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Managing Water in the West

Standard Operating Procedures for the Debris Removal System and Traveling Screen, Tracy Fish Collection Facility, Tracy, California

Tracy Technical Bulletin 2008-1

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14. ABSTRACT

This Standard Operating Procedure (SOP) describes operation, inspection, maintenance, and safety procedures for the Debris Removal System (DRS) located within the secondary channel at the Tracy Fish Collection Facility (TFCF), Tracy, California. The purpose of the DRS is to remove water-born debris during routine cleaning operations and during periods when excess debris is present in the TFCF intake at the trash rack and the secondary channel. This SOP is an update of the original 1999 SOP *Traveling Water Screen - Mitten Crab Removal Project*, prepared when the DRS was first installed. The original SOP contained mechanical drawings, parts descriptions, manufacturer's specifications, and operation and maintenance procedures. The component descriptions and information in the 1999 SOP were beyond the need and scope of the general operator and many of the components of the DRS have been changed since 1999. This SOP emphasizes the safe operation and routine maintenance of the DRS as it was equipped in June 2007.

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Standard Operating Procedures for the Debris Removal System and Traveling Screen, Tracy Fish Collection Facility, Tracy, California

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by

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October 2008

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SUMMARY

This Standard Operating Procedure (SOP) describes operation, inspection, maintenance, and safety procedures for the Debris Removal System (DRS) located within the secondary channel at the Tracy Fish Collection Facility (TFCF), Tracy, California. The purpose of the DRS is to remove water-born debris during routine cleaning operations and during periods when excess debris is present in the TFCF intake at the trash rack and the secondary channel. This SOP is an update of the original 1999 SOP *Traveling Water Screen - Mitten Crab Removal Project*, prepared when the DRS was first installed. The original SOP contained mechanical drawings, parts descriptions, manufacturer's specifications, and operation and maintenance procedures. The component descriptions and information in the 1999 SOP were beyond the need and scope of the general operator and many of the components of the DRS have been changed since 1999. This SOP emphasizes the safe operation and routine maintenance of the DRS as it was equipped in June 2007.

INTRODUCTION

Background and Purpose

The Debris Removal System (DRS) is installed within the secondary channel at the Tracy Fish Collection Facility (TFCF), just north of the fish holding tank building. The DRS was originally installed to remove Chinese mitten crabs (*Eriocheir sinensis*) in 1999 using a traveling screen, and has proved to be an effective tool for removing general floating debris that enters the secondary channel when debris inflows are heavy and during routine cleaning of the trash rack and the primary louvers (Boutwell and Sisneros, 2006). The additional debris reduction from DRS operation benefits salvaged fish in the circular holding tanks, haul-out bucket, and fish hauling truck, where fish are more susceptible to injury from contact with debris and added oxygen demand from decaying vegetative materials.

This document is an update of the original 1999 Standard Operating Procedure (SOP) *Traveling Water Screen–Mitten Crab Removal Project*, prepared when the DRS was first installed. The original SOP (attached as Appendix 1) contained detailed engineering drawings, parts descriptions, manufacturer's specifications, and procedures for operation and maintenance. However, component descriptions and information in the 1999 SOP were beyond the need and scope of the general operator, and many components of the DRS have been changed since 1999.

The updated SOP presented here is intended to provide a practical guide for operators at the TFCF using the DRS as configured in June 2007. Routine operations and maintenance activities are outlined.

General Description of the Traveling Screen

A plan view drawing of the DRS showing the major components is seen in Figure 1, and the annotated photos in Figures 2a–2c show general views of the DRS. Components are given names and letter labels that will be used throughout this SOP.

How the Traveling Screen Works

Refer to the components and letter labels identified in Figures 1 and 2. The DRS operates in the following general manner:

The DRS is powered from the main **Circuit Breaker Panel** (**P1**) located immediately to the east of the DRS. Figures 3a–3c show the Circuit Breaker Panel P1.

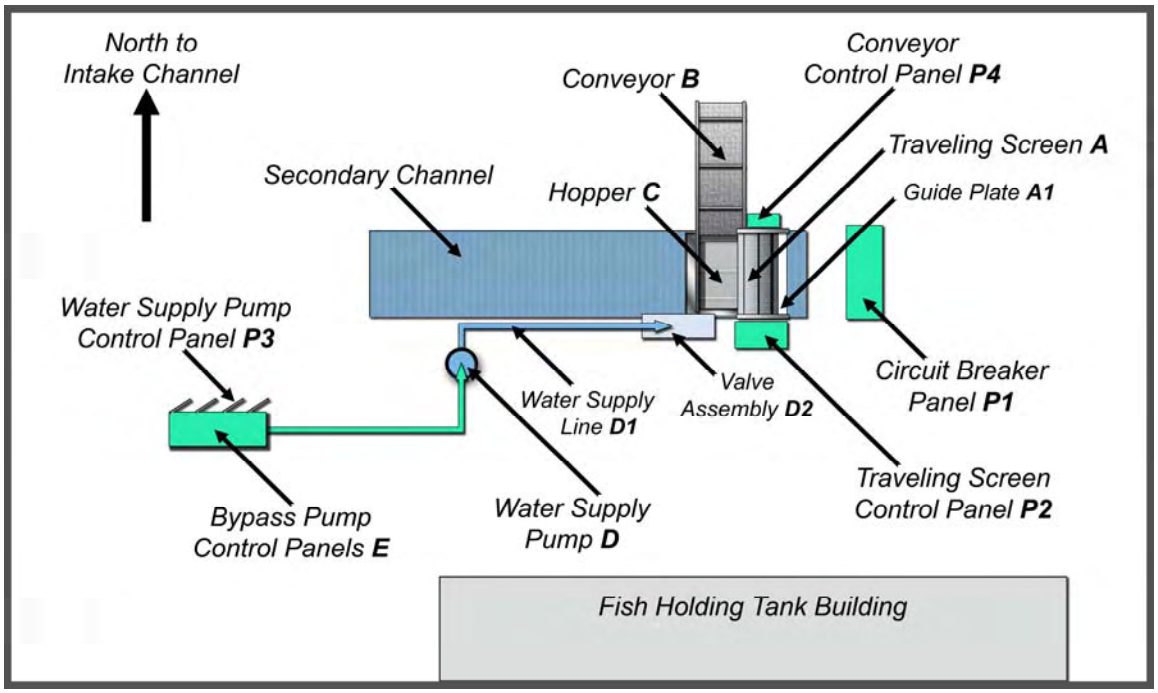


FIGURE 1.—Plan view of the Debris Removal System (DRS) showing the major components. Objects are not drawn to scale.

