

LOWER SAN JOAQUIN RIVER
FLOOD CONTROL PROJECT

OPERATION AND MAINTENANCE
MANUAL

FOR

SAN JOAQUIN RIVER AND
CHOWCHILLA CANAL BYPASS
AUTOMATIC CONTROL STRUCTURES
AND APPURTENANCES

PART III

THE RECLAMATION BOARD

1969

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INTRODUCTION

1000

Reference

1100

Chapter 1000 -- Introduction of Part I, "General Data and Operation and Maintenance Manual for Levees, Irrigation and Drainage Structures, Channels and Miscellaneous Facilities", applies to this manual.

GENERAL

2000

Reference

2100

Chapter 2000 -- General of Part I, "General Data and Operation and Maintenance Manual for Levees, Irrigation and Drainage Structures, Channels and Miscellaneous Facilities", applies to this manual.

DESCRIPTION

3000

General

3100

The San Joaquin River and Chowchilla Canal Bypass control structures and appurtenances are located at the junction of the San Joaquin River and Chowchilla Canal Bypass. These two structures control the division of flows of the San Joaquin River.

The two reinforced concrete structures are identical. Each structure is divided into four equal bays that are gated. Approach embankments connect the structures with the levee system. Patrol bridges provide continuity of the left bank levee San Joaquin River with the left bank levee Chowchilla Canal Bypass and left bank levee Chowchilla Canal Bypass with the right bank levee of Chowchilla Canal Bypass and San Joaquin River.

Four float wells are used to control the gate operation. Float Well No. 1 is located on the left bank of the San Joaquin River approximately 12 miles upstream of the structures and one-half mile upstream of the end of the project works. Float Well No. 2 is situated on the right bank of the San Joaquin River several hundred feet upstream of the structures. Float Well No. 3 is located on the right bank of the San Joaquin River just below the San Joaquin River structure, and Float Well No. 4 is located on the left bank of the Chowchilla Canal Bypass just below the Chowchilla Canal Bypass structure.

General (Continued)

3100

A Control Building and the Well and Fuel Tank Storage Enclosure with a chain link fence enclosure are situated on a pad adjoining the left levee of the Chowchilla Canal Bypass just downstream from the structure.

Following is an aerial photograph showing all of the facilities described above except Float Well No. 1.

San Joaquin River and Chowchilla Canal
Bypass Control Structures

3200

Each structure is reinforced concrete with four gated bays. The structures are 87.5 feet wide, from outside of one abutment wall to the outside of the other. As the structures are identical, it will be necessary to describe only one structure. Forming the bottom is a two-foot-thick floor slab 78.25 feet in length. Under the slab is a two-foot thick layer of processed drain material. The top of the slab is elevation 162.0 feet and extends 7 feet beyond the abutment walls into the approach embankment. A hydraulic cutoff wall extends below the slab along the upstream and side edges to elevation 130.0 feet. Along the downstream edge of the slab a concrete cutoff wall extends to elevation 159.0 feet.

Piers rise 18 feet above the floor slab. The nose of the piers slopes back 4.5 feet at the top from the vertical and forms 20-foot wide bays. The top of the floor slab between the piers has the following items starting from the upstream end and proceeding downstream: 5-inch diameter x 8-inch deep trash



barrier posts inserts, 14 per bay, 1.33 feet center to center across the slab; sill plate; and five floor blocks, 2-feet square and 4-feet high equally spaced across the floor slab of each bay. There is an end sill, 1-foot wide, 2-feet high with 4-inch drain pipes at 5 feet center to center.

Located on the side of the abutment walls and piers are vertical stop log groove, radial gage side plate, and trunnion block. Six 1-inch diameter anchor bolts extend from each trunnion block to which the gate hinge pin assembly is bolted. Four-inch diameter drain pipes are located in the abutment and wing walls, 10 feet above the floor slab, 5 feet center to center beginning just behind the radial gate side plate and extending downstream.

A 12-foot-wide maintenance platform, 6-foot-wide hoist operating platform, and 16-foot-wide patrol bridge extends between the abutment walls across the top of the piers with the maintenance platform on the upstream end, the roadway on the downstream end, and hoist operating platform situated in the middle. Removable pipe handrail panels are on the upstream edge of the maintenance platform and fixed panels between the hoist machinery on the downstream edge of the hoist operating platform. Metal bar grate panels fill the space between the two platforms. Each panel is 2.33 feet wide and 10.25 feet long, and weights approximately 675 pounds.

San Joaquin River and Chowchilla Canal
Bypass Control Structures (Continued)

3200

Trash barrier post anchors, 1.33 feet center to center, are in the upstream edge of the maintenance platform. There are 14 trash barrier posts per bay. Each post is a 4-inch inside diameter by 20.5-foot standard pipe, concrete filled. The roadway has a curb and metal beam guard railing on each side. Through the curbs are 8-inch diameter semicircular drain openings, one per bay.

Retaining walls extend 64 feet from the face of each abutment wall and parallel to the crown of the approach embankment. Wing walls 60 feet in length extend downstream from the end of the abutment walls. The face of the wing walls are at a 30-degree angle to the centerline of the channel. Fixed pipe handrails extend along the top of the retaining walls; across the top of the abutment walls, between the retaining wall and maintenance platform, the hoist operating platform and the roadway; and a 14-foot section on top of the wing walls, adjacent to the roadway.

Approach embankments connect the structures to the levee system. These embankments have a crown width of 64.5 feet, surfaced with 4 inches of crushed mineral aggregate. The side slopes of the embankments are on a 3-to-1 slope.

The channel invert adjacent to the structures has a $3\frac{1}{2}$ -foot thick cover of stone protection extending 30 feet upstream and 40 feet downstream. This cover consists of a

San Joaquin River and Chowchilla Canal
Bypass Control Structures (Continued)

3200

6-inch thick, well-graded mineral aggregate, 2 inches maximum, filter blanket; 1-foot thick, well-graded cobbles, $1\frac{1}{2}$ inch to 8 inches maximum; and a top coarse, 2 feet in depth, of well-graded quarry rock, 8 inches to 24 inches maximum. Stone protection, $1\frac{1}{2}$ feet in thickness, and a filter blanket has been placed on the embankment slopes adjacent to the retaining walls, continuous between the structures, and behind the wing walls.

Control Building Area. An embankment pad which measures 95 feet by 86 feet is situated adjacent to the left bank levee of Chowchilla Canal Bypass and left approach embankment of the Chowchilla Canal Bypass control structure. This area has been surfaced with a 4-inch thick course of crushed mineral aggregate.

3201

A chain link fence provides an enclosure for the two buildings located on the pad. The fence enclosure measures 54 feet by 70 feet. The fence fabric is 7 feet high with metal posts set in concrete. Three strands of barbed wire are supported by arms attached to the top of the metal posts and top of gates. Two double 14-foot gates provide access to its enclosure. The gates have a plunger rod locking device. The District shall provide a lock for each gate.

Control Building. The Control Building is 24 feet by 28 feet hollow concrete block, grout filled, wall construction with concrete floor slab. The roof consists of metal

3202

decking with 6-inch metal fascia, 1-inch thick rigid insulation and built-up compositon roofing with $3\frac{1}{4}$ -inch aluminum gravel stop. An interior block wall divides the building into two equal portions. The west half is a storage room with an 8-foot wide roll-up door in the south wall. An exterior hollow metal door, 3-feet wide, in the north end of the west wall, which also provides access to the storage room. The east half of the building is divided into a mechanical room in the rear and office in the front. These two rooms are divided by a lavatory and closet accessible from the office. In the east wall exterior hollow metal doors, 3-feet wide, provide access to the office and mechanical room. In the rear wall a full louvered door provides another access to the mechanical room. The office room has a 6-foot 8-inch window with sun louver in the front wall. A roof drain with down spout discharges on a splash block on the west side of the building. A concrete pad, 4 feet by 8 feet, is situated at the entrance to the office.

A standby engine-generator set is located in the mechanical room. An aluminum louver in the east wall of the mechanical room provides a discharge opening for the engine's radiator air exhaust duct. The lavatory room has a wash bowl and water closet. The control panel for the gates of the structures is located on the west wall of the office. Also included are fire extinguishers, one each on the wall of the storage room, office, and mechanical room.

Well and Fuel Tank Storage Enclosure. The Well 3203

and Fuel Tank Storage Enclosure is a 10-foot 8-inch by 21-foot 4-inch hollow concrete block, grout-filled and mortar cap, wall construction with concrete floor slab. The top of the enclosure is 8 feet high and is open. A hollow block wall divides the enclosure into two portions. A well enclosure is on the south end and the fuel tank storage enclosure is on the north end. On the west wall of the building, exterior hollow metal doors, 3-feet wide, provide access to the two enclosures.

Float Wells. A float well consists of a 48-inch 3204

diameter, 14-gauge, galvanized corrugated metal pipe. The bottom of the float well pipe is embedded in a 5-foot square, 1-foot thick concrete slab. The top of the float well and floor of the recorder house is a $\frac{1}{4}$ -inch steel plate with hatch cover. The float well has a steel ladder for access and three 2-inch intake pipes with static tubes and flushing devices on the two lower intake pipes. The bottom intake pipe is located 2 feet above the concrete slab, and the next pipe is 1 foot above. For the location of the highest intake pipe, see the table on the following page.

A recorder house is attached to the top of the float well. The float well housing is 48-inch corrugated metal pipe, 8 feet in height with a 14-gauge galvanized steel, cone-shaped roof. The door is attached with three hinge bars, hasp and lock bar. The district shall provide locks for the four installations.

TABLE OF FLOAT WELL ELEVATIONS

Float Well	Float Well Approach Grade	Top of Float Well	Top of Highest Static Tube	Top of Slab and Toe of Stone Protection
1	197.0	197.5	193.0	186.0
2	180.0	180.5	173.0	162.0
3	177.0	177.5	170.0	164.0
4	178.1	178.6	170.0	162.0

Approach embankments, 12-feet wide with 3-to-1 side slopes, have been provided extending from the levee crown to Float Well Nos. 1, 2, and 3. Float Well No. 4 is situated in the corner of the Control Building pad. Stone protection has been placed on the bank of the low flow channel where the intake pipes extend through the bank. The stone protection extends 10 feet on each side of the intake pipe alignment from the toe to the top of the bank. The stone protection is a 1-foot thick blanket of cobbles well graded from $1\frac{1}{2}$ inches to 8 inches maximum.

Mechanical Installation. The mechanical equipment consists of eight radial gates, one for each bay of the two structures. Each gate is controlled by its own set of hoist machinery. Also included is the standby engine-generator set, fuel system, well and water system, and sewage disposal system. 3210

Radial Gates. Each radial gate measures 19 feet 3211

11 inches by 17 feet 2 inches. The gate consists of a $\frac{1}{4}$ -inch steel skin plate attached to a girder frame. Extending from the girder frame are two radial side arms with trunnion hubs. The radius from the center of the bushing of the trunnion hub to the skin plate is 18.0 feet. The trunnion hub is connected to the gate hinge pin assembly which is anchor-bolted to the trunnion block on the side of the pier or abutment wall. Grease piping is connected to the center of the hinge pin. The $\frac{1}{2}$ -inch galvanized steel piping extends up the pier or abutment from the hinge pin assembly to the top of the curb of the roadway. A standard hydraulic grease fitting is attached to the end of the piping. Steel cable attachments are welded to the face of the skin plate. When fully closed, the gate rests on a stainless steel sill plate embedded in the top of the floor slab. A 12-inch wide stainless steel gate wall plate is embedded in the abutments and piers conforming to the edge of the gate face plate.

