

● View of the Colorado river near the site of the Parker Dam which will divert water to the aqueduct for the Metropolitan Water District of Southern California. Picture on right shows exact model of Parker dam showing how it will look and how it will function when completed.

Many Interesting Features Involved in Parker Dam Project

Deep Excavation Required for Foundation Gates 50-Foot Square in Spillway Structure

Unique among the many large dam projects for which the present decade will be notable in history is the Parker Dam, 14 miles above the town of Parker, Ariz., which will divert water from the Colorado River into the aqueduct now being built by the Metropolitan Water District of Southern California, on which construction operations will soon be under way. Bids will be received on the project at the office of the U. S. Bureau of Reclamation, 608 Grant Building, Los Angeles, until 10 a. m., Thursday, July 26, 1934. The bureau will build the dam under a contract with the Metropolitan Water District and will have full charge of its construction. Originally designed by district engineers, the final plans and specifications were prepared by the bureau's office at Denver.

While the purpose of the Parker Dam is to merely raise the water level in the Colorado River at the aqueduct intake to the necessary height for diversion, which is about 72 feet above the mean low water line, there is contemplated in the project a power plant to be constructed later. Construction of the dam will necessitate the diversion of the stream flow through tunnels and the building of two coffer dams, one above and the other below the dam site. Bids will be taken at this time on the construction of the two diversion tunnels and a road included in Schedule No. 1 and construction of the two coffer dams and the diversion dam included in Schedule No. 2.

The magnitude of the work as a construction project is indicated by the fact that excavation of all classes in the tunnels and for the dams will total 2,160,600 cu. yds., and there will be 438,000 cu. yds. of earth fill in the coffer dams. Concrete in the diversion dam and appurtenant structures, including lining of tunnels, will aggregate 304,200 cu.

yds. If awards are made on the two schedules in separate contracts, 365 calendar days will be allowed for completion of the tunnels and road, Schedule No. 1, and 1280 days for completion of the diversion dam, Schedule No. 2. If all the work is awarded in one contract the time limit will be 1280 calendar days, the 365-day limit for Schedule No. 1 being waived. The penalty for failure to complete the dam within the time limit will be \$1000 for each calendar day of delay.

The Parker Dam will be of the concrete arch type with a maximum height of about 340 ft. from the lowest point in the foundation to the roadway on the crest of the dam, and a crest length of about 800 ft. The depth of the required excavation below the river bed will be approximately 240 ft., which accounts for the large amount of excavation. If two height-limit Los Angeles office buildings were placed one on top of the other in this excavation only 60 ft. of the upper one would be above the river bed. All of the diversion dam except the spillway structure will be completely submerged all times when in use.

Five spillway openings will be located in the center of the crest of the dam, each controlled by a structural steel Stoney gate 50 ft. wide and 50 ft. high, operated from an operating house built above and upstream from the roadway across the top of the dam. These gates will approximate the size of the great gates constructed to permanently close the huge diversion tunnels at Boulder Dam. For easier operation they will be counterbalanced with concrete weights in wells on either side. These counterweights will contain 480 cu. yds. of concrete. The gate, gate frames and counterweight guides and hangers will contain 3,125,000 pounds of steel. These gates alone will cost about \$1,500,000.

Design of the spillway structure was the

subject of extensive study by engineers of the Metropolitan Water District and the Reclamation Bureau. The problem was to prevent the accumulation of silt on the upstream side of the dam and to minimize the turbulence of the flow in flash floods over the spillway so that the stability of the dam would not be affected by scouring of the river bed on the downstream side. Several models were constructed and tested at Sunset reservoir of the Pasadena city water department. The last one made accurately as to scale and design conforming to the approved plans is shown in the accompanying picture. Flow over the spillway will be regulated by the Stoney gates. When they are raised the water flowing through will scour out the silt in the stream bed above the dam. With the river backed up to elevation 455 ft. behind the dam, just beneath the roadway on the spillway structure, a 717,000-acre reservoir will be formed extending up the river as far as Needles.