FIGURE 2a.—Southeast view of Debris Removal System (DRS). The descending side of Traveling Screen A is shown along with Hopper C and Conveyor B. The 5-ton and 2-ton Hoist Motors F are both located on the top of DRS superstructure, and 2-ton F1 and 5-ton F2 Hoist Cables are noted.

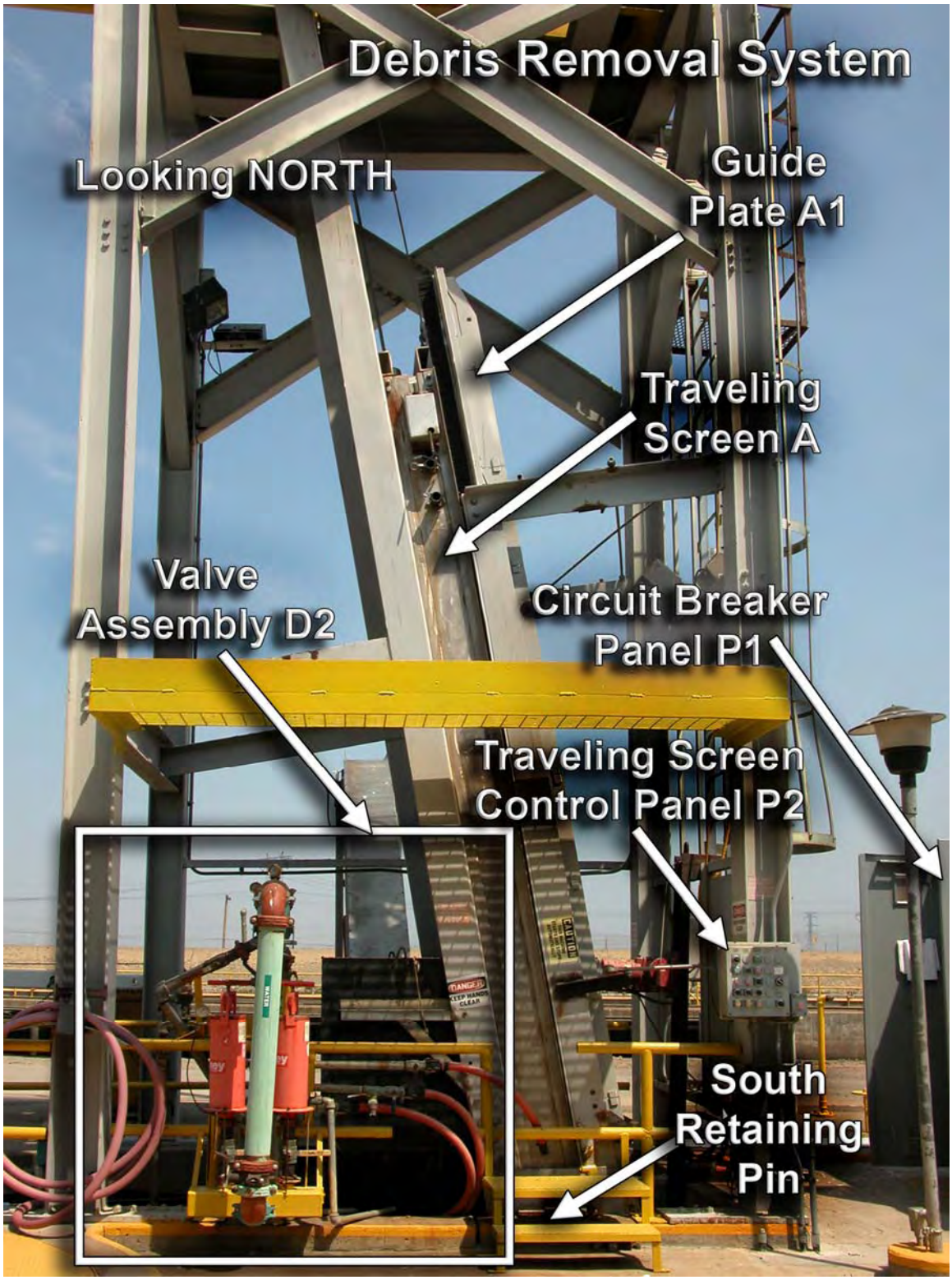


FIGURE 2b.—North view of Debris Removal System (DRS). Water Supply Filtration-Purge-Spray Boom Valves D2 are located within the annotation box on the bottom left. To the right and located on the DRS superstructure is Traveling Screen Control Panel P2. To the far right is Circuit Breaker Panel P1.