Hoist Machinery. The radial gate hoist machinery 3212 consists of a gear motor and brake, flexible coupling on the high-speed shaft of the reducer, parallel shaft speed reducer, spring-set shoe brake, and limit and speed switch. The drive unit support base is anchor-bolted to the hoise platform. Attached to the low speed shafts of the reducer are the following items: flexible coupling, self-lubricated type; drum shaft;

Hoist Machinery. (Continued)

3212

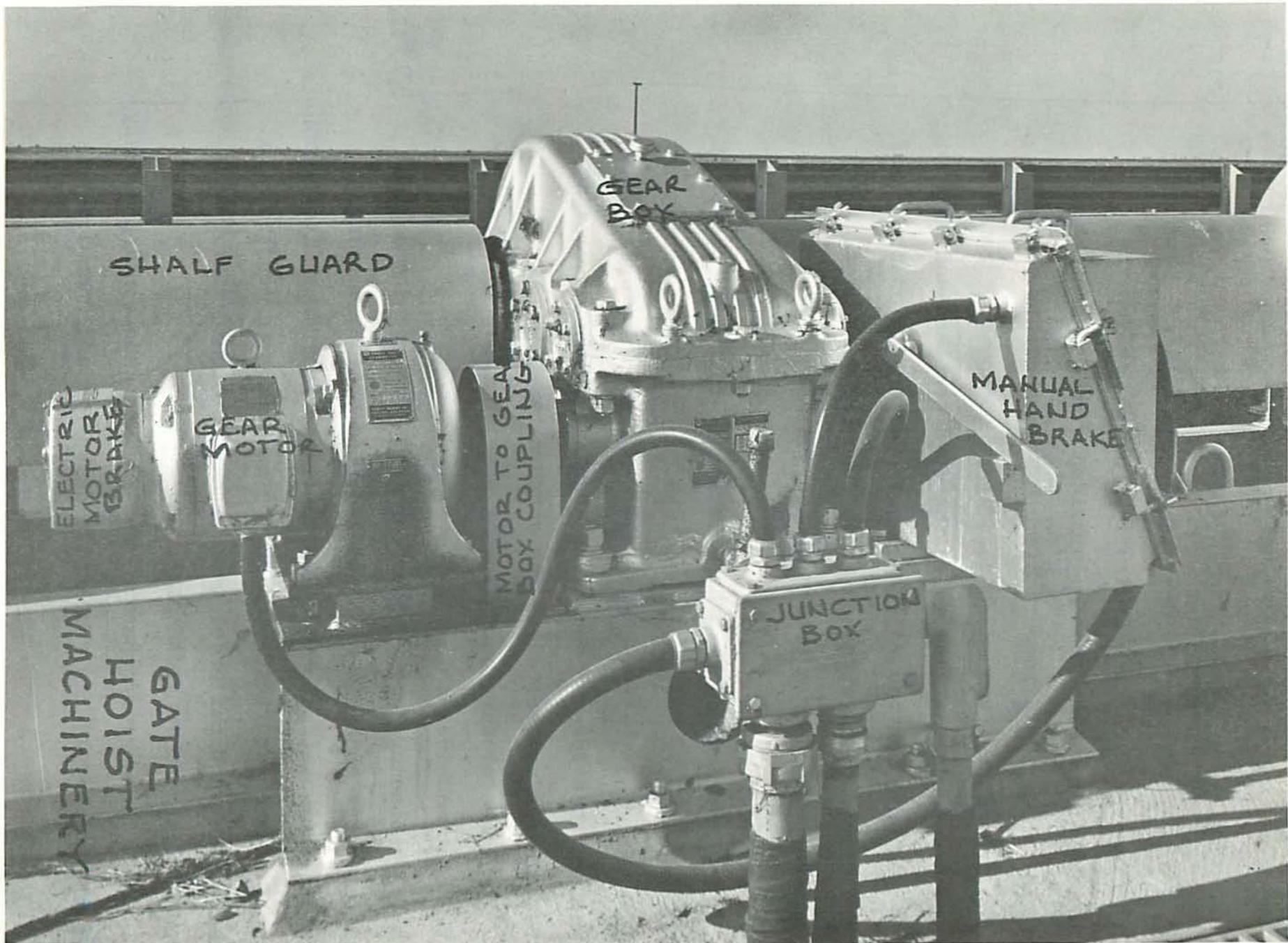
pillow block bearing provided with grease fitting; 21-inch pitch diameter wire rope drum with grooves; and on the outside a pillow block bearing provided with grease fitting. The wire rope is $3/4$ inch in diameter and securely clamped to the drum at one end. Two dead wraps of the rope remain on the drum when the gate is in the down position and when in full open position the rope will not overwind. The other end of the wire rope is attached to an open bridge socket which is bolted to the cable attachment on the skin plate of the radial gate.

The drum support base is anchor-bolted to the hoist platform. Covers have been provided for the drums spring-set shoe brake, and limit and speed switch. A safety guard has been furnished for the shaft and couplings. The covers and safety guards are bolted to the support bases.

See picture on following page showing typical gate hoist machinery.

Standby Engine-Generator Set. The standby engine - 3213 generator set consists of a water-cooled engine, cooling system, fuel system, exhaust system, main generator, instrument panel, and accessories. The engine-generator is mounted on a one-piece structural steel base, with vibration dampers, and anchor bolted to concrete base.

The engine-generator set has adequate continuous duty capacity to supply the cumulative demand of one radial gate



SHALF GUARD

GEAR
BOX

ELECTRIC
MOTOR
BRAKE

GEAR
MOTOR

MOTOR TO GEAR
BOX COUPLING

MANUAL
HAND
BRAKE

JUNCTION
BOX

GATE
HOIST
MACHINERY

Standby Engine-Generator Set. (Continued)

3213

hoist motor running, one radial gate hoist motor starting, and a 3 KW station service load. The set provides continuous electric output from the main generator at 440-volt, 3-phase, 3-wire, 60-cycle. The synchronous speed will not exceed 1,800 rpm.

Engine. The engine is an International Harvester, Model 15 U.C. 135 propane gas fueled, 4 cycle, valve-in-head, water cooled with 4 cylinders. The engine has a maximum piston stroke to cylinder bore ratio of 1.25 and compression ratio of 6.25. The engine is connected directly to the generator with a semiflexible coupling. The engine has a replaceable air filter, automatic choke, full pressure lubrication with gear driven oil pump, full flow oil filter with replaceable element, radiator, radiator fan, water pump, 12-volt battery ignition with generator and automatic regulator, oil pressure gauge, thermostatically-controlled water jacket heater, cranking limiter, automatic over-speed shutdown, high water temperature cutout, and low oil pressure actuated shutoff switch. A multiviscosity oil is used for engine lubrication. The engine is equipped with an adjustable, centrifugal governor which will compensate quickly for changes in load and will maintain generator speed regulation within 3 cycles per second from no load to rated load.

3213.1

Fuel System. The engine fuel system is 3213.2
complete with storage tank, fuel piping from the fuel tank to
engine, converter with integral primary and secondary regulators,
filter, solenoid shut-off valve, and all the necessary compo-
nents required to complete the fuel system. The fuel system is
a liquid withdrawal type for use with commercially available
propane gas.

The storage tank has a 150 gallon gross volume.
The tank is equipped with float gauge, and filling, liquid
shut-off and relief valves. The tank is securely attached
to a structure steel support base which is anchor bolted to
the floor slab of the enclosure. The converter is securely
mounted on the engine generator and uses the engine cooling
water as a heat source. The solenoid shut-off valve is
energized from the starting battery. A flexible connection
is in the fuel line adjacent to the fuel converter.

Exhaust System. The engine exhaust piping and 3213.3
components are arranged to discharge the engine exhaust gases
outside of the building. There is a flexible connection in
the piping adjacent to the engine and muffler strapped to the
ceiling near the discharge point through the wall. The
horizontal portion of the exhaust piping slopes downward the
discharge end to prevent water from entering the engine.

Generator. The main generator is an 3213.4
alternating-current type employing a direct-connected excitation
system, with the necessary excitation system components. The

Generator. (Continued)

3213.4

voltage rating of the generator is 120/240-volt, 3-phase, 4-wire delta, 60-cycle. At rated capacity the generator is capable of delivering 100 percent full-load amperes continuously at rated voltage and frequency. Voltage regulation is within plus or minus 3 percent between no load and rated load while operating at rated frequency. The rated temperature rise of the generator is 50^oc. A 480-volt, 3-phase, time curve, circuit breaker is mounted on the unit.

Instrument Panel. An instrument panel is

3213.5

securely mounted on the generator and contains an oil pressure gauge, water temperature gauge, battery-charging rate ammeter, battery-charging rate adjusting rheostat, indicating tachometer, voltmeter, ammeter, engine "Start-Stop-Check" selector switch, and a running time meter which registers the total number of hours the engine generator has operated.

See picture on following page showing instrument panel.

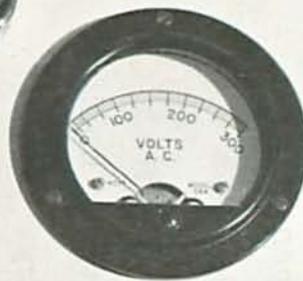
Accessories. Accessories and appurtenances

3213.6

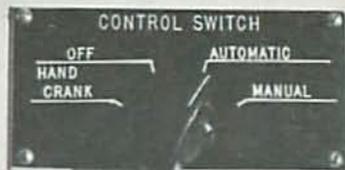
of the engine-generator set include the starting battery, battery cables, battery hydrometer and filler, radiator discharge duct, fire extinguisher, and tools.

The battery for the ignition system is a 12-volt, D.C., heavy-duty, 120-ampere hour type. The battery is enclosed in a glass fiber impregnated resin battery box with

FAIRBANKS MORSE



EXCITER RHEOSTAT



ENGINE - GENERATOR
CONTROL PANEL



RESET

RUN-STOP

HAND CRANK

12 AMP FUSE



START

HAND CRANK

Accessories. (Continued)

3213.6

removable cover. The battery hydrometer is mounted on the wall in a plastic case. The battery filler is a four-quart capacity with filler case and built-in glass cage.

The radiator discharge duct connects the engine radiator air discharge opening to the louvered opening in the outside wall. The duct includes a flexible section for vibration dampening and gradually increases to the size of the wall opening. The duct is 24-gauge galvanized steel with flanges at the radiator and the wall opening to provide an airtight connection. The flexible section of the duct is ventglas.

Well and Water Piping. The well is a 6-inch

3214

inside diameter welded steel water well casing. Installed inside the casing is a $\frac{1}{2}$ -h.p. submersible pump with 110-foot length of drop pipe. A pressure tank with a capacity of 82 gallons is mounted on the floor of the enclosure. Three-quarter-inch buried galvanized iron pipe extends from the pressure tank to the Control Building and supplies water for the lavatory and water closet.