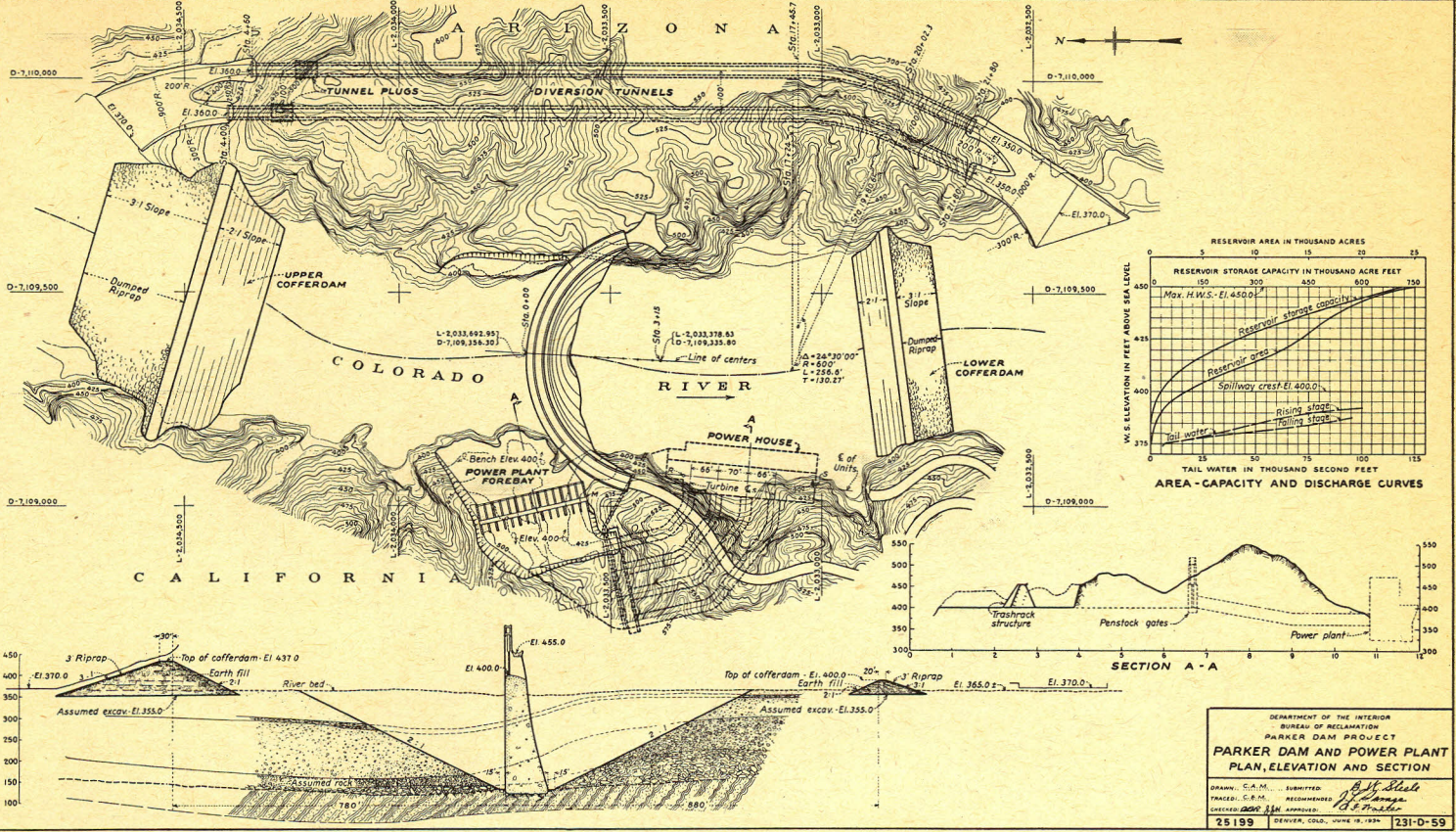
The dam will be 265 ft. in height from the lowest point in the foundation to the crest, 100 ft. thick at the base and 50.48 ft. thick at the crest. The upstream face will be vertical, arched on a radius of 315 ft., and the downstream slope will be built up on a constant angle with variable radius.

There will be 260,000 cu. yds. of concrete in the dam and 15,000 cu. yds. of concrete in the spillway bridge piers, gate guides and stairway shaft, 1150 cu. yds. in the operating house and 870 cu. yds. in the curbs, parapets and roadway bridges.