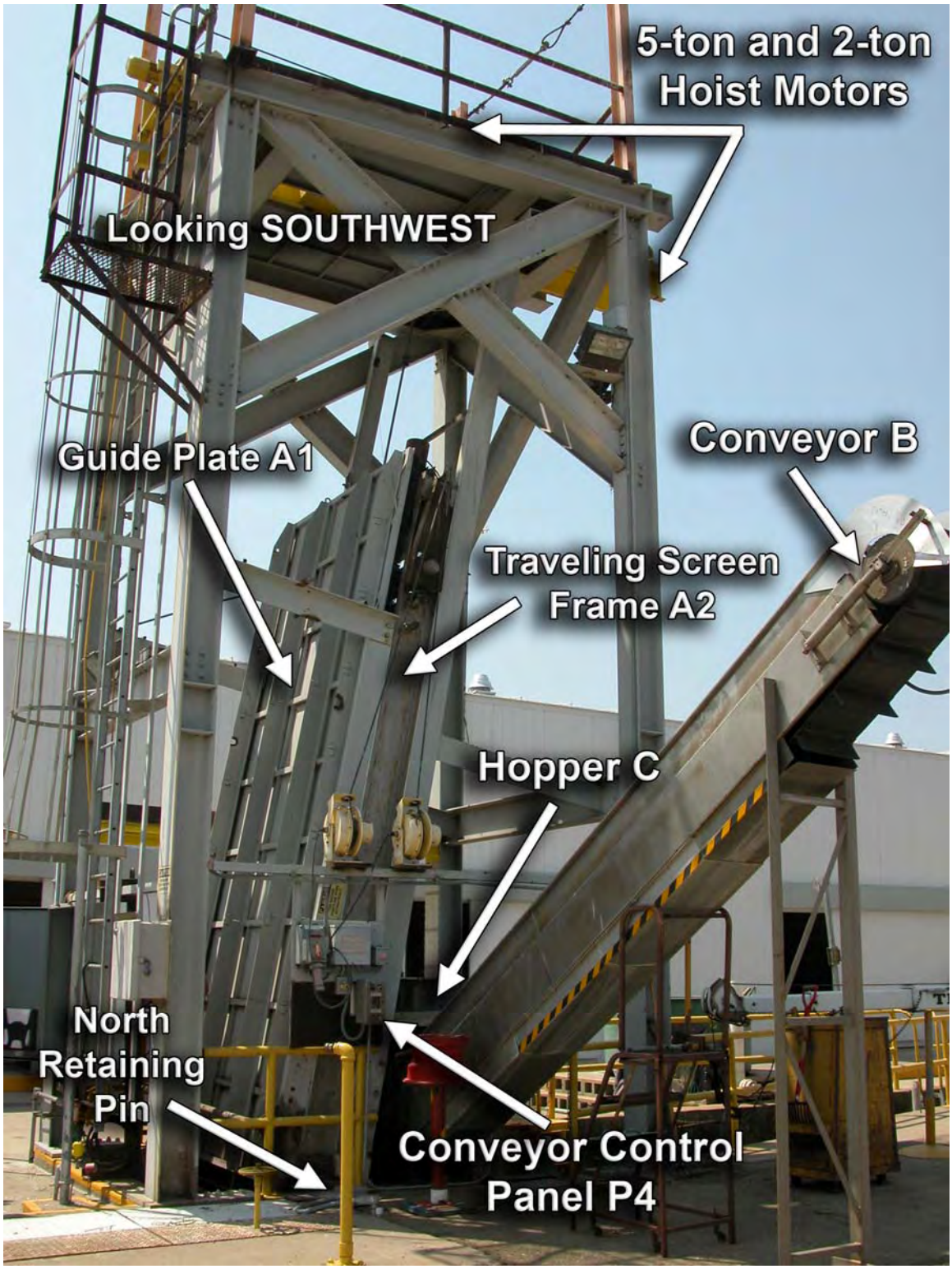


FIGURE 2c.—Southwest view of Debris Removal System (DRS). Guide Plate A1 can be seen covering the ascending (east-facing) side of Traveling Screen A. Conveyor Control Panel P4 is shown to the left of Hopper C near the bottom of Conveyor B.

FIGURE 3a.—Circuit Breaker Panel P1. East view of Circuit Breaker Panel P1 from the south side of Debris Removal System (DRS) and Traveling Screen Control Panel P2.

FIGURE 3b.—Circuit Breaker Panel P1. East view of opened doors showing electrical Panels LF and PF. Debris Removal System (DRS) controls are switched ONLY on Panel PF (to the right).

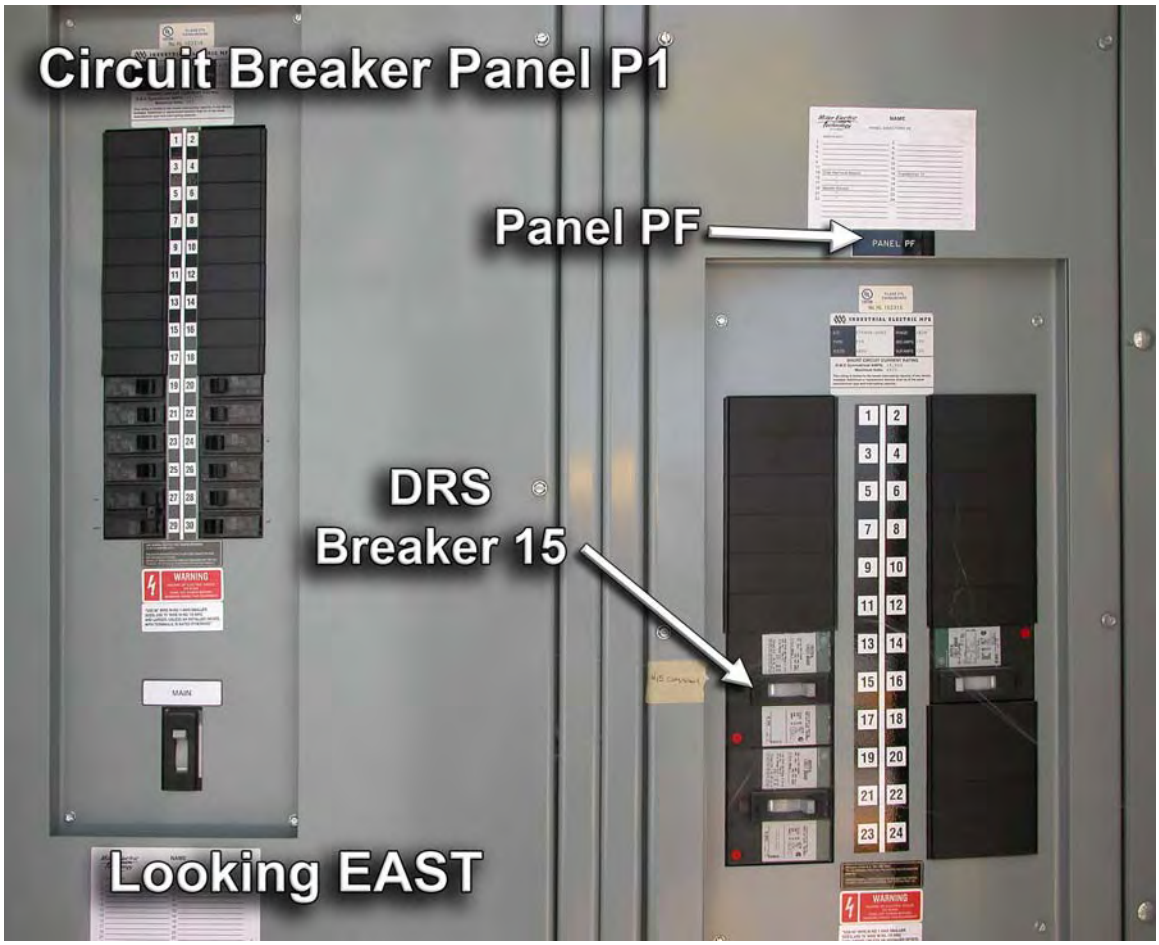


FIGURE 3c.—Circuit Breaker Panel P1. East close-up view of Panel PF and Debris Removal System (DRS) Breaker 15.