Septic Tank and Leaching Field. A reinforced

3215

concrete septic tank is located on the land side of the left bank levee Chowchilla canal bypass, 40 feet from the levee centerline at Levee Mile 5.29. A 3-inch cast iron pipe carries the effluent from the Control Building to the

Septic Tank and Leaching Field. (Continued)

3215

septic tank. Two cleanouts are located in the floor of the storage room. The leaching line extends from the septic tank in a downstream direction and 40 feet equal distance from the centerline of the left bank levee Chowchilla canal bypass.

Electrical Installation. The electrical installation

3220

in general consists of lighting, power and grounding systems; and electrical control panel, level transducers, and associated equipment.

Service Poles. One service pole is located on

3221

the north edge of the Control Building area embankment pad. The power utility company supplies 120/240-volt, 3-phase, 4-wire, delta 60-cycle electrical service at this installation. The pole is Class 6, Douglas Fir, creosote pressure treated, and extends approximately 20 feet above grade. Buried conduit with wire extends from the service pole to the control panel of the Control Building. The other service pole is located near FloatWell No. 1 and is identical to the above-mentioned service pole except that the electrical service is 120-volt, single-phase. Buried conduit and wire extends from the pole to the floatwell.

Lighting and Power System. Located on the

3222

handrail at each hoist machinery installation are a light standard; column lite floodlight, 300-watt lamp; duplex

Lighting and Power System. (Continued)

3222

convenience outlet, conduit with snap cover plate, weather-proof and lockable. The District shall furnish locks, 10 total.

Situated on the hoist platform at each gate hoist is a junction box. Distributed from the junction box is wire in flexible conduits for power and control of the following equipment: overspeed switch, shoe brake, motor, dish brake, and limit switch.

The Control Building has the following lighting, power outlet, fan, and heater arrangement. In the storage room, two ceiling lighting fixtures with one 100-watt light bulb each, controlled by two 3-way switches, and two duplex convenience outlets; in the mechanical room, two ceiling lighting fixtures with two 100-watt bulbs each, controlled by two 3-way switches, two duplex convenience outlets, and wall heater, 2000 watt, 240-volt automatic fan type; in the office, two ceiling lighting fixtures with two 100-watt bulbs each, controlled by one switch, two duplex convenience outlets, a wall heater, 2000 watt, 240-volt automatic fan type, and switch that controls 100-watt flush mounted lighting fixture in the outside wall adjacent to entrance of the office, and in the lavatory, one lighting fixture with two 100-watt bulbs and ceiling fan controlled by wall switch, and one duplex convenience outlet.

Lighting and Power System. (Continued)

3222

Each float well recorder house has the following equipment: one 100-watt light fixture with switch, one duplex convenience outlet--two at Float Well No. 1, junction box--none at Float Well No. 1, and a one-pole, 240-volt A.C., 15 ampere, circuit breaker.

Grounding System. A grounding grid connects the ground electrode, engine-generator, ground bus in the motor control cabinet, hoist machinery, handrails, and platform gratings. The grounding electrode, 3/4 by 8 feet galvanized steel rod, is embedded in the ground adjacent to the service pole.

3223

Automatic Control System. The automatic control system was furnished and installed by the Honeywell Company. The equipment is located in the four floatwells and control cabinet in the control house. Float Well No. 1 has located in its recorder house a water surface level indicator transducer with float system, resistance-current transducer and current-to-current transducer. The water surface elevation is transmitted to the control house via telephone leased line. Located in each of the recorder houses of Float Wells Nos. 2, 3, and 4 are a water surface level indicator transducer and resistance-current transducer. This latter mentioned equipment is wired to the control cabinet. The automatic control system equipment is rated at 110-volt, single phase, 60-cycle.

3224

Control Cabinet. The necessary electronic

3224.1

equipment to operate the motors of the gate hoist machinery is situated in the control cabinet located in the office of the Control Building. The cabinet measures 6 feet wide by 6 feet high by 30 inches deep. A copper ground bus is provided to which the housing, framework, cable support, and noncurrent carrying metallic parts of all equipment and conduits have been grounded. A 100-watt space heater, 120-volt with thermostat is provided to maintain the internal temperature in the cabinet at an adjustable valve between 30° and 120°F. The thermostat has been set at 70°F.

The equipment located on the face of control cabinet to operate the gates is as follows:

Four water surface level indicators for Float Wells Nos. 1, 2, 3, and 4 located at the top of the cabinet. The range of the scale of the indicators are 180 feet to 204 feet for Float Well No. 1 and 160 feet to 184 feet for Float Wells Nos. 2, 3, and 4. Just below Float Well Nos. 1 and 2, water surface level indicators are Ratio and Bias auxiliary meters. Located in the next row below from left to right are: lockable "stop" control switch; lights to indicate when Float Well No. 1 is "out of service"; function selector switch with operational mode control settings of automatic, manual, and local; four selector switches with lights, one switch for each motor of the gates of the

San Joaquin River structure; and below the latter mentioned selector switches, four selector switches with lights, one switch for each motor of the gates of the Chowchilla Canal Bypass structure. See picture on following page showing control panel switches and instruments.

Equipment to receive the transmitted signals from the float wells and condition it for use with the other instruments to control the gates are located within the cabinet. A change in water surface elevation at Float Well No. 1 will result in a proportional change in water surface elevation at Float Well No. 2. Three proportionality constants have been provided, each adjustable over the range of the equipment. This is necessary as the stage-discharge curves have different characteristics for the channel at the two float wells.

The level indicators are also adjustable as to time, level, and ratio within the cabinet. Limit switches will stop each motor at the limits of its gate's travel and provide contact for other control functions. An overload relay is provided in each of the three power leads. Electrical and mechanical interlocks have been provided on the starters. A list of the equipment in the cabinet is as follows:

<u>Quantity</u>	<u>Description</u>
2	Resistance to current transducer
4	Level Indicator
3	Monitor Relay
2	Ratio and Bias Auxiliary
2	Amplifier-controller

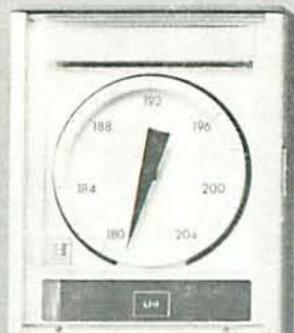
Control Cabinet. (Continued)

3224.1

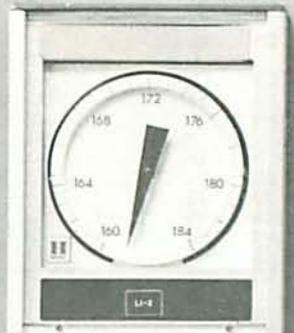
<u>Quantity</u>	<u>Description</u>
8	Starter, Reversing Nema Size 1, 3 overloads
1	Starter, Nonreversing, Nema Size 1, 3 overloads
8*	Circuit Breaker, 3-pole, 15-amp., 480-volt
1*	Circuit Breaker, 3-pole, 70-amp., 480-volt
3*	Circuit Breaker, 1-pole 15-amp., 240-volt
1*	Circuit Breaker, 3-pole, 100-amp., 480-volt
1	Contractor, 30-amp., 2-pole, with 2 auxiliary contacts
8	Relay, Time Delay on Energizing with Instantaneous Contacts
4	Relay, Time Delay on Energizing and on Deenergizing
4~	Stepping Switch, 120 V.A.C.
16	Relay, Auxiliary, 10-amp., 300-volt
--	Resistors, 1%
--	Potentiometer, precision
1	Transfer Switch with Controls
1*	Distribution Panel 240/120-volt service, 70a mains, S.N. with 7-20a, 1 pole, S.N. 1-15a, 1 pole, and 2-30a, 2 pole breakers
1	Space heater, 100-watt, 120-volt A. C.
1	Thermostat

*See picture on following page showing circuit breakers.