The foundation rock near the heel of the dam will be drilled and grouted through pipes placed in the concrete of the base of the dam, the grouting to be done after not less than 10 ft. of concrete has been placed. The concrete of the dam will be divided into blocks or panels by means of vertical radial contraction joints spaced at about 50-ft. centers. A system of cooling pipes will be embedded in the concrete of the dam, through which river water will be circulated for the purpose of cooling the concrete prior to the grouting of the contraction joints. The concrete will be cooled and the contraction joints grouted before the spillway gates are set in place. In order to obtain river water at a temperature low enough to be effective without resorting to refrigeration, the cool-

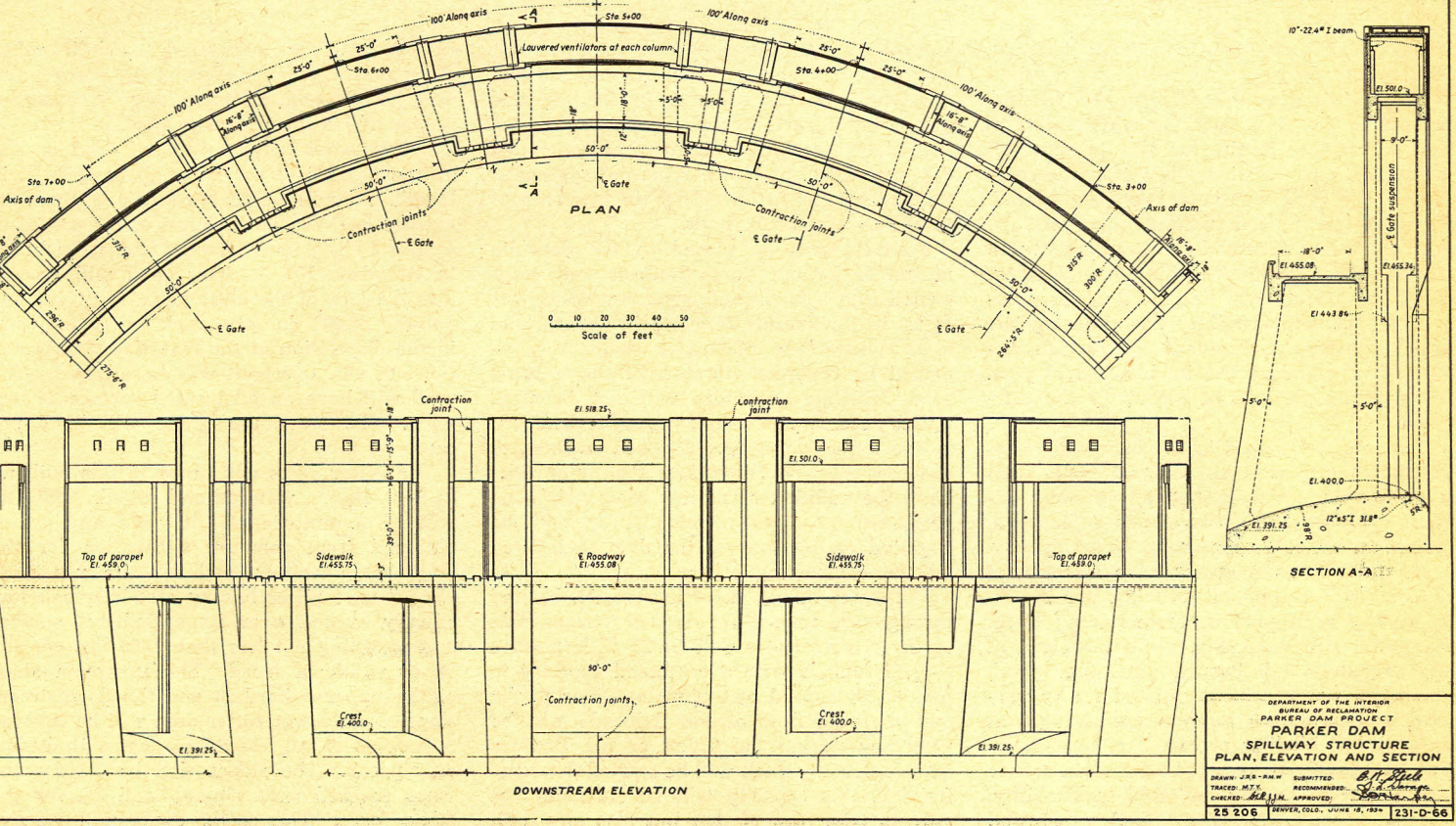
SPECIFICATIONS No. 574

DRAWING No. 9



SPECIFICATIONS No. 876

DRAWING No. 16



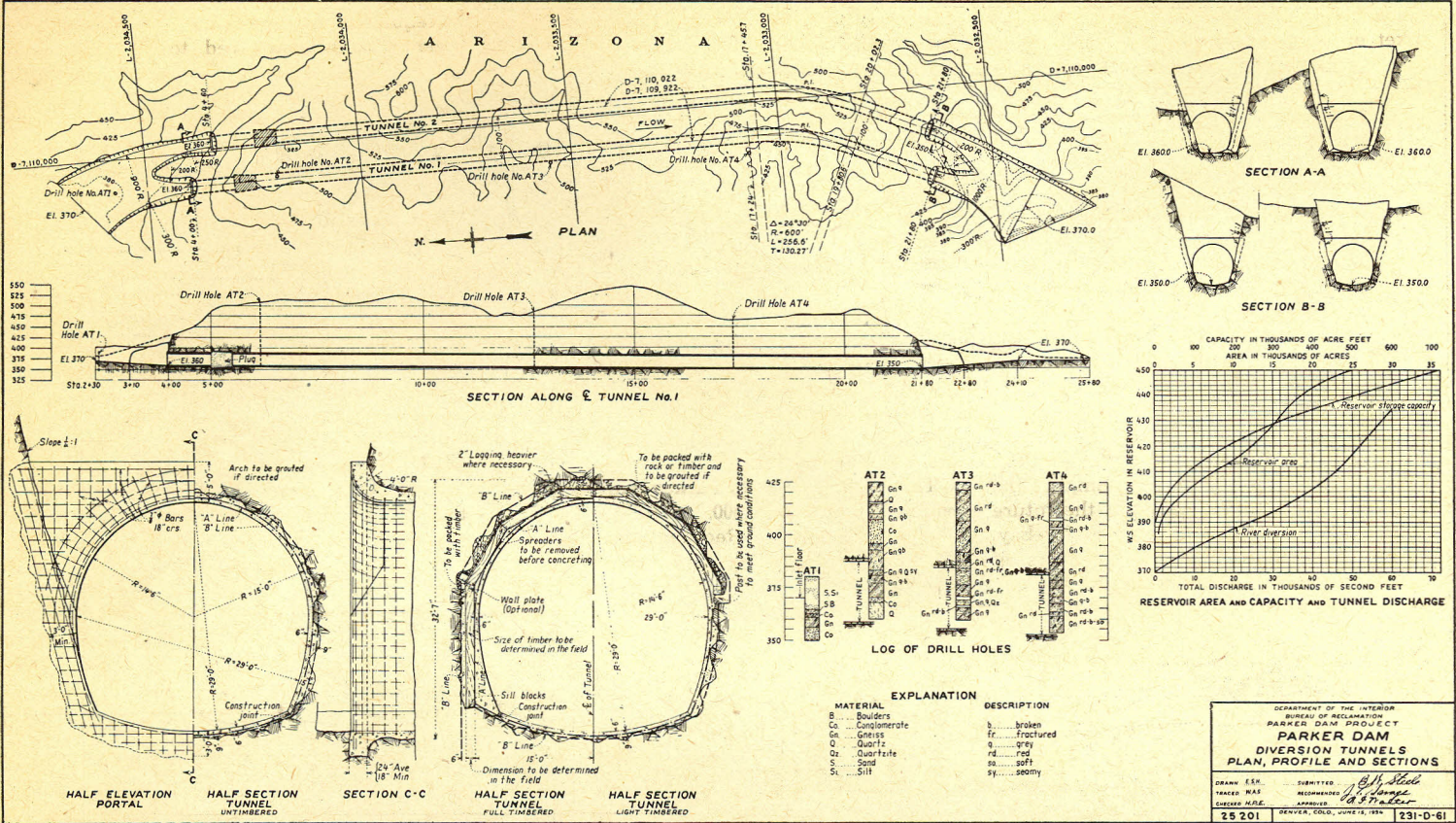
Official drawings from the plans and specifications for Parker Dam Project. Drawing at top gives a comprehensive layout of the construction works incident to the building of the dam and shows the great excavation necessary to carry the dam down to solid rock. Details of the spillway structure with its 50 ft. square Stoney gates are shown in drawing at bottom.