Traveling Screen A (Figures 1 and 2, item **A**) is driven by an electric motor and controlled by **Traveling Screen Control Panel P2** (Figures 1 and 2b, item **P2**). The Traveling Screen is lowered into the secondary channel using the **5-ton Hoist F** (Figures 2a and 2c, item **F**) which is also controlled at Traveling Screen Control Panel (**P2**).

Guide Plate A1 (Figures 1, 2b, and 2c, item **A1**) covers the ascending (east-facing) side of the Traveling Screen to prevent debris from falling off before reaching the top of the Traveling Screen frame. The Guide Plate is raised and lowered using the **2-ton Hoist F** that is also controlled at Traveling Screen Control Panel (**P2**).

Water is used to help clear debris from the descending (west-facing) side of Traveling Screen A (Figure 2a, item **A**). Pressurized water is supplied from **Water Supply Pump D** (Figure 1, item **D**) which is controlled from **Water Supply Control Panel P3** (Figure 1, item **P3**). Water is pumped through **Water Supply Line D1** to **Water Supply Filtration-Purge-Spray Boom Valves D2** before being routed to three Spray Booms located on the descending, west-facing side of the Traveling Screen.

The rotating Traveling Screen transports debris upwards that then falls into **Hopper C** (Figures 1, 2a, and 2b, item **C**) which guides the debris to **Conveyor B** (Figures 1, 2a, and 2b, item **B**). The conveyor removes debris that falls into the Hopper and is driven by a separate electric motor controlled at **Conveyor Control Panel P4** (Figures 1 and 2b, item **P4**). Debris then falls into a dump truck parked beneath the Conveyor during DRS operation.

Traveling Screen Components

Figures 4a–4c shows detailed images of the components of the Traveling Screen. The Traveling Screen consists of a lattice made of vertical **plastic-coated cables** (Figure 4a) held in place by horizontal metal **cable separators** (Figure 4b). The screen also has horizontal **brushes and lifts** (Figure 4a) that help capture debris as the Traveling Screen rotates. Three **drive chains** (Figure 4b) rotate the screen around **upper and lower rollers** that rotate within white **nylon roller guides** (Figures 4a and 4b).

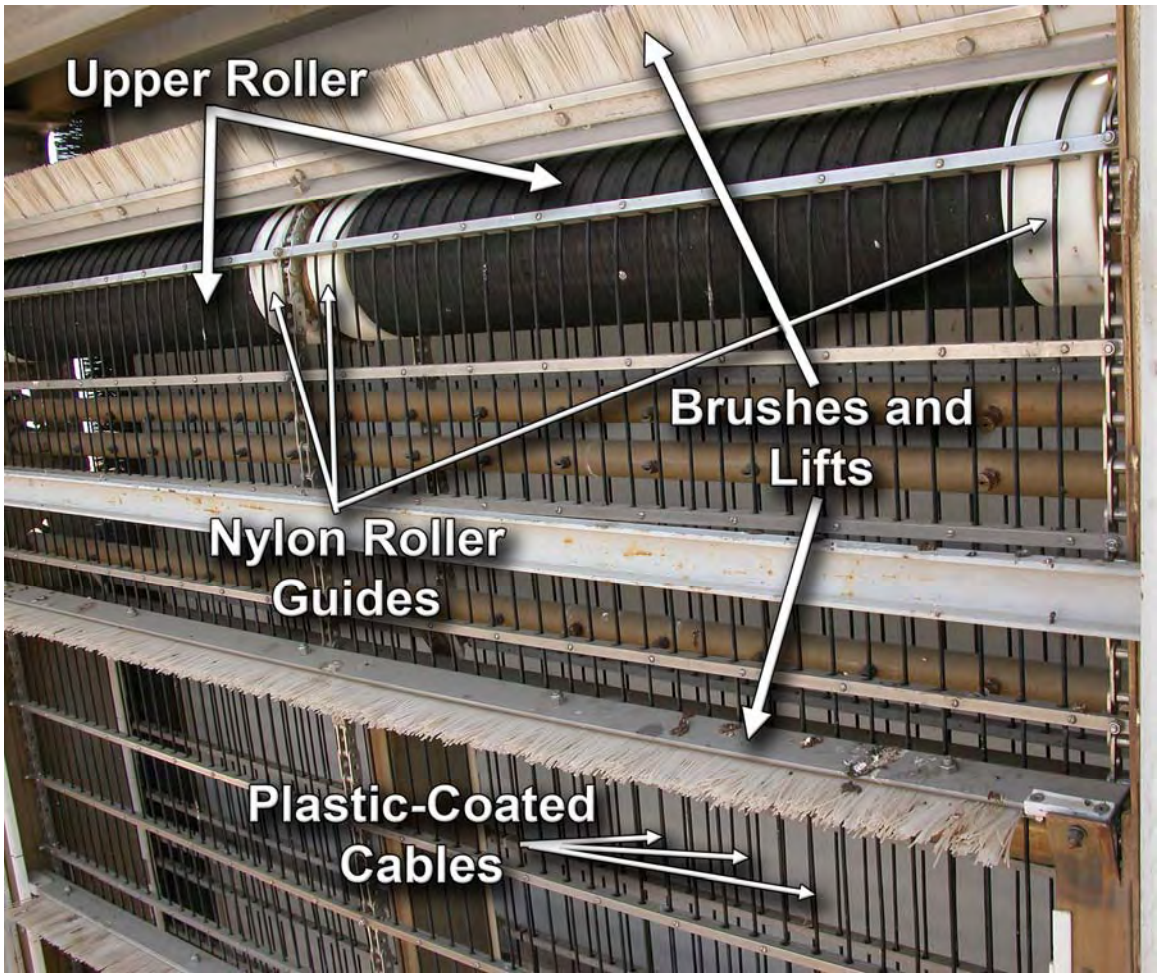


FIGURE 4a.—Traveling Screen A. View of the descending west-facing side of the Traveling Screen showing mechanical components. Seen here are the black Upper Roller and white Nylon Roller Guides, Plastic-Coated Cables, and Brushes and Lifts.

