not needed.

ADDITIONAL OUTLET WORKS.

8. All outlet pipes, valves and gates to be delivered to the contractors at the damsite. In addition to the regular outlets at the bottom of the dam, in a space on either side of the depression in which the pipes are laid, a set of a butterfly and valve gates is to be placed which will discharge into an open bay or pool formed between two buttress walls, from which it is to pass under the reduced pressure to the main pipe lines. The exact location of this is to be made by the Engineer of the owners before required to be set about 65 feet below the crest of the dam.

At an elevation of 45 feet from the crest of the dam an 18" valve is to be set.

At 25 feet from the crest an 18" valve gate is to set. These two gates are to be arranged so as to be operated independently of each other, and are to discharge into the pool at 65 feet below the crest.

SIPHON SPILLWAY SPECIFICATIONS.

9. A siphon spillway of the approved Italian type is to be provided to regulate the flow line in the reservoir within 4 inches, from elevation 200 to 200.33, and to have a discharge capacity of over 1000 feet per second.

A spillway of this type, having 5 bays, each to be 5' x 3' x 4' or 13.5 square feet in area is to be located

between a set of buttresses to give the required working head of 25 feet, preferably between No. 2 and No. 3 on the north end as determined by the engineer for the owners.

These 5 bays will discharge 1080 second feet at 40 per cent of the theoretical spouting velocity or 1695 second feet at 70 per cent. The static head will be reduced by the back water, making the efficiency variable, but the discharge in excess of requirements.

The arch ring of the vertical head is carried down to the foundation to form the rear wall of the spillway, the upper edge of this wall being tipped forward to form the lip and slide for charging the spillway, this lip being made level, and also supports the hood by means of the web walls as shown on the drawings.

The front wall consists of a concentric arch ring set 3 feet in front of the rear wall and the bays located between by the use of radial web walls.

The ~~front wall~~ interior web walls are to be 6 inches in thickness and the end wall and the front and rear walls are nine inches in thickness, all heavily reinforced by means of steel rods, all web walls being radial. The front wall continued, forms the hood and cowl. The base of front wall is cut away and is provided with a sharp edge lip to facilitate the escape of the entrained air from the crown of the hood when charging. Three column buttresses set to guide the water parallel with the buttresses of the dam, support the front wall which is also an arch supported by struts to the buttress walls and foot-

walk. The lower strut is placed well above the discharge, and all walls are out away at the bases to facilitate the discharge of the waste water.

The lower air seal is maintained by the use of an auxiliary dam or rollway placed across the downstream ends of the buttresses, consisting of a pavement laid on a loose rock form, carefully laid, the pavement to be a part of the floor on the upstream side and to be placed on the bed rock on the downstream side entirely inclosing the rock filling.

A drain connecting with a low sump in the pool and running through the buttress on the low side is to be provided to drain the pool dry when out of service.

A wing wall, to consist of an extension of the buttress on the low side is to be built to carry the spillway water clear of the dam and discharging it into the canyon.

CLEANING UP.

10. After the work is finished, all materials, rubbish and debris shall be removed from the site, and the site cleaned up satisfactory to the engineer.

FIELD SERVICE.

11. Field drawings of all parts of the works in each detail as to make all parts of the work plain, as well as instructions as to best and most economical methods will be furnished the constructors as required.

Ed Fletcher Papers

1870-1955

MSS.81

Box: 56 Folder: 14

**Business Records - Water Companies -
Cuyamaca Water Company - Contract for
construction of dam at La Mesa Heights**



Copyright: UC Regents

Use: This work is available from the UC San Diego Libraries. This digital copy of the work is intended to support research, teaching, and private study.

Constraints: This work is protected by the U.S. Copyright Law (Title 17, U.S.C.). Use of this work beyond that allowed by "fair use" requires written permission of the UC Regents. Permission may be obtained from the UC San Diego Libraries department having custody of the work (<http://libraries.ucsd.edu/collections/mscl/>). Responsibility for obtaining permissions and any use and distribution of this work rests exclusively with the user and not the UC San Diego Libraries.