ing must be done during the months of December, January and February. The mean temperature of the concrete will be reduced to 54 degrees Fahrenheit or less. In event construction has not progressed to permit cooling during the winter of 1936-1937, the cooling and grouting of contraction joints will be deferred to the following winter, but the contractor will be given no additional

allowance to that provided in his lump sum bid on account of the delay.

Metal tubing, 1 inch outside diameter, with expansion type couplings, is contemplated for the cooling system and the installation of about 230,000 lin. ft. of tubing, involving about 16,000 couplings, will be required. The cooling coils will vary in length from 450 to 1800 ft. About 1200 gallons of water per

minute will be forced through them under pressure of 100 lbs. per sq. in. The main header will extend from the intake for the river water to and along the crest of the dam with branch headers placed on the upstream face of the dam connecting to the individual cooling coils. The contractor will furnish and install the main header, but the government will furnish the pipe for the



Official drawing showing details of the diversion tunnels for the Parker Dam Project which will pass 60,000 cu. ft. per second, ample to take care of river flow while Boulder dam reservoir is being filled.

branches and coils which will be installed by the contractor.

Systems of grout pipes will also be imbedded in the mass concrete with outlets in the contraction joints, for use in pressure grouting the contraction joints after the cooling of the mass concrete has been placed. Standard galvanized welded pipe will be used for this system and the government will furnish the pipe and fittings, estimated at 43,400 lbs. Grout will be placed under pressure of 100 and 300 lbs. For grouting the foundations the government will furnish 29,000 lbs. of standard 2 1/2-in. black steel pipe. All grouting pie will be placed by the contractor.

Concrete to be used in the dam will range in character from mass concrete made with 6 in. maximum size aggregate, minimum cement content of one barrel per cubic yard, maximum water-cement ratio of 0.9 by volume, and minimum compressive strength at time of full loading of 3000 lbs. per sq. in. to heavily reinforced concrete having 3/4-in. maximum size aggregate, cement content of approximately 1 1/2 barrels per cubic yard, maximum water cement ratio of 0.9 by volume, and minimum compressive strength at time of full loading of 3500 lbs. per sq. in. The individual mixes will be based on securing concrete having suitable workability, density, impermeability and required strengths without the use of an excessive amount of cement, and using, so far as practicable, the entire yield of suitable materials from the natural deposits from which the aggregates are obtained.

The gravel deposits are about 1 1/2 miles above the dam site at the mouth of the Bill Williams River. The contractor will be allowed free use of these deposits, but will furnish the necessary plant for washing and screening the material. Equipment for the concrete mixing plant must be capable of

controlling the delivery of material for weighing or volumetric measurement, so that the combined inaccuracies in feeding and measuring during normal operations will not exceed 1 1/2 per cent for cement or water and 2 1/2 per cent for each separate aggregate. Cement will be furnished by the government to the contractor in bulk.

Concrete will be placed in the dam by means of bottom dump buckets and compacted into a horizontal layer not exceeding 18 in. in thickness. Concrete in general and mass concrete in particular shall be compacted by concrete vibrators of the internal type. Surface vibrators will not be used unless necessary to secure proper embedment of the large aggregate. Exposed surfaces of concrete must be finished by tooling or rubbing, the addition of mortar coats not being permitted. A hand-rubbing finish may be required on portions of the dam designated by the contracting officer.

There will be two diversion tunnels blasted through the rock cliffs on the Arizona side of the river. These will be 29-ft. horseshoe shaped tunnels with a combined capacity to pass 60,000 second feet of water. Due to the fact that the flow of the Colorado will be very low during the filling of the Boulder dam reservoir, which will be started the coming fall, this capacity will be sufficient not only to take care of that but also any flash flood that may be discharged by the Bill Williams River just above the dam site.

The tunnels will each be approximately 1600 ft. in length with open cut excavation at the portals. There will be 72,000 cu. yds. rock and 7,000 cu. yds. common excavation in the portal cuts and 108,800 cu. yds. excavation of all classes in the tunnels. The bores will be lined with a minimum of 6 inches of concrete with a smooth dense finish on all interior surfaces.