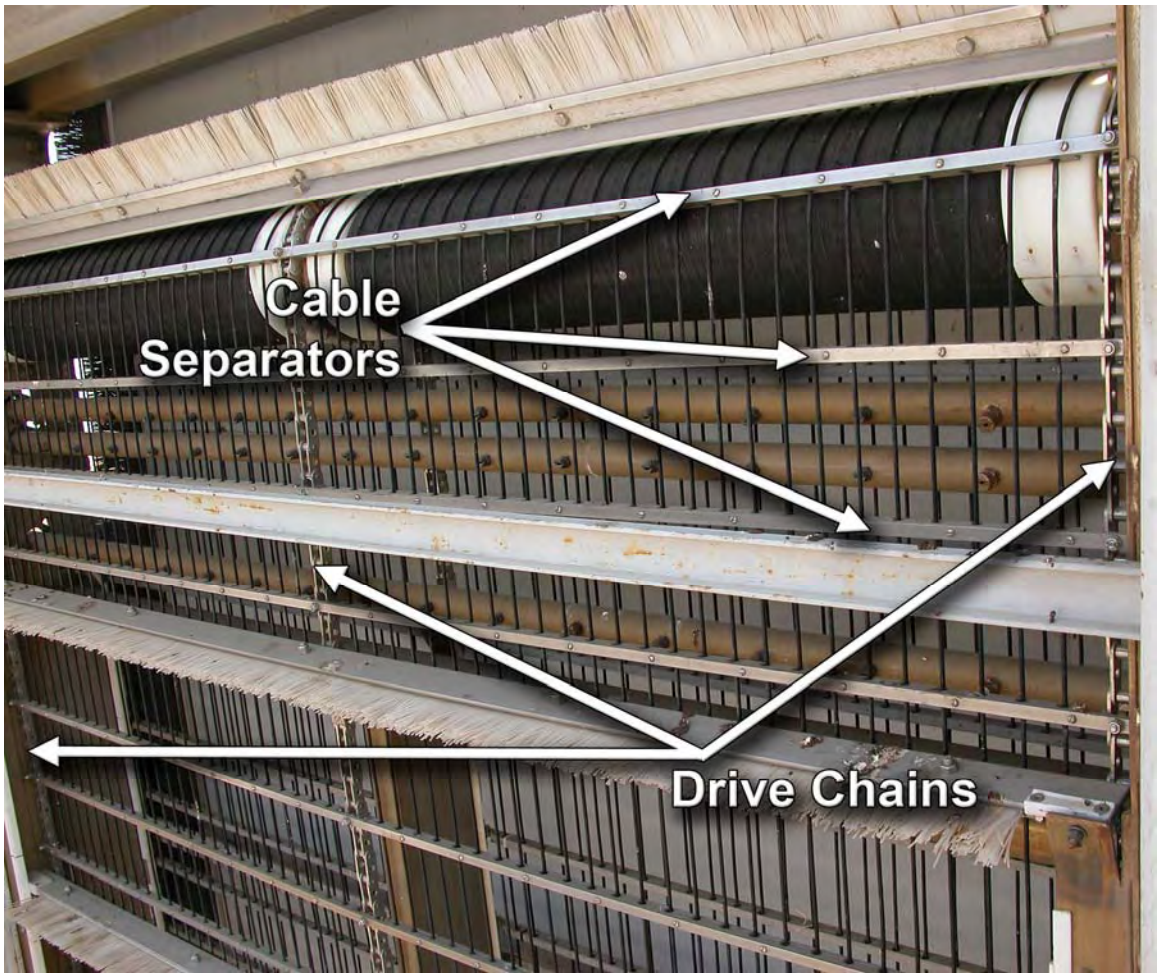


FIGURE 4b.—Traveling Screen A. View of the descending west-facing side of the Traveling Screen showing mechanical components. Seen here are the perpendicular Cable Separators and three Drive Chains.

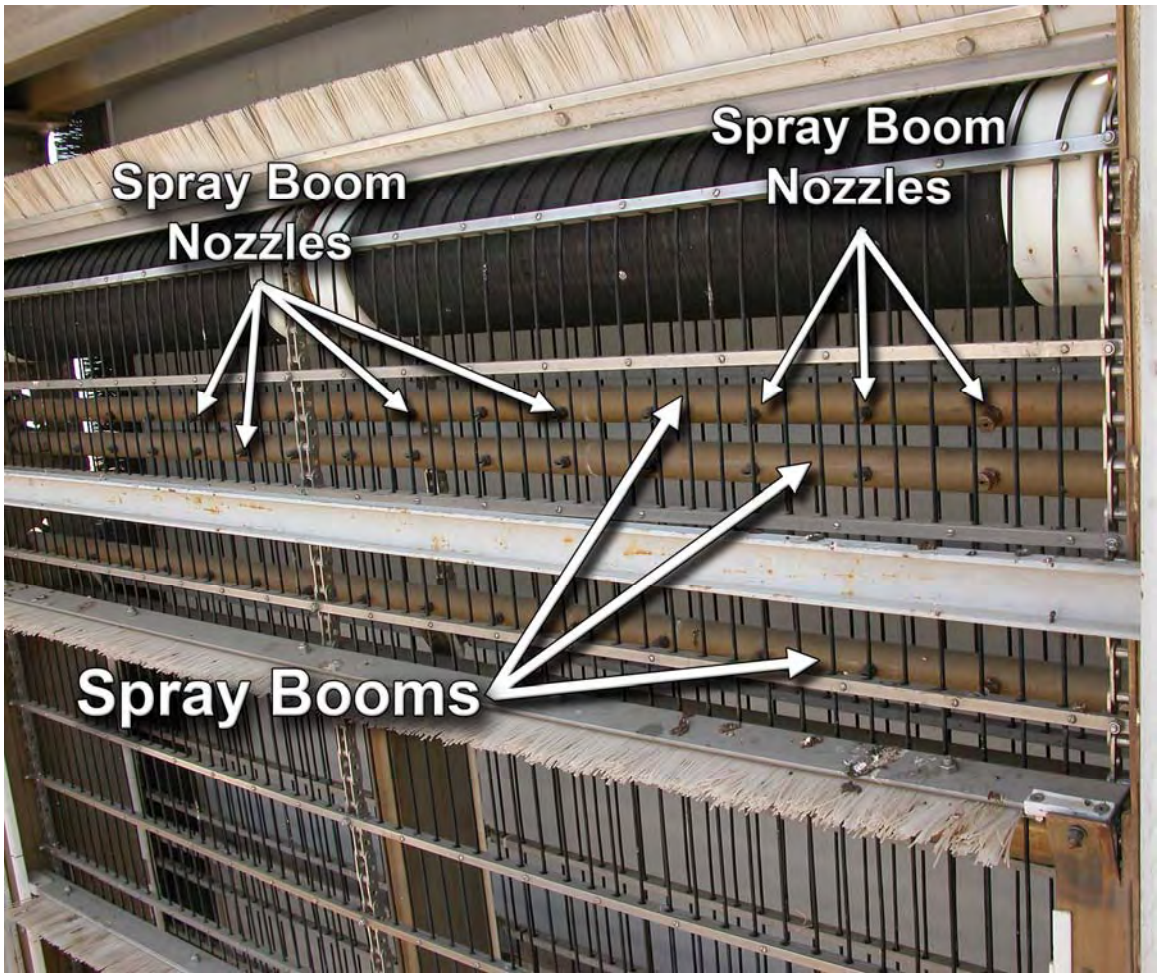


FIGURE 4c.—Traveling Screen A. View of the descending west-facing side of the Traveling Screen showing the three Spray Booms used to help remove debris from the screen and convey debris to Hopper C.