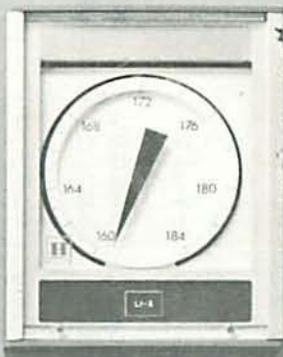
HONEYWELL SYSTEM ENGINEERED



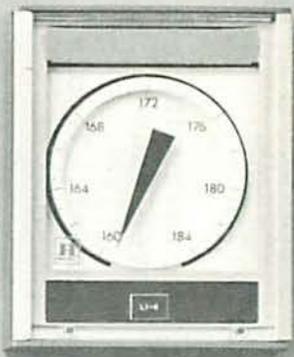
FLOATWELL #1 W.S. ELEVATION



FLOATWELL #2 W.S. ELEVATION



FLOATWELL #3 W.S. ELEVATION



FLOATWELL #4 W.S. ELEVATION

CONTROL PANEL

STOP OUT OF SERVICE IN SERVICE FLOAT WELL #1

INITIAL FLOW TO SAN JOAQUIN INITIAL FLOW TO CHOWCHILLA

MANUAL LOCAL

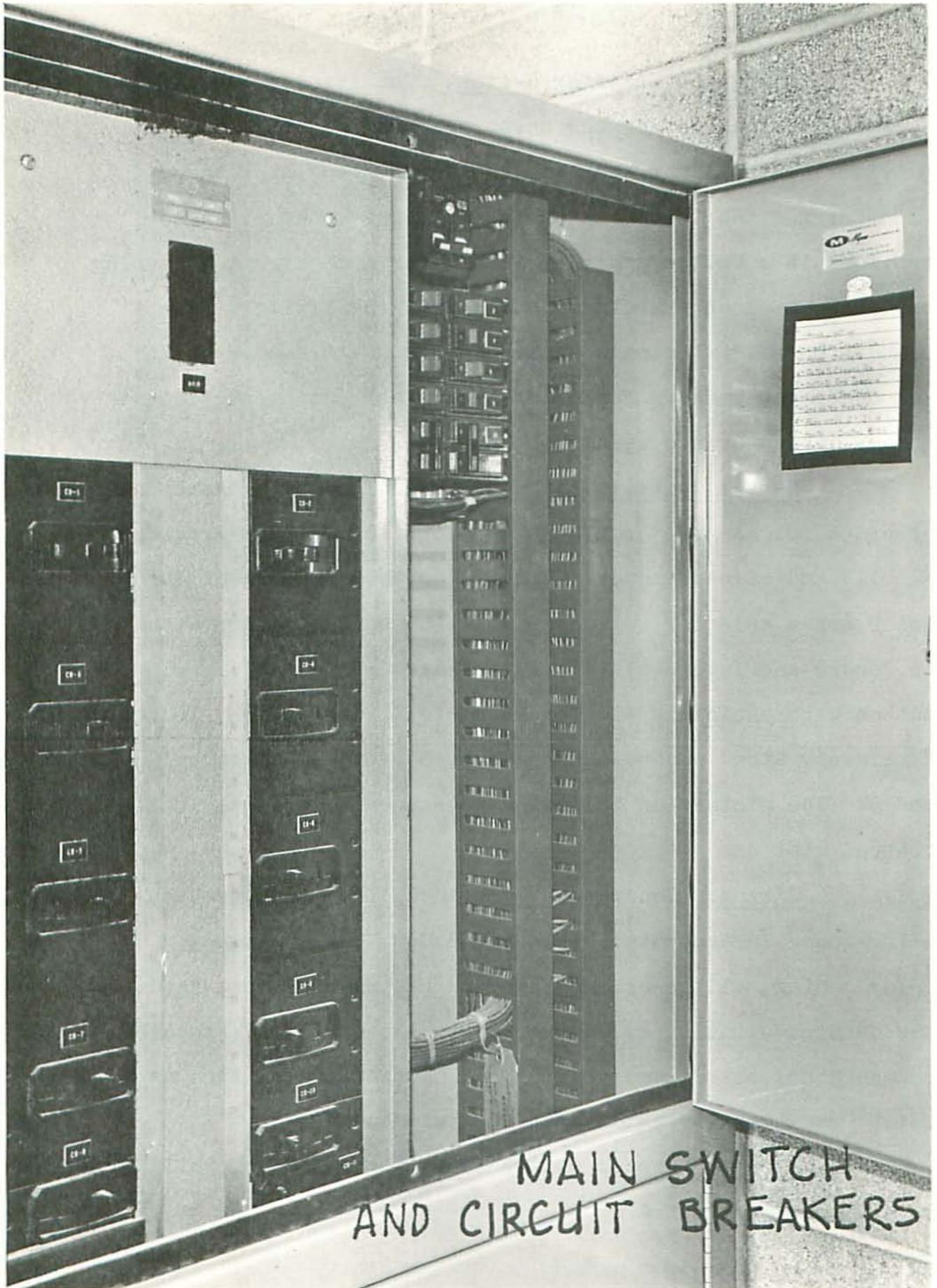
FUNCTION SELECTOR SWITCH

OPEN GATE #1 CLOSE OPEN GATE #2 CLOSE OPEN GATE #3 CLOSE OPEN GATE #4 CLOSE

SAN JOAQUIN RIVER GATES

OPEN GATE #5 CLOSE OPEN GATE #6 CLOSE OPEN GATE #7 CLOSE OPEN GATE #8 CLOSE

CHOWCHILLA CANAL BYPASS GATES



MAIN SWITCH
AND CIRCUIT BREAKERS

Emergency Transfer Switch. The transfer switch 3225

located in a cabinet on the north wall of the office provides controls for starting the engine-generator and transferring the load from the normal power source. Also provided is a battery charger with meter and current adjusting rheostat, a clock exerciser, and a cranking limiter. See picture on following page showing emergency transfer switch and other equipment. For other electrical equipment for the engine-generator see paragraph 3213.

Manual Control Stations. Manual control has been 3226

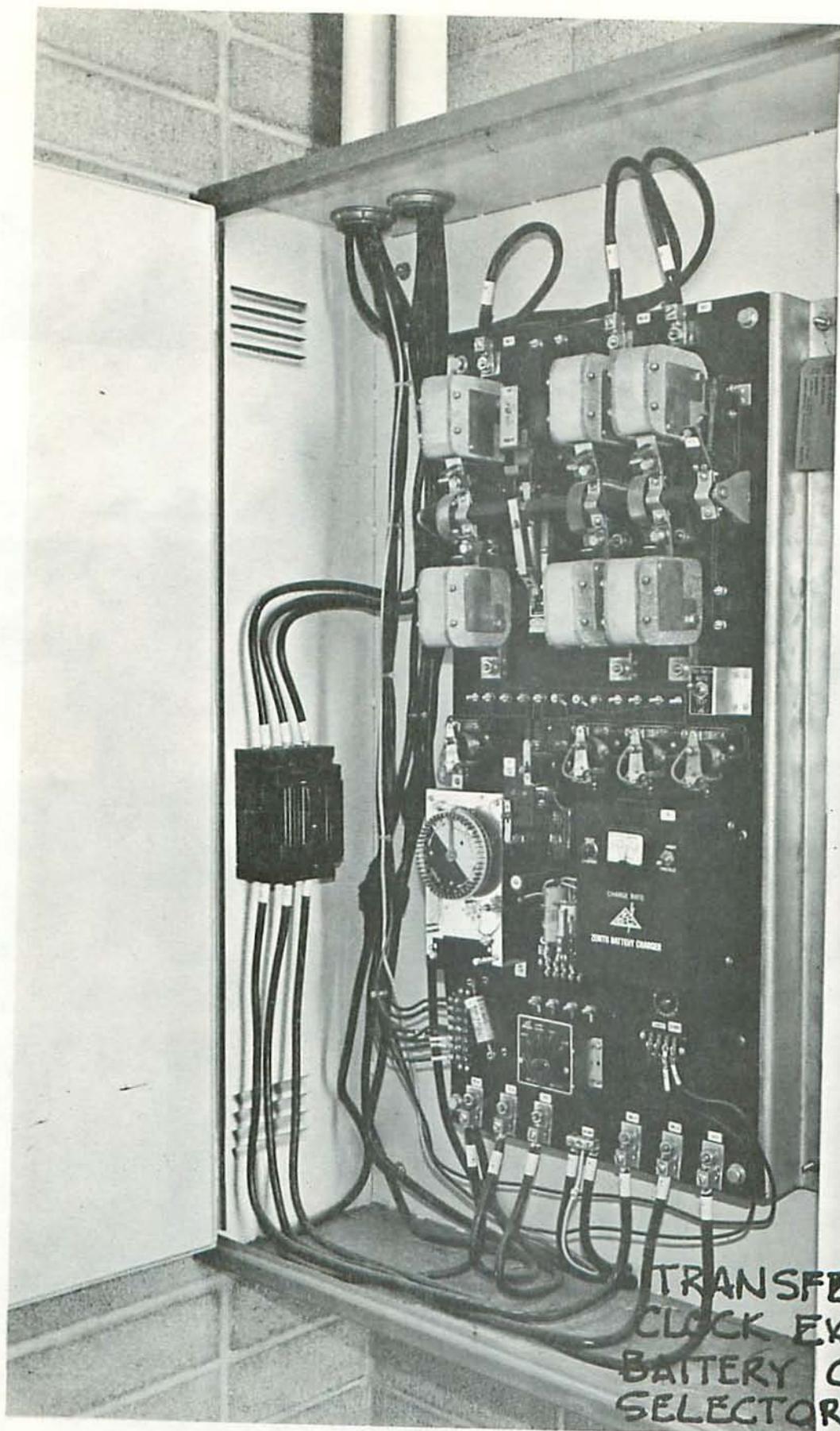
provided for each motor at the control cabinet (See Paragraph 3224.1) and at each motor. Located on the handrail at each motor are a selector switch, 3 position spring return with enclosure and legend plate; and pushbutton, lockable, red button with enclosure and legend plate. In addition, lockable "Emergency Stop" pushbuttons have been provided at gates Nos. 1 and 5. See picture on following page showing typical local control station.

Wiring. Conductors of branch circuits have been 3227

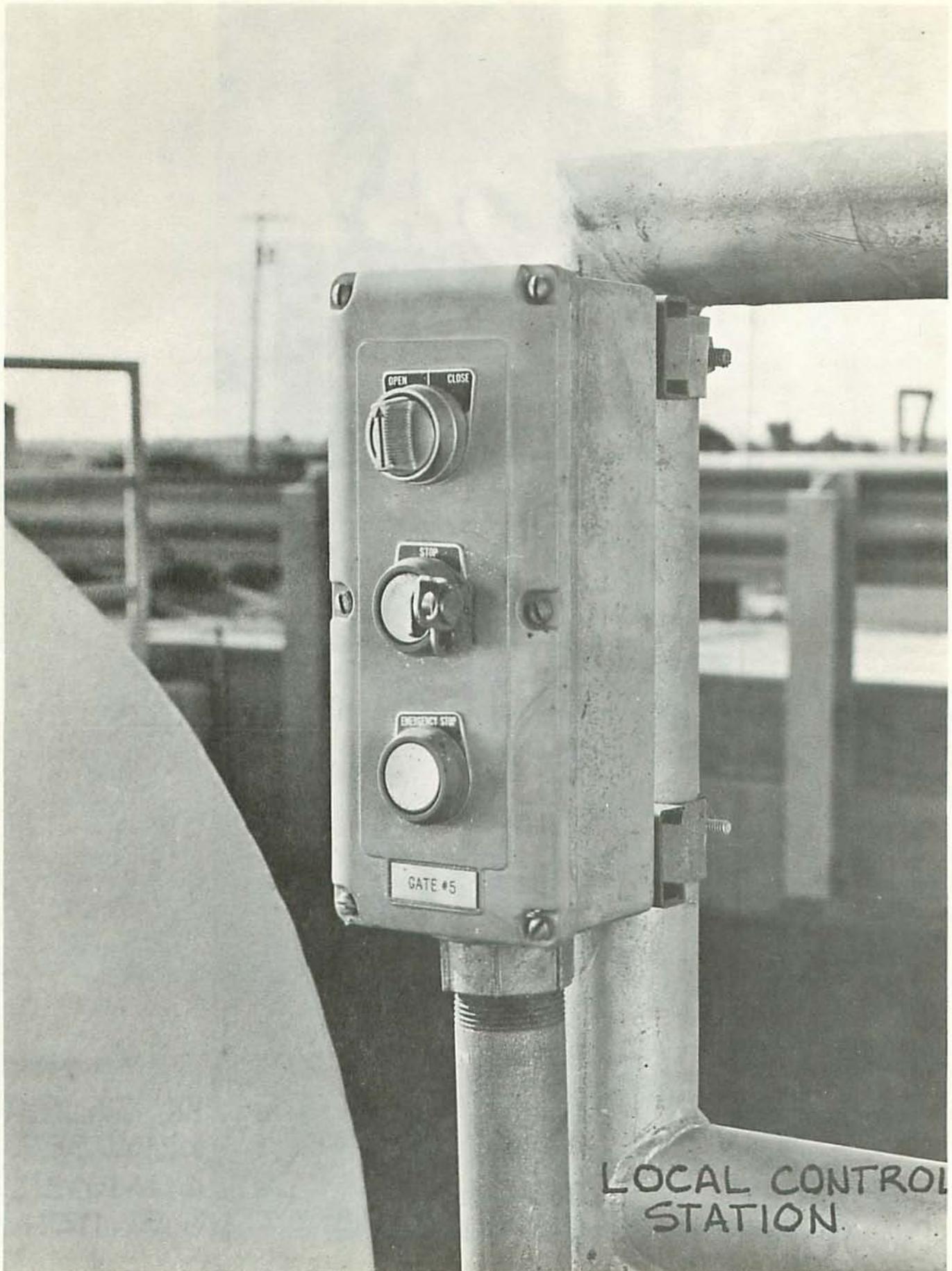
color coded in accordance with the N.E.C. In addition to color coding, all power and lighting branch circuits, feeders, and control circuits are numbered at all terminals, junction boxes, panel boards and control enclosures. Check the "As Built Drawings" wiring diagram for reference.

Siren. Mounted on the roof of the Control Building 3228

is a siren, 120-volt A.C.



TRANSFER SWITCH
CLOCK EXERCISER
BATTERY CHARGER
SELECTOR SWITCH



LOCAL CONTROL
STATION.