When the diversion dam is completed the

tunnels will be dewatered, earthfill coffer dams shutting off the river at the portals, and will be plugged with concrete in enlarged sections near the upstream portals.

Construction of a permanent road on the California side of the river about 1800 ft. in length, extending from a connection with the existing highway to the crest of the dam, and a spur to the power house site, is included in Schedule No. 1. This road will be cut into the face of the cliffs along the river, involving 68,000 cu. yds. rock excavation and in the disposition of the material 754,000 station cu. yds. overhaul will be allowed. The road will have an oil treated surface 24 feet wide. The maximum grade will be 6 per cent.

The coffer dams will be earth fills built up in 8-in. layers, watered and rolled. Material will be a mixture of silt, sand and gravel obtained from common excavation for the dam. Specifications call for the use of a "Rohl" type roller having cast iron ball feet equally spaced over its cylindrical surface and weighing not less than 1000 lbs. per lin. ft. of width of tread. The upstream slope of the upper cofferdam and the downstream slope of the lower coffer dam will be covered to a depth of not less than 3 feet with dumped rip-rap. The slopes will be 3:1 for the faces covered with rip-rap and 2:1 for the other faces. The coffer dams will require approximately 438,000 cu. yds. earth fill and 22,000 cu. yds. of rip-rap. The larger dam, upstream, will be 82 ft. in height above the foundation in the river and will be 30 ft. thick on the crest. The smaller downstream dam will be about 45 ft. high and 20 ft. thick on the crest.

Excavation for the diversion dam and coffer dams will approximate 1,508,000 cu. yds. common and 83,000 cu. yds. rock excavation. The main excavation for the dam in earth will be made with 2:1 slopes. Rock exca-

vated for the foundation will be placed as a blanket on the slopes of the common excavation to stabilize the lower part of the slopes.

Stripping of the overburden from the sand and gravel deposits to be utilized for concrete aggregates will require about 150,000 cu. yds. excavation.

Plans for future construction include a power plant containing four generating units on the California side of the river immediately downstream from the dam. Four penstock tunnels will lead from the forebay to the power house, the flow being regulated by penstock gates in the forebay structure. The forebay will be protected by a trash-rack structure, together with the excavation of a sluice tunnel for the drainage of the forebay. A concrete bulkhead will be constructed near the upper end of the forebay sluice tunnel and the concrete lining of the tunnel will be placed as a part of the future development. Excavation for the forebay, 134,000 cu. yds. of rock and 1000 cu. yds. of common, is included in Schedule No. 1. Concrete in the forebay trash-rack structure and sluice tunnel plugs, 5200 cu. yds., and installing trash-rack metal work are included in Schedule No. 2.

A tract on the California side of the river about a half-mile below the dam site has been set aside by the government for the contractor's camp. Plans for the camp will be subject to approval by the contracting officer, specific provisions being made for water supply, sanitation and fire protection. The charges for meals are limited to \$1.15 per day for each employee and 25 cents per day for lodging.

All construction work will be under the regulations of the Public Works Administration which should be familiar to all readers of the Southwest Builder and Contractor as they have been published from time to time. The minimum wage for skilled labor will be \$1.10 per hour and for unskilled labor 45 cents per hour, with a maximum 8-hour day and maximum 40-hour week.

The total cost of the Parker dam project is estimated at \$13,000,000.

For the Bureau of Reclamation R. F. Walter is chief engineer and J. L. Savage, chief designing engineer. For the Metropolitan Water District F. E. Weymouth is general manager and chief engineer, Julian Hinds assistant chief engineer, B. W. Steele engineer of dams.

if required, call upon the members of the Agency to also proceed to Washington in order to back up the presentation of this phase of code work. The entire success of the program in this state will depend upon this allocation of a proper proportion of revenues for adequate local administration.

The Agency during its meeting considered plans for bid depositories. It is understood that before such a plan can be placed in effect it must be approved by the Divisional Code Authority in Washington; and a special subcommittee of the Agency was assigned the task of assembling complete information relating thereto, to be taken to Washington by Mr. Booe and by him personally presented, to the end that the State Agency may be given blanket authority to work out the details as rapidly as possible.