The Traveling Screen is controlled from **Traveling Screen Control Panel P2** (Figures 1, 2b, and below in Figure 5). Traveling Screen Control Panel P2 is used to raise and lower Traveling Screen A and Guide Plate A1 using the 5-ton and 2-ton Hoist Controls. The direction and speed of the Traveling Screen rotation are also controlled from the P2 Panel.

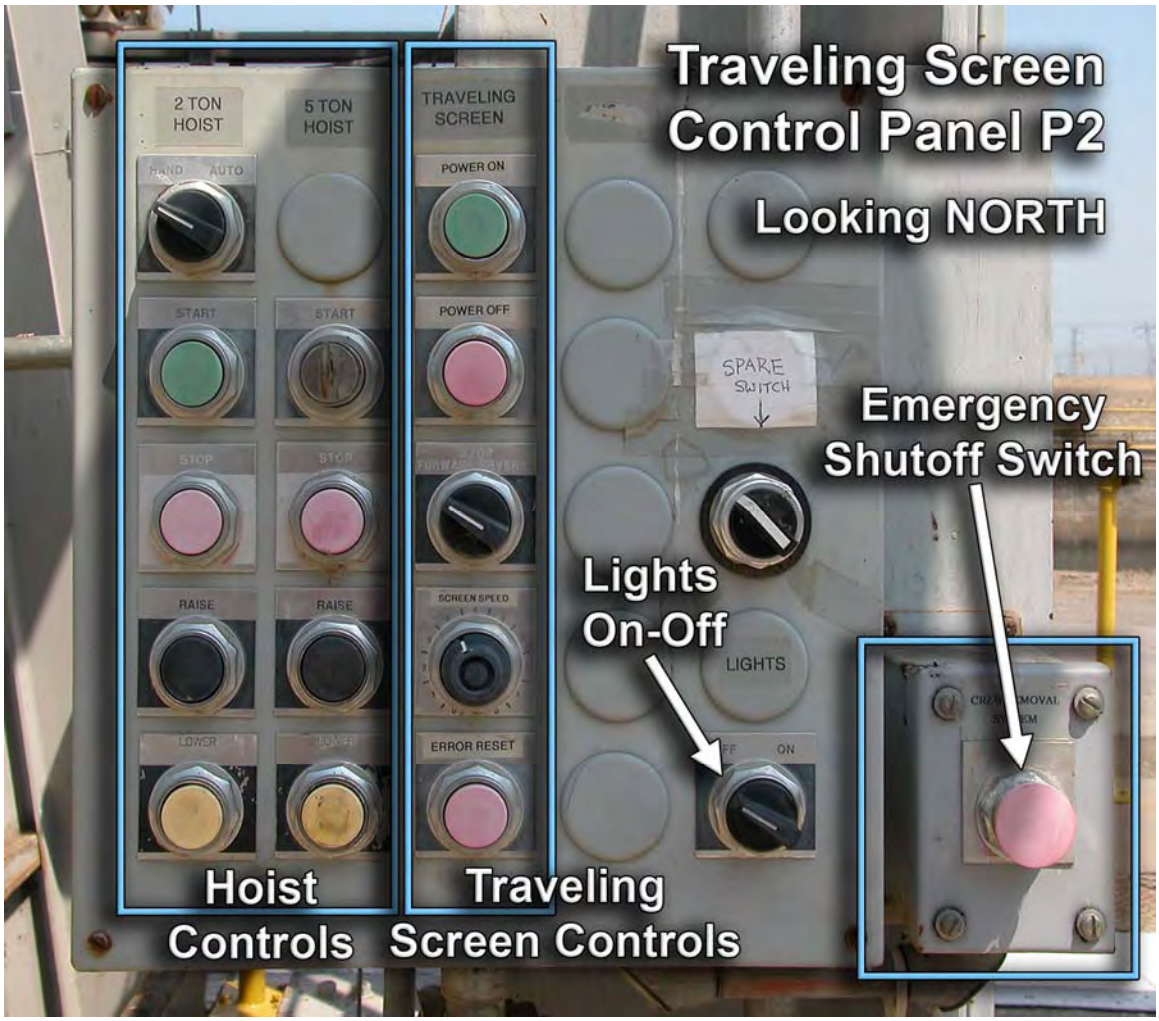


FIGURE 5.—Traveling Screen Control Panel P2 (north view). This panel, located on the Debris Removal System (DRS) superstructure, provides controls for the 2-ton and 5-ton Hoists (F), and Traveling Screen A. The Emergency Shut-Off Switch is located on the lower right corner of Panel P2.

Conveyor B and Hopper C Components

Hopper C collects debris from the Traveling Screen A during operation that is then carried upwards by the Conveyor B to be collected in a dump truck parked beneath the top of the Conveyor. The Conveyor and Hopper are best seen in the Figures 2a and 2c DRS photos. Figures 6a–6c show detailed photographs of the Hopper.