MAINTENANCE

4000

General

4100

The District shall maintain the facilities described in Chapter 3000 of this manual.

The maintenance and service on the mechanical and electrical facilities shall be scheduled and prosecuted just prior to the fall detailed inspection made by personnel of the State Department of Water Resources. This inspection shall include the testing of the gate units several times through the full range of operation. Suggested inspection forms are included in Chapter 6000 and will assist the superintendent as a guide when making inspections conforming to Section 2280 of the Part I manual.

Since adequate operation of the mechanical and electrical equipment is vital for the proper functioning of gate units, controls and appurtenances shall be maintained in good operating condition. The subject of maintenance and procedures can only be briefly touched upon, and should be expanded and improved upon as continued experience is gained in operation of the equipment.

All damaged or unserviceable parts shall be repaired or replaced without delay. Before attempting repairs, the applicable "As Built Drawings", shop drawings, specifications, as well as catalogs, descriptive data, parts lists, and operation and maintenance procedures supplied by the

manufacturers of the equipment installed should be carefully reviewed. Full use shall be made of all pertinent technical data furnished with the respective units.

Use high-grade lubricants which are suitable for the service. The manufacturers of the various components of equipment have furnished the initial supply of lubricants for their respective machinery. In all instances lubricant specifications shall be in accordance with the equipment manufacturers' recommendation, or if none, in accordance with the best practice for the service.

Painting and recoatings required should be performed in accordance with the original contract specifications. Where replacements are made, the replacement parts shall be equal in quality to those originally installed or of a suitable later improved design.

The structures and appurtenances shall have a good general appearance and function properly. The entrance and exits of the structures and spillway slabs shall be clear of any foreign object or debris. Check to see if the concrete is spalling, eroding, cracking excessively, or reinforcing bars are exposed; metal work is not damaged or in need of refinishing; embankment and slope protection, adjacent to the structure or appurtenant to, are free of uncontrolled weed growth and not in need of reshaping or repair. If any item is in need of

General (Continued)

4100

repair or maintenance include required work in the next scheduled maintenance activity.

Manufacturers' maintenance and parts manuals are listed in Appendix A of this manual.

Mechanical

4200

Give particular attention to the items listed on the inspection report and perform maintenance in accordance with the maintenance and service standards as set forth in the maintenance manuals furnished by the contractor.

All repairs to the gates and gate hoist machinery shall be performed by a qualified mechanic experienced in the type of equipment involved.

Each gear motor and speed reducer has a nameplate showing correct type, weight and amount of oil or grease to be used in each particular unit. The grease to be used for lubrication of the hinge pins is Lubriplate No. 630 AA. Gate trunnion pins are provided with a pressure lubrication system, operable from the curb of the roadway. For the lubrication of bearings and other items consult the manufacturers' maintenance manuals.

Schedule one lubrication service in October of each year and others as prescribed by the manufacturer of each type of equipment. The Superintendent shall make a lubrication chart showing the item to be serviced, type and weight of

Mechanical (Continued)

4200

lubricant to be used, amount applied, and frequency of application.

Electrical

4300

Give particular attention to the items listed on the inspection report and perform maintenance in accordance with the maintenance and service standards as set forth in the maintenance manuals furnished by the contractor.

All repairs shall be performed by a qualified electrician experienced in the type of electrical equipment involved. Arrangements can be made with Honeywell for servicing of the instrumentation for a fixed labor charge plus parts required.

The servicing of the instrumentation should be scheduled at the end of September and February. These scheduled servicings should give assurance that the complete electrical equipment of the system is in first-class condition prior to the rainfall-runoff and snowmelt-runoff periods. The servicing shall include all electrical components and wiring serviced and maintained as set forth in the operation and maintenance manuals supplied by the manufacturers.

Control Building and Fuel Tank Storage Enclosure

4400

The following good housekeeping practices and procedures shall be observed at the Control Building and Fuel Tank Storage Enclosure:

Control Building and Fuel Tank Storage
Enclosure (Continued)

4400

1. Keep structures in repair inside and out, painting as required.
2. Keep area within fence in neat and orderly condition and free of weeds.
3. Keep fire extinguishers in their proper location, fully charged and operational.
4. Keep Control Building and Enclosure clean and free of fire hazards.
5. In the Control Building arrange and store any supplies, materials, and tools in an orderly manner.
6. Do not store gasoline, paint, oils, or other inflammables in the fenced area.
7. Keep wiping rags in covered metal containers outside of Control Building.
8. Keep floors free of debris.
9. Area must be maintained as safe place to work.
10. Buildings and gates shall be kept locked when vacated.

Standby Engine-Generator Set. The Standby Engine-Generator Set shall be maintained as set forth in the maintenance manuals supplied by the manufacturers of the various components of equipment. All repairs shall be made by a mechanic or electrician experienced in the types of equipment to be repaired.

4410

Standby Engine-Generator Set. (Continued)

4410

Schedule one maintenance and lubrication service in October of each year and others as prescribed by the manufacturer of each type of equipment. The Superintendent shall make a maintenance and lubrication chart showing the items to be maintained, type of replacement, frequency of maintenance and replacement, and type and weight of lubricant to be used, amount applied, and frequency of application.

OPERATION

5000

General

5100

The flow in the San Joaquin River upstream of the control structures of the head of the Chowchilla Canal Bypass will normally vary from 0 to 8,000 cfs with infrequent flows up to 12,000 cfs occurring when the flood control capacity of Millerton Lake behind Friant Dam is exceeded. The discharge in Fresno Slough above Mendota will normally vary from 0 to 5,000 cfs depending on releases from Pine Flat Dam.

Releases from Millerton Lake behind Friant Dam by the U. S. Bureau of Reclamation will normally constitute the major flows to arrive at the control structures. Notification of these releases and the amounts therein requested by the Bureau to be passed down the San Joaquin River to Mendota Pool will be made to the District by the Bureau. The Bureau will also advise the District, from information obtained by discussion with the Corps of Engineers, of actual and anticipated flows through Fresno Slough above Mendota.

Operation of the outlet works of Friant Dam and Pine Flat Dam by the Bureau and the Corps will normally result in total flows at the latitude of Mendota which will not exceed 10,000 cfs. Under flow conditions of up to 10,000 cfs in the system at the latitude of Mendota, the San Joaquin River and Chowchilla Canal Bypass Control structures will be operated by the Lower San Joaquin Levee District to best utilize the design capacities of the Lower San Joaquin River Flood Control Project.

It shall be the objective of this criteria, if practical or possible, whenever excess water is available to provide

for the flow of 2,000 cfs below Mendota Pool for a period of at least two weeks per year..

The first increment of flow down the San Joaquin River may be routed through either structure. Up to 2,500 cfs shall normally be routed through the San Joaquin River Control Structure insofar as it does not exceed the capacity of the river when added to the releases from Pine Flat Dam and the remaining increment of flow. Up to 5,500 cfs shall be passed through the Chowchilla Canal Bypass Control Structure. A total flow of 8,000 cfs will normally be divided with 2,500 cfs passing through the San Joaquin River Control Structure and 5,500 cfs passing through the Chowchilla Canal Bypass Control Structure.

Should the flows exceed 8,000 cfs at the control structures or 10,000 cfs at the latitude of Mendota, the District will operate the control structures at their own discretion with the objective of minimizing damage to the flood control project and protected area.

The District will report the flows at each control structure to the Bureau at least once daily and whenever the controlled release rates are changed.

Operation Instructions for the San Joaquin River and Chowchilla Canal Bypass Control Structures

1. Decide what flow split conditions is to be used. As originally designed there are two normal operating conditions. They are: (A) Initial flow to San Joaquin River and (B) Initial flow to Chowchilla Canal Bypass. The decision as to which condition to use should be based on

Operation Instructions for the San Joaquin River and Chowchilla Canal Bypass Control Structures. (Continued) 5200

the overall flood control needs in the project area. The flow splits for the two conditions are described below:

A. Initial flow to San Joaquin River

<u>Upstream Flow SJR</u>	<u>Downstream Flow SJR</u>	<u>CCBP</u>
0-2,500 cfs	0-2,500 cfs	0 cfs
2,500-8,000 cfs	2,500 cfs	0-5,500 cfs
8,000-12,000 cfs	2,500-6,500 cfs	5,500 cfs

B. Initial flow to Chowchilla Canal Bypass

<u>Upstream Flow SJR</u>	<u>Downstream Flow SJR</u>	<u>CCBP</u>
0-5,500 cfs	0 cfs	0-5,500 cfs
5,500-8,000 cfs	0-2,500 cfs	5,500 cfs
8,000-12,000 cfs	2,500-6,500 cfs	5,500 cfs

2. Telephone USBR Fresno Office every day and request the observed gage height and flow at Gravelly Ford. Also request the USBR to give notice of any flow changes at Gravelly Ford should they occur between the regular reading times.

3. Add 186.7 feet to the observed gage height at Gravelly Ford to obtain the observed water surface elevation at Gravelly Ford.

4. For a given flow subtract the elevation difference in the table below to obtain the required water surface elevation for Float Well No. 2.

<u>Flow at Gravelly Ford in cfs</u>	<u>Elevation Difference in feet</u>
0- 2,500	20.8
2,500- 4,500	20.3
4,500- 6,500	19.7
6,500- 8,000	19.2
8,000-10,000	18.6
10,000-12,000	18.0

5. Adjust the gates on the structures until the correct pool elevation is reached.

6. While maintaining the pool elevation, readjust the gates until the correct flow is passing down each channel. These flows can be set by using the rating curve for Float Well No. 3 and the rating curve for the staff gage in the Chowchilla Canal Bypass included with this section.

This procedure can most efficiently be followed if a chart similar to the one at the end of this section is prepared and kept up to date.

Trash Barrier. Keep the trash barriers of the control structures clear of debris at all times. The most critical period of debris accumulation will normally occur at the time of beginning of flow until after the peak has passed the structures. Of course, debris will always be a problem at the site during sustained flows. 5210

Sometimes debris will be pulled down at the trash racks in the flow drawdown making removal difficult. In this situation, close the adjacent gate, which will float the debris thus simplifying the operation. After removal of debris return the gate to its previous position.

Stack debris on the embankment in neat and orderly piles. When disposing of waste material, burn or remove it from the flood control project.

Automatic Control Operation

5300

The necessary automatic controls have been incorporated into the system to operate the gates of the control structures under the normal operation conditions as set forth in Section 5200 above. Equipment settings are as follows:

<u>Equipment</u>	<u>Position</u>
Normal Power	On
Engine-Generator Selector-Switch	Automatic
Control Panel Selector Switch	Initial flow to SJR or CCBP
Float Well No. 1 Power	On

Gate Operation. The time interval for gate movement increments is adjustable between 5 and 60 seconds. The equipment is set for 20 seconds. The time between gate movements is adjustable between 15 seconds and 5 minutes. The equipment is set for 1 minute and 40 seconds. The San Joaquin River structure gates will move one at a time always starting with Gate No. 1 (at north end) when they are all at the bottom or Gate No. 4 (at south end) when they are all at the top. The gates are raised in the order 1, 2, 3, 4, 1, 2, etc., and are lowered in the order 4, 3, 2, 1, 4, 3, etc. Sequencing of the Chowchilla Canal Bypass structure gates No. 5 (at west end) through 8 (at east end) are similar-- raised in the order 5, 6, 7, 8, 5, 6, etc. and lowered in the order 8, 7, 6, 5, 8, 7, etc. There is one increment

5310

Gate Operation. (Continued)

5310

between the highest and lowest gates of each structure. If a signal is received to adjust a gate on one structure when a gate on the other structure is being adjusted, the second gate waits until the first one completes its movement.