According to reports made to the Agency, there are already established in many communities plans of bid deposit and central registration of bids which are functioning successfully and all of these will be used as an urge to the National Authorities to delegate discretionary power to the State Administrative Agency in working out these problems locally.

Effective administration of the code will be handicapped until final approval is given to the subdivisional codes, Chapters II-a, II-b and II-c, on which hearings have been held in Washington and which are said to be near final approval. Provision will be made in the budget submitted for the proper setting up of administrative units, both statewide and local, under each of the subdivisions, and it is hoped that this complete program may be placed in effect shortly after July 1.

According to the reports, registration is coming in satisfactorily from all parts of the state through the registration sub-offices established in all important centers.

One of the difficulties in the proper administration of the codes is the long delay caused by transmitting reports and correspondence back and forth to Washington. This is particularly inconvenient in connection with registration and the return of fees for carrying on local work, it having already been found that it takes more than thirty days to get a return back through local channels. Because of this, Mr. Booe will urge upon the Divisional Code Authority and the Construction Code Authority, as well, the importance of the establishment in San Francisco of a regional headquarters for all construction code activities of the eleven western states and endeavor to secure the approval for it.

The method of handling registration has already been found to be very cumbersome and strong recommendation will be made in regard to simplifying this procedure and allowing the local administrative agencies to handle and disburse the funds, merely remitting the proper percentage to Washington. This alone would save a considerable item of cost and would mean much more effective administration.

Present at the State Agency meeting were: R. D. Watson, chairman; H. M. Walker, vice-chairman; S. M. Griffith, George J. Maurer and B. O. Larsen, members; Floyd O. Booe, secretary; F. J. Connolly, assistant secretary; William E. Hague, M. A. Mathias and F. T. Andrews, guests. W. A. Bechtel, Jr., a member of the agency, was unable to be present because of being in the northwest bidding on the Grand Coulee Dam.

Regional Code Headquarters in West Sought by General Contractors

More Money Needed for Local Administration Plans of State Agency Taken to Washington

Various problems arising in connection with the administration of the General Contractors' Code were considered at a meeting of California Administrative Agency of the Divisional Code Authority for General Contractors at a meeting in San Francisco on June 15, and these will be laid before the Code Authority at Washington this week, together with recommendations, by Floyd G. Booe, secretary of the Agency.

These recommendations include the establishment of regional headquarters at San Francisco for all construction code activities in the western states to facilitate code administration; the delegation to the State Agency of blanket authority to work out the details of a plan for bid depositories, and the return of 77 per cent of the registration fees instead of the 40 per cent now allowed for local administration, at the same time giving local agencies the privilege of retaining the percentage allowed for local administration and handling this fund.

A firm of certified auditors was retained to make a complete audit of registration to date and study and report on the matter of finances required to adequately carry on code work on behalf of the general contractors in California; and this very exhaustive report is being transmitted to Washington for further review by the National General Contractors' Code Authority. It was very quickly determined that it would be impossible for code administration in California to properly function with a return of only 40 per cent of registration fees for local administration. A study indicates that not less than 77 per cent of the registration fees

of one-tenth of 1 per cent must be returned for use by state and local authorities in code administration.

The matter of finances is of such great importance to the successful functioning of code administration that the Agency instructed the secretary, Floyd G. Booe, to immediately proceed to Washington and submit a complete budget for approval, along with the various other matters that require immediate decision on the part of the National Authority and to insist on a proper allocation of funds for local administration. Carrying out these instructions, Mr. Booe left for Washington June 26 to appear before the National Code Authority this week and to present a complete budget of expenditures and income proposed in this state, along with definite figures in regard to expected revenues from code registration. Mr. Booe will also present a tentative program for establishment of bid depositories and various other matters important to an immediate establishment of code administration in every locality.

According to the budget of the National Code Authority submitted to N.R.A., copies of which were received by the State Agency, the intent was that approximately 75 per cent of fees be returned for local administration; but for some unknown reason the allocations to date to California for local work have only been 40 per cent and Mr. Booe's strongest effort before the Divisional Code Authority will be to convince them that it will be utterly impossible for the General Contractors' Code to be properly administered in California with such a small return of registration fees. In presenting the case to the National Authority, he will,