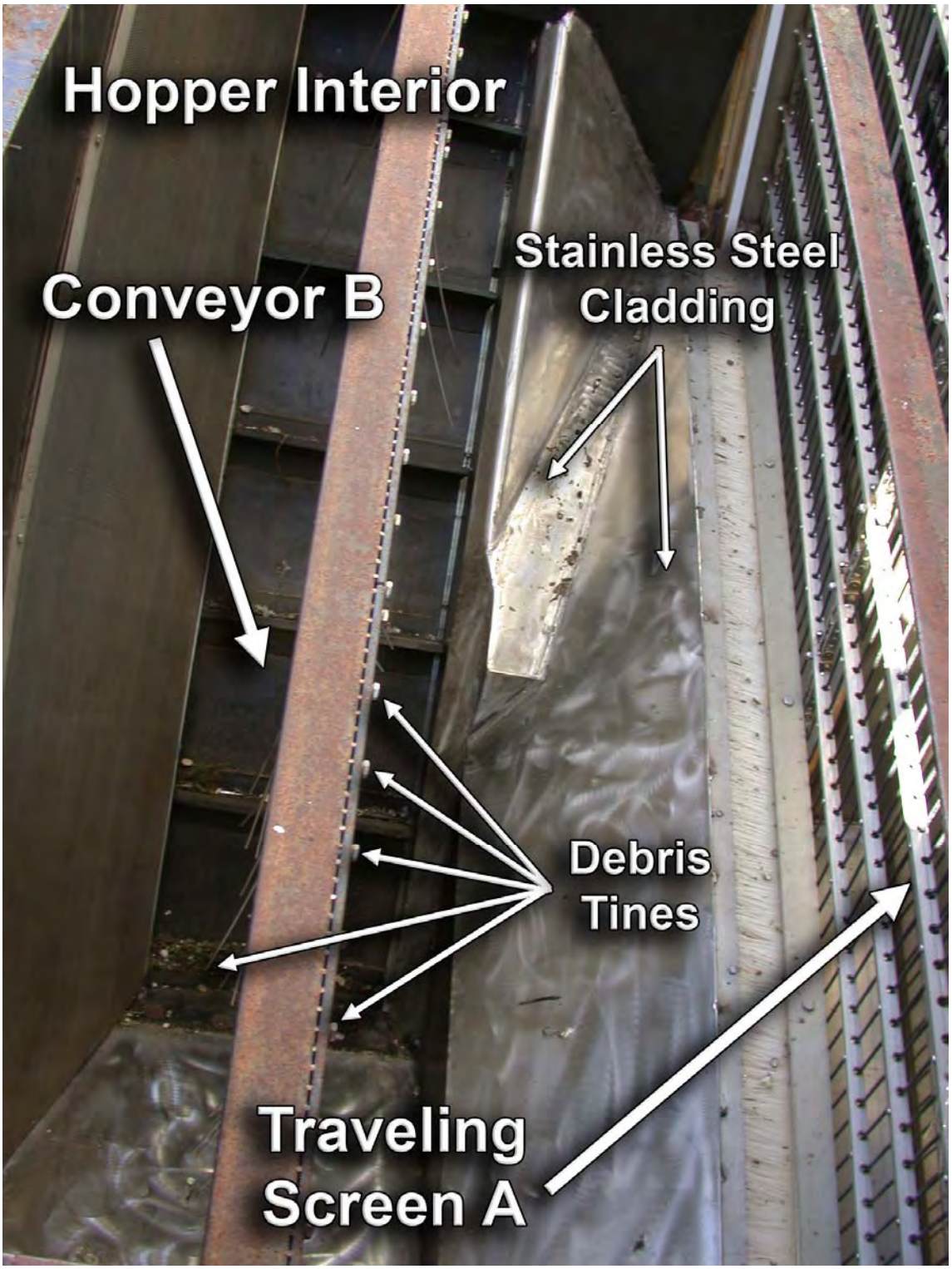


FIGURE 6a.—Top-down view of Hopper interior with the lid open from the south end. Traveling Screen A can be seen to the right and Conveyor B on the left, underneath a metal beam used to mount debris deflection tines.

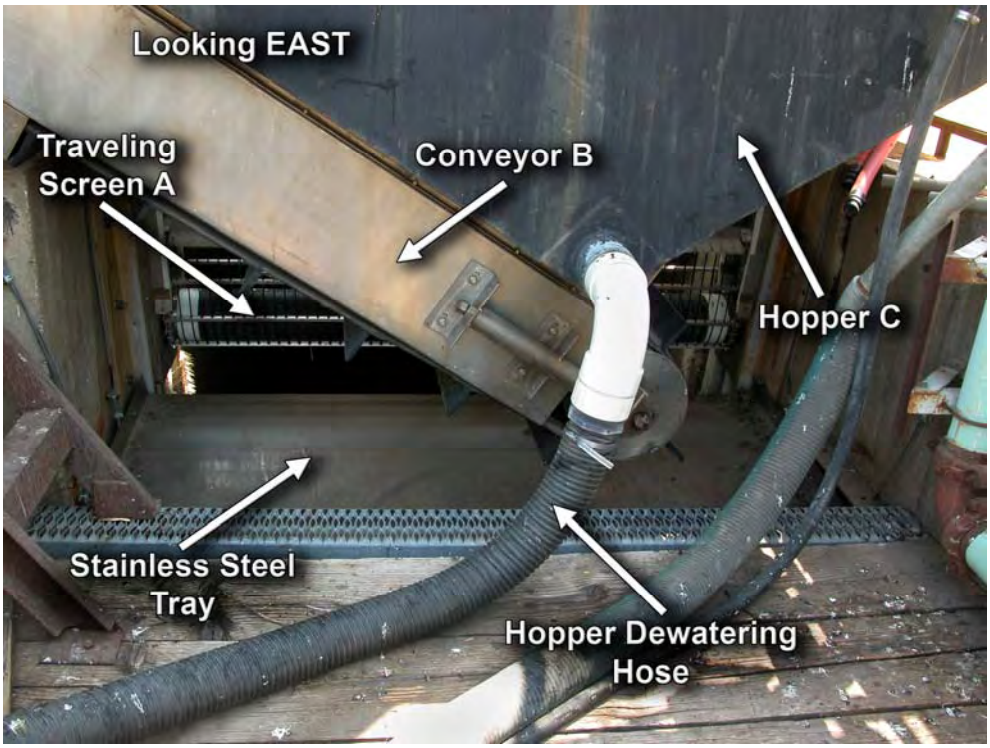


FIGURE 6b.—East view of Hopper exterior seen from the walkway over the Secondary Channel. The Hopper rests on the Conveyor frame and Traveling Screen A can be seen in the background.