Turn System Off and On. To turn the electrical control system off, place the lever of the main circuit breaker

5320

to "off" position. It will also be necessary to disengage the engine-generator set. The power to the control panel can also be interrupted by depressing the red emergency stop button on the face of the control panel. Following is the equipment setting for power off:

<u>Equipment</u>	<u>Position</u>
Red emergency stop button	Depressed and locked
or	
Main Circuit Breaker (Power Pole)	Off
Engine-Generator Set Selector Switch	Off

Following is the equipment setting for power on:

<u>Equipment</u>	<u>Position</u>
Red Emergency button	Unlocked
Main Circuit Breaker (Power Pole)	On
Engine-Generator Set Selector Switch	Automatic

If the main circuit or any secondary circuit breakers have been thrown, move the levers as far as they will go in the "off" position so that the circuit breaker will reengage, and then place the the lever in the "on" position.

The control system shall be left "on" at all times, except when shut off for making repairs, maintenance or when operating under manual control. The reason the system should be operational at all times is that flows, minimum releases from Friant and drainage return are in the river channel at all times of the year. Also, at any time of the year condensation can form in the control cabinet enclosure. Condensation will cause corrosion of the electrical equipment, terminals and wiring, thus allowing the possibility of the system to malfunction. A space heater, 120-volt, is provided to eliminate condensation forming within the enclosure.

Siren. A siren is mounted on the roof of the Control Building. The siren will sound when there is a loss of signal from Float Well No. 1. The siren will continue to sound until the system is switched to manual control.

5330

The gates of the control structures will react to loss of signal from Float Well No. 1 in the following manner: The gates in the San Joaquin River Structure will open completely, and the gates on the Chowchilla Canal Bypass Structure will adjust to control the flow at 5,500 cfs.

Manual Operation. Manual control will be required whenever the automatic control system is inoperative, for abnormal flows, and releases from Friant Dam are increased or decreased abruptly causing a sudden flow change when arriving at the structures.

5400

The gates can be controlled individually from either the control panel in the control house or at the gate hoist installation. To operate from the control panel place the Function Selector Switch to MANUAL. The Function Selector Switch is placed on LOCAL for control at the gates.

Each gate is controlled by a selector switch with settings of OPEN or CLOSE. When a switch is activated, either to open or close, the gate hoist operates for 20 seconds moving the gate 0.5 feet.

When opening the gates on a raising stage they shall be moved one at a time. Wait two minutes between gate movements so that the change can be effected at the local float wells. The gates of a structure shall be opened one at a time with no more than one increment between the first and last gate. If it is necessary to operate the gates of both structures, move the gate of one structure and then a gate of the other. In this manner it will be easier to control the water surface elevation at Float Well Nos. 2, 3, and 4.

For a raising stage the gates of the San Joaquin control structure shall be raised in the order 1, 2, 3, 4, 1, 2, etc., and are lowered in the order 4, 3, 2, 1, 4, 3, etc. The gates of the Chowchilla Canal Bypass control structure shall be raised in the order 5, 6, 7, 8, 5, 6, etc. and lowered in the order 8, 7, 6, 5, 8, 7, etc.

See Operation Instructions--paragraph 5200 for details on the operation criteria of the gates.

The engine-generator located in the control house will provide adequate electrical energy to operate the two control structures and appurtenant facilities if there is an interruption of the electrical service. The transfer switch transfers the load to the engine-generator when there is a power failure.

There are two-4-position selector switches that control the engine-generator. One is situated in the transfer switch installation and the other on the engine-generator panel.

The AUTO position will start the engine and transfer the load to the generator when power is cut-off. When power returns the transfer switch resets to the normal load position and the engine-generator is shut-down. The selector switches shall be left in the AUTO position.

Set the switch to the STOP position and the engine-generator will not start. When making repairs or performing maintenance to the gates and equipment set the switches to STOP before cutting out the power.

The TEST position will start the engine but will not transfer the load.

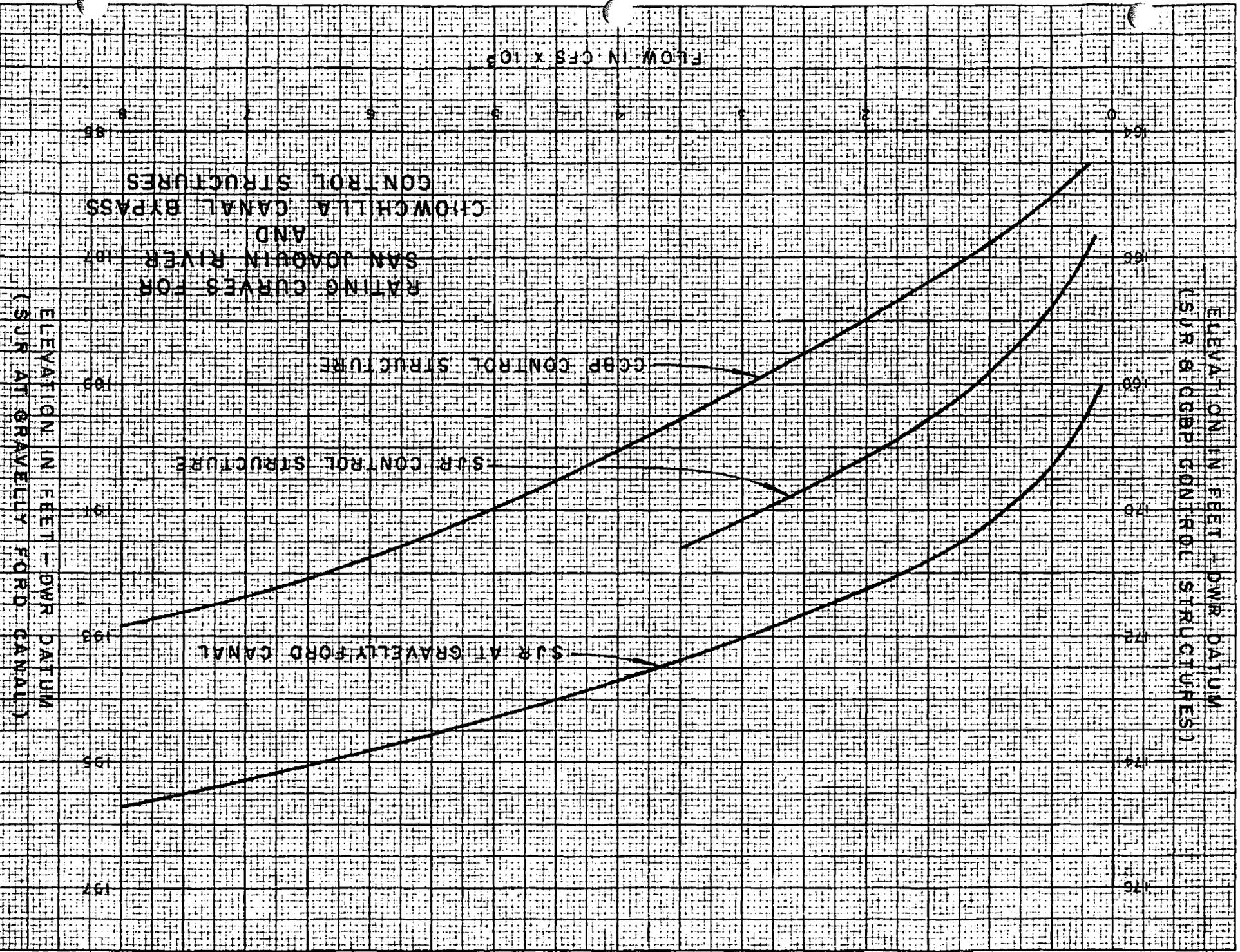
Engine. Check the oil and water level of the engine and the water level of the battery once a month minimum. Also check to see that the engine is performing as set forth in the manufacturer's manual.

Clock Exerciser. The clock exerciser will start the engine, run it for 15 minutes, and then stop it. The equipment has been set to occur once every seven days.

5520

Fuel Tank. The L.P.G. storage tank shall be at full capacity at the beginning of the flood season. A full tank of fuel will run the engine-generator under full load for a period of about 48 hours. Add fuel as required during the flood season.

5530



APPENDIX A

MANUFACTURERS' O&M MANUALS

APPENDIX A

Manufacturers' Operation and Maintenance Manuals

<u>DWR File No.</u>	<u>Title</u>
B9 - 351	Radial Gates Operation and Maintenance
B9 - 352A	Engine-Generator and Transfer Switch
B9 - 221A	Control System
B9 - 354A	Water Pump and Pressure Tank

The above manufacturers' manuals are an integral part of this manual.

APPENDIX B

CHECK LISTS

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Chowchilla Canal Bypass Control Structures

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APPENDIX B

Check Lists

Forms suggested as check lists for reporting inspections of the control structures and appurtenances will be found in this section. These forms should be used on each inspection to insure that the structures are in good condition and working at all times. It is suggested that a mechanical and electrical inspector assist the Department of Water Resources' levee inspectors when performing inspection on the control structures and appurtenances.

Suggested Check Lists for
San Joaquin River and Chowchilla Canal
Bypass Control Structures

Inspector's Report Sheet No. _____

Inspector _____

Date _____

Superintendent _____

Item	Remarks
A. San Joaquin River Control Structure--Concrete Structure	
1. Piers	
2. Floor Slab	
3. Retaining and Wing Walls	
4. Abutment Walls	
5. Bridge Deck	
6. Metal Beam Guard Rail	
7. Hoist Operating Platform	
8. Pipe Handrails	
9. Embankments	
10. Surfacing	
11. Stone Protection	
B. Chowchilla Canal Bypass Control Structure--Concrete Structure	
1. Piers	
2. Floor Slab	
3. Retaining and Wing Walls	
4. Abutment Walls	
5. Bridge Deck	
6. Metal Beam Guard Rail	
7. Hoist Operating Platform	
8. Pipe Handrails	
9. Embankments	
10. Surfacing	
11. Stone Protection	

Instructions for Completing Sheet B-1
(to be printed on back of Sheet B-1)

Item A and B:

Note conditions of concrete structure and signs of abnormal cracks, spalling or settlement; condition of metal hardware, embankments and surfacing, and stone protection; or other conditions requiring maintenance.

Suggested Check Lists (Continued)

Item	Remarks
C. Radial Gates	
1. Gate No. 1 - S.J.R.	
(a) Skin Plate	
(b) Girder Frame	
(c) Radial Arms - 2	
(d) Hinge Pin Grease	
(d) Piping - 2	
(e) Hinge Pin Assembly - 2	
(f) Side Arm Hinge - 2	
(g) Cable Attachment - 2	
(h) Wire Rope - 2	
(i) Gate Wall Plates - 2	
(j) Gate Sill Plate	
(k) Grating	
(l) Trash Barrier Posts	
(l) and Anchorage	
2. Gate No. 2 - S.J.R.	
(a) Skin Plate	
(b) Girder Frame	
(c) Radial Arms - 2	
(d) Hinge Pin Grease	
(d) Piping - 2	
(e) Hinge Pin Assembly - 2	
(f) Side Arm Hinge - 2	
(g) Cable Attachment - 2	
(h) Wire Rope - 2	
(i) Gate Wall Plates - 2	
(j) Gate Sill Plate	
(k) Grating	
(l) Trash Barrier Posts	
(l) and Anchorage	

Suggested Check Lists (Continued)

Item	Remarks
C. Radial Gates (Continued)	
3. Gate No. 3 - S.J.R.	
(a) Skin Plate	
(b) Girder Frame	
(c) Radial Arms - 2	
Hinge Pin Grease	
(d) Piping - 2	
(e) Hinge Pin Assembly - 2	
(f) Side Arm Hinge - 2	
(g) Cable Attachment - 2	
(h) Wire Rope - 2	
(i) Gate Wall Plates - 2	
(j) Gate Sill Plate	
(k) Grating	
Trash Barrier Posts	
(l) and Anchorage	
4. Gate No. 4 - S.J.R.	
(a) Skin Plate	
(b) Girder Frame	
(c) Radial Arms - 2	
Hinge Pin	
(d) Grease Piping - 2	
(e) Hinge Pin Assembly - 2	
(f) Side Arm Hinge - 2	
(g) Cable Attachment - 2	
(h) Wire Rope - 2	
(i) Gate Wall Plates - 2	
(j) Gate Sill Plate	
(k) Grating	
Trash Barrier Posts	
(l) and Anchorage	

Suggested Check Lists (Continued)

Item	Remarks
C. Radial Gates (Continued)	
5. Gate No. 5 - C.C.B.P.	
(a) Skin Plate	
(b) Girder Frame	
(c) Radial Arms - 2	
Hinge Pin Grease	
(d) Piping - 2	
(e) Hinge Pin Assembly - 2	
(f) Side Arm Hinge - 2	
(g) Cable Attachment - 2	
(h) Wire Rope - 2	
(i) Gate Wall Plates - 2	
(j) Gate Sill Plate	
(k) Grating	
Trash Barrier Posts	
(l) and Anchorage	
6. Gate No. 6 - C.C.B.P.	
(a) Skin Plate	
(b) Girder Frame	
(c) Radial Arms - 2	
Hinge Pin Grease	
(d) Piping - 2	
(e) Hinge Pin Assembly - 2	
(f) Side Arm Hinge - 2	
(g) Cable Attachment - 2	
(h) Wire Rope - 2	
(i) Gate Wall Plates - 2	
(j) Gate Sill Plate	
(k) Grating	
Trash Barrier Posts	
(l) and Anchorage	

Suggested Check Lists (Continued)

Item	Remarks
C. Radial Gates (Continued)	
7. Gate No. 7 - C.C.B.P.	
(a) Skin Plate	
(b) Girder Frame	
(c) Radial Arms - 2	
Hinge Pin Grease	
(d) Piping - 2	
(e) Hinge Pin Assembly - 2	
(f) Side Arm Hinge - 2	
(g) Cable Attachment - 2	
(h) Wire Rope - 2	
(i) Gate Wall Plates - 2	
(j) Gate Sill Plate	
(k) Grating	
Trash Barrier Posts	
(l) and Anchorage	
8. Gate No. 8 - C.C.B.P.	
(a) Skin Plate	
(b) Girder Frame	
(c) Radial Arms - 2	
Hinge Pin Grease	
(d) Piping - 2	
(e) Hinge Pin Assembly - 2	
(f) Side Arm Hinge - 2	
(g) Cable Attachment - 2	
(h) Wire Rope - 2	
(i) Gate Wall Plates - 2	
(j) Gate Sill Plate	
(k) Grating	
Trash Barrier Posts	
(l) and Anchorage	

Instructions for Completing Sheets B-3, B-4, B-5, & B-6
(to be printed on back of sheets B-3, B-4, B-5, & B-6)

Item C:

All nuts and bolts connecting the radial arms to the girder frame and the hinge pin assembly shall be sufficiently tight. The complete gate shall be carefully inspected for signs of rust as well as condition of all coated surfaces. The general alignment of the gate between the piers shall be noted and also any sign of distortion of the gate. If the gate moves freely when being lowered or hoisted without a tendency to bind at any point it shall be noted.

The hinge pin and side arm hinge shall be checked, to the extent practical without disassembly, for signs of abnormal wear, or signs of misalignment. Check to make sure the hinge pin is receiving lubrication. Also note any other condition requiring maintenance.

The wire rope shall be properly attached to the gate and all bolts sufficiently tightened. Check the wire rope for fraying or corrosion and make sure it has proper lubrication and protective coating. Check the wall and sill plates, grating and trash barrier post and anchorage for distortion, corrosion and that they all have a proper protective coating.

If any item is in need of replacement, repair or maintenance, include work in the next scheduled maintenance activity.

Suggested Check Lists (Continued)

Item	Remarks
D. Gate Hoist Machinery	
1. Gate Hoist Unit #1	
(a) Motor Brake	
(b) Gear Motor	
(c) Spring-set Shoe Brake	
(d) Limit and Speed Switch	
Parallel Shaft Speed	
(e) Reducer	
(f) Flexible Couplings - 3	
(g) Drive Unit Support Base	
(h) Shafts	
(i) Pillow Block Bearings - 4	
(j) Wire Rope Drums - 2	
(k) Drum Support Bases - 2	
Limit & Speed Switch	
(l) Enclosure	
Shaft and Coupling Safety	
(m) Guards - 2	
(n) Drum Covers - 2	

Suggested Check Lists (Continued)

Item	Remarks
D. Gate Hoist Machinery (Continued) 2. Gate Hoist Unit #2	
(a) Motor Brake	
(b) Gear Motor	
(c) Spring-set Shoe Brake	
(d) Limit and Speed Switch	
(e) Reducer	
(f) Flexible Couplings - 3	
(g) Drive Unit Support Base	
(h) Shafts	
(i) Pillow Block Bearings - 4	
(j) Wire Rope Drums - 2	
(k) Drum Support Bases - 2	
(l) Enclosure	
(m) Shaft and Coupling Safety Guards - 2	
(n) Drum Covers - 2	

Suggested Check Lists (Continued)

Item	Remarks
D. Gate Hoist Machinery (Continued)	
3. Gate Hoist Unit #3	
(a) Motor Brake	
(b) Gear Motor	
(c) Spring-set Shoe Brake	
(d) Limit and Spee	
Parallel Shaft Speed	
(e) Reducer	
(f) Flexible Couplings - 3	
(g) Drive Unit Support Base	
(h) Shafts	
(i) Pillow Block Bearings - 4	
(j) Wire Rope Drums - 2	
(k) Drum Support Bases - 2	
Limit & Speed Switch	
(l) Enclosure	
Shaft and Coupling Safety	
(m) Guards - 2	
(n) Drum Covers - 2	

Suggested Check Lists (Continued)

Item	Remarks
D. Gate Hoist Machinery (Continued)	
4. Gate Hoist Unit #4	
(a) Motor Brake	
(b) Gear Motor	
(c) Spring-set Shoe Brake	
(d) Limit and Speed Switch	
Parallel Shaft Speed	
(e) Reducer	
(f) Flexible Couplings - 3	
(g) Drive Unit Support Base	
(h) Shafts	
(i) Pillow Block Bearings - 4	
(j) Wire Rope Drums - 2	
(k) Drum Support Bases - 2	
Limit & Speed Switch	
(l) Enclosure	
Shaft and Coupling Safety	
(m) Guards - 2	
(n) Drum Covers - 2	

Suggested Check Lists (Continued)

Item	Remarks
D. Gate Hoist Machinery (Continued) 5. Gate Hoist Unit #5	
(a) Motor Brake	
(b) Gear Motor	
(c) Spring-set Shoe Brake	
(d) Limit and Speed Switch	
Parallel Shaft Speed	
(e) Reducer	
(f) Flexible Couplings - 3	
(g) Drive Unit Support Base	
(h) Shafts	
(i) Pillow Block Bearings - 4	
(j) Wire Rope Drums - 2	
(k) Drum Support Bases - 2	
Limit & Speed Switch	
(l) Enclosure	
Shaft and Coupling Safety	
(m) Guards - 2	
(n) Drum Covers - 2	

Suggested Check Lists (Continued)

Item	Remarks
D. Gate Hoist Machinery (Continued) 6. Gate Hoist Unit #6	
(a) Motor Brake	
(b) Gear Motor	
(c) Spring-set Shoe Brake	
(d) Limit and Speed Switch	
(e) Reducer	
(f) Flexible Couplings - 3	
(g) Drive Unit Support Base	
(h) Shafts	
(i) Pillow Block Bearings - 4	
(j) Wire Rope Drums - 2	
(k) Drum Support Bases - 2	
(l) Enclosure	
(m) Shaft and Coupling Safety	
(n) Guards - 2	
(n) Drum Covers - 2	

Suggested Check Lists (Continued)

Item	Remarks
D. Gate Hoist Machinery (Continued)	
7. Gate Hoist Unit #7	
(a) Motor Brake	
(b) Gear Motor	
(c) Spring-set Shoe Brake	
(d) Limit and Speed Switch	
Parallel Shaft Speed	
(e) Reducer	
(f) Flexible Couplings - 3	
(g) Drive Unit Support Base	
(h) Shafts	
(i) Pillow Block Bearings - 4	
(j) Wire Rope Drums - 2	
(k) Drum Support Bases - 2	
Limit & Speed Switch	
(l) Enclosure	
Shaft and Coupling Safety	
(m) Guards - 2	
(n) Drum Covers - 2	

Suggested Check Lists (Continued)

Item	Remarks
D. Gate Hoist Machinery (Continued)	
3. Gate Hoist Unit #8	
(a) Motor Brake	
(b) Gear Motor	
(c) Spring-set Shoe Brake	
(d) Limit and Speed Switch	
Parallel Shaft Speed	
(e) Reducer	
(f) Flexible Couplings - 3	
(g) Drive Unit Support Base	
(h) Shafts	
(i) Pillow Block Bearings - 4	
(j) Wire Rope Drums - 2	
(k) Drum Support Bases - 2	
Limit & Speed Switch	
(l) Enclosure	
Shaft and Coupling Safety	
(m) Guards - 2	
(n) Drum Covers - 2	

Instructions for Completing Sheets B-8, B-9, B-10,
B-11, B-12, B-13, B-14, and B-15
(to be printed on back of sheets B-8, B-9, B-10,
B-11, B-12, B-13, B-14, and B-15)

Item D:

Carefully inspect all components for signs of rust as well as condition of painted and coated surfaces. Note any parts in need of cleaning, lubrication, and any other condition requiring maintenance.

Carefully inspect the gear motor and reducer to ensure that they are being properly lubricated and the oil is at the proper level. While the motor is operating note any unusual noise or vibration which would indicate bearings require attention or some loose part must be immediately corrected. Note any oil leaking by the oil seals, or any oil on the outside of the gear motor and reducer housing.

Carefully check to ensure that all nuts and bolts of the couplings are sufficiently tight and that all components are properly attached to the support base.

Any part of the hoisting ropes or drums worn excessively shall be noted.

Ensure that all safety guards and enclosures provided are in place, in good condition and securely fastened to their supports.

Suggested Check Lists (Continued)

Item	Remarks
E. Floatwells and Equipment	
1. Floatwell No. 1	
(a) Approach Embankment	
(b) Stone Slope Protection	
(c) Shelter House	
(d) Floatwell	
(e) Static Tubes	
(f) Intake Tubes	
(g) Convenience Outlet and Lighting	
(h) Level Indicator Transducer and Float System	
(i) Resistance - Current Transducer	
(j) Current-to-Current Transducer	
2. Floatwell No. 2	
(a) Approach Embankment	
(b) Stone Slope Protection	
(c) Shelter House	
(d) Floatwell	
(e) Static Tubes	
(f) Intake Tubes	
(g) Convenience Outlet and Lighting	
(h) Level Indicator Transducer and Float System	
(i) Resistance - Current Transducer	

Suggested Check Lists (Continued)

Item	Remarks
E. Floatwells and Equipment (Continued) 3. Floatwell No. 3	
(a) Approach Embankment	
(b) Stone Slope Protection	
(c) Shelter House	
(d) Floatwell	
(e) Static Tubes	
(f) Intake Tubes	
(g) Convenience Outlet and Lighting	
(h) Level Indicator Transducer and Float System	
(i) Resistance - Current Transducer	
4. Floatwell No. 4	
(a) Approach Embankment	
(b) Stone Slope Protection	
(c) Shelter House	
(d) Floatwell	
(e) Static Tubes	
(f) Intake Tubes	
(g) Convenience Outlet and Lighting	
(h) Level Indicator Transducer and Float System	
(i) Resistance - Current Transducer	

Instructions for Completing Sheets B-17 and B-18
(to be printed on back of sheets B-17 and B-18)

Item E:

Note condition of approach embankment, surfacing and intake pipe stone slope protection for signs of erosion, settlement, weed growth or other conditions requiring maintenance.

Carefully inspect all parts of the shelter house and floatwell for signs of rust as well as condition of painted and coated surfaces. Note any parts in need of cleaning, and any other condition requiring maintenance.

Insofar as practical, inspect the floatwell for any indication of debris which may interfere with operation of float including possible restriction of static tubes and intake pipes.

Check the convenience outlet and lighting to verify their proper functioning.

Remove the cover of the level indicator unit and inspect the mechanism for proper functioning. Check electrical wiring and connections from receiver unit. Ensure that the base anchor bolts are secure and that float line is in true alignment with centerline of the float. Also, note any indication of wear or other deterioration of the line assembly including connections at float and counterweight.

Suggested Check Lists (Continued)

Item	Remarks
F. Control House, and Well and Fuel Tank Storage Enclosure	
1. Embankment	
(a) Slopes	
(b) Surfacing	
2. Fence	
(a) Fabric	
(b) Posts	
(c) Gates	
3. Control Building	
(a) Concrete Floor	
(b) Enclosure Walls	
(c) Doors	
(d) Windows	
(e) Roof	
(f) Downspout	
(g) Fire Extinguishers	
4. Engine-Generator Set	
(a) Engine	
(b) Fuel System	
(c) Exhaust System	
(d) Generator	
(e) Instrument Panel	
(f) Anchor Bolts	
(g) Assessories	

Instructions for Completing Sheet B-20
(to be printed on back of sheet B-20)

Item F:

- (1) Note the condition of the embankment slopes and surfacing. If maintenance is required include work in next scheduled maintenance activity.
- (2) Check the chain link fence and gates, including fabric, posts and hardware, to make sure the fabric is properly connected to the posts and frame, barbwire is properly connected to supporting arms and the supporting arms are properly connected to posts, and the gates function properly. Gates shall have a lock. Note any parts in need of painting, repair, or replacement and any condition requiring maintenance.
- (3) Check the control building enclosure including the floor walls, doors, roof and hardware. Note any items in need of painting, repair, or replacement, and any condition requiring maintenance.
- (4) Check the engine radiator and battery water level and crankcase oil level. Check to see that the maintenance checks and lubrication schedules recommended by the manufacturer have been adhered to. Through a visual inspection see that the engine-generator set components are clean and properly secured in place. Note any parts in need of painting, repair or replacement, and any condition requiring maintenance.

Suggested Check Lists (Continued)

Item	Remarks
F. Control House, and Well and Fuel Tank Storage Enclosure (Continued)	
5. Electrical	
(a) Convenience Outlets	
(b) Lighting	
(c) Wall Heaters	
(d) Ceiling Fan	
(e) Control Cabinet	
(1) Level Indicator FW #1	
(2) Level Indicator FW #2	
(3) Level Indicator FW #3	
(4) Level Indicator FW #4	
6. Well and Fuel Tank Storage Enclosure	
(a) Concrete Floor	
(b) Enclosure Walls	
(c) Doors	
(d) Well	
(e) Fuel Tank	
(f) Float Gauge	
7. Water Piping, and Sanitary Sewer Line	
(a) Water Piping	
(b) Wash Basin	
(c) Toilet	

Instructions for Completing Sheet B-22
(to be printed on back of sheet B-22)

Item F: (Continued)

- (5) Check all convenience outlets, lighting, wall heaters, and ceiling fan to verify their proper functioning. Check all circuit breakers to make sure they operate properly and check contacts of circuit breakers, relays and motor starters for signs of wear and corrosion. Note any sign of condensation in control cabinet to ensure space heater is functioning properly. Make sure wiring is properly connected to terminal blocks (using insulated screwdriver) and control units. Check level indicators for proper setting.

- (6) Check the Well and Fuel Tank Storage Enclosure including the floor, walls, and doors.

Check the storage tank anchorage, fuel line, tank, and fuel gauge. If tank is less than $\frac{1}{2}$ full, arrange for filling of the tank with proper fuel.

Check well and pump, including pump anchorage, wiring, discharge line and any unusual sound when operating.

Note any item in need of painting, repair or replacement and any condition requiring maintenance.

- (7) Check water lines and pump by turning on water faucet in wash basin and flushing toilet. The lavatory room and fixtures shall be clean. Note any items in need of repair or replacement and any condition requiring maintenance.

Suggested Check Lists (Continued)

Item	Remarks
G. Manual Control Stations Electrical Installation	
1. Gate Hoist No. 1	
(a) Light Standard	
(b) Convenience Outlets	
(c) Junction Box	
2. Gate Hoist No. 2	
(a) Light Standard	
(b) Convenience Outlets	
(c) Junction Box	
3. Gate Hoist No. 3	
(a) Light Standard	
(b) Convenience Outlets	
(c) Junction Box	
4. Gate Hoist No. 4	
(a) Light Standard	
(b) Convenience Outlets	
(c) Junction Box	

Suggested Check Lists (Continued)

Item	Remarks
G. Manual Control Stations Electrical Installations (Continued)	
5. Gate Hoist No. 5	
(a) Light Standard	
(b) Convenience Outlet	
(c) Junction Box	
6. Gate Hoist No. 6	
(a) Light Standard	
(b) Convenience Outlet	
(c) Junction Box	
7. Gate Hoist No. 7	
(a) Light Standard	
(b) Convenience Outlet	
(c) Junction Box	
8. Gate Hoist No. 8	
(a) Light Standard	
(b) Convenience Outlet	
(c) Junction Box	

Instructions for Completing Sheets B-24 and B-25
(to be printed on back of sheets B-24 and B-25)

Item G:

Check each light standard and convenience outlet to verify their proper functioning. Check junction boxes and conduit. Note any condition in need of repair, replacement or maintenance.

Suggested Check Lists (Continued)

Item	Remarks
V. Operational Check of Radial Gates and Engine-Generator Set 1. Manual Control	
(a) Control at Gate Hoist	
Gate No. 1	
Gate No. 2	
Gate No. 3	
Gate No. 4	
Gate No. 5	
Gate No. 6	
Gate No. 7	
Gate No. 8	
(b) Control at Panel	
Gate No. 1	
Gate No. 2	
Gate No. 3	
Gate No. 4	
Gate No. 5	
Gate No. 6	
Gate No. 7	
Gate No. 8	
2. Automatic	
3. Engine-Generator Set	

Instructions for Completing Sheet B-27
(to be printed on back of sheet B-27)

Item H:

- (1) Check all gates from the manual control at each unit by a complete raising and lowering of each set of gates. Also check each gate stop button.

Check all gates from the manual control at the panel in the Control House by a complete raising and lowering of each set of gates. Also check each gate by stop button.

The limit switches shall be adjusted so that they interrupt the motor current when the gates are completely closed and when the gates are completely open. The full open position corresponds to a vertical movement of the lower edge of the skin plate of 17.0 feet. Elevation of top slab is 162.0 feet and elevation of bottom of gate at full raise 179.0 feet.

- (2) Check automatic operation of the gates by simulating a raise in the water level by dialing the water surface indicators of Floatwell No. 1 and No. 2. The minimum amount required for sensitivity is _____ feet. Gate No. 1 should rise 0.5 feet. Simulate a drop in the water level by dialing the water surface indicator of Floatwell No. 1 and No. 2 the minimum amount as above in reverse.

Simulate a continued rise in the water level by dialing the water surface indicators of Floatwell No. 1 and No. 2. The system should keep on cycling, raising the gates in the order 1, 2, 3, 4, 1, 2, etc. in 0.5 feet increments. After several cycles of the gates, lower the gates by dialing the water surface indicators to the minimum water surface level.

Turn the selector switch to position "Initial Flow to Chowchilla Canal Bypass". Repeat the sensitivity and cycling operation of gates 5, 6, 7 and 8 by both raising and lowering the gates.

- (3) Check the functioning of the Engine-Generator Set by cutting out the normal power source. When the Engine-Generator is supplying power, operate the gates under manual control. Check to make sure the Engine-Generator is operating within the limits as set forth by the manufacturers' operators manual.

Suggested Check Lists (Continued)

Item	Remarks
J. Control System, Engine-Generator Set and Gates shall be adjusted and left in following condition: 1. Timer (Motor Running Time) adjustable between 5 and 60 seconds	Initial setting - 20 seconds
2. Timer (Gate Movement Interval) adjustable between $\frac{1}{4}$ to 5 minutes	Initial setting - 100 seconds
3. Level Indicator F.W. #1 Zero reading at elev. _____	
4. Level Indicator F.W. #2 Zero reading at elev. _____	
5. Function Selector Switch Automatic Position	"Initial Flow to San Joaquin River"
6. Normal Power Source (Circuit Breaker on Power Pole)	"On"
7. Space Heater Thermostat	Initial setting - 70° F.
8. Engine-Generator Selector Switch	"Start" Position
9. Gates (a) 1, 2, 3, and 4 (b) 5, 6, 7, and 8	

Instructions for Completing Sheet B-29
(to be printed on back of sheet B-29)

Item I:

After inspection has been completed, return equipment and installation to automatic condition. If adjustments have been made to system enter change to respective component in remarks column. Also note any item in need of repair or maintenance.