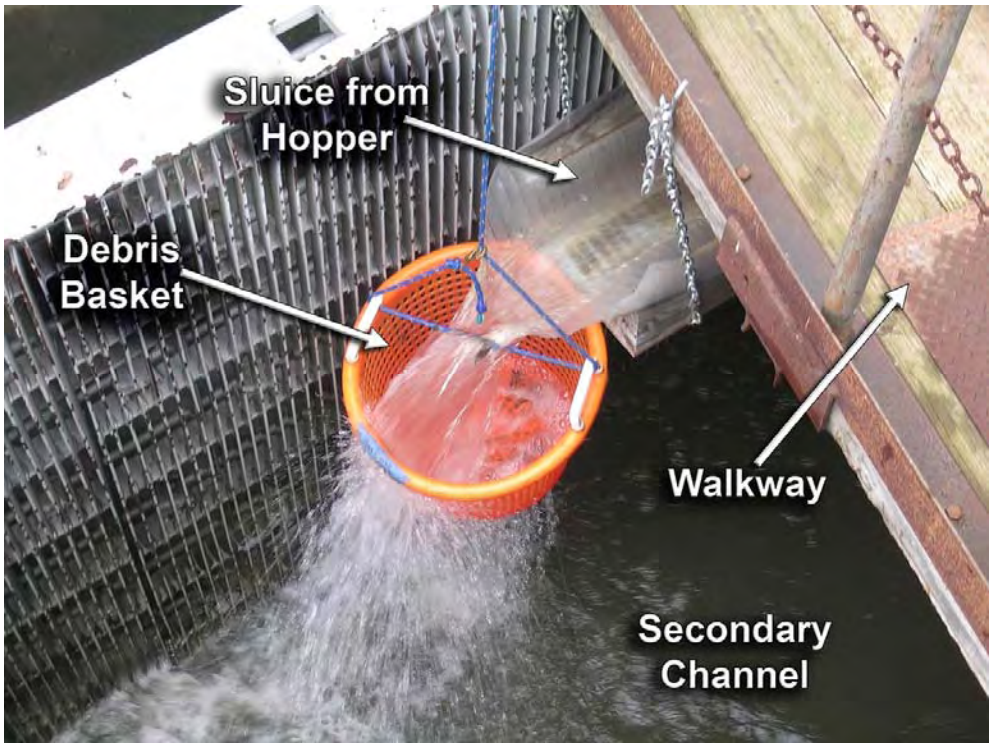


FIGURE 6c.—Debris and small fish entrained in the Traveling Screen and Hopper may be removed via a Sluice that drains into a basket suspended above the Secondary Channel. The Sluice is mounted beneath the stainless steel tray under the Conveyor and walkway.

The Conveyor is controlled from Conveyor Control Panel P4 (Figure 7), located on the north side of the DRS immediately to the east of the Conveyor.

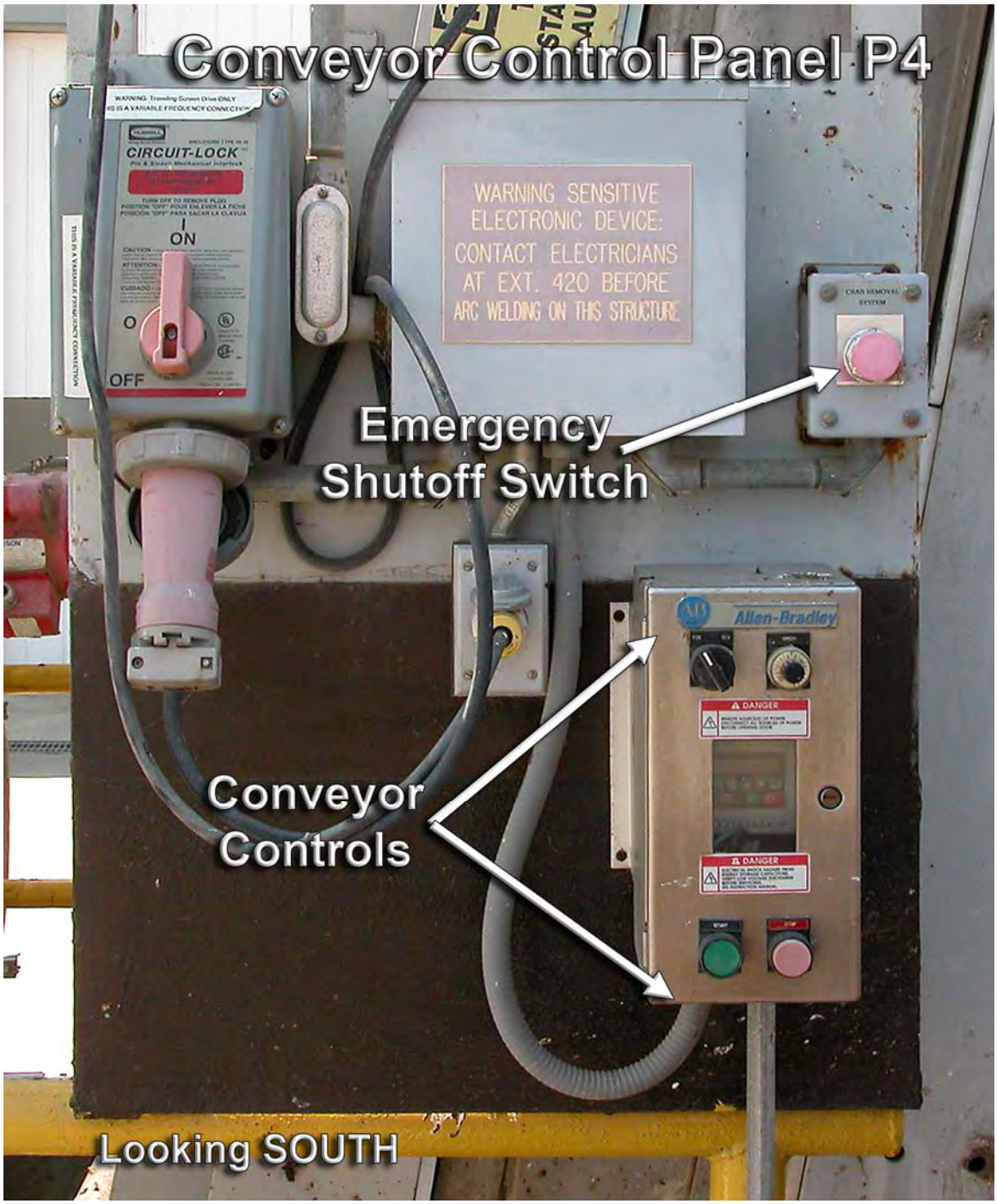


FIGURE 7.—South view of Conveyor Control Panel P4 showing Conveyor Controls and Emergency Shut-Off Switch.

Spray Boom and Hopper Water Supply

Water is supplied to the Spray Booms (Figure 4c) on the Traveling Screen and to the Hopper by way of the Water Supply Pump D, through the Water Supply Line D1 (Figures 1 and 8). The supply water is pumped from a grate-covered sump, the screen water pit, located adjacent to the Secondary Channel, and this water often contains sand and other debris that must be filtered. The Water Supply Pump D is controlled at the Water Supply Pump Control Panel P3, seen in Figures 9a–9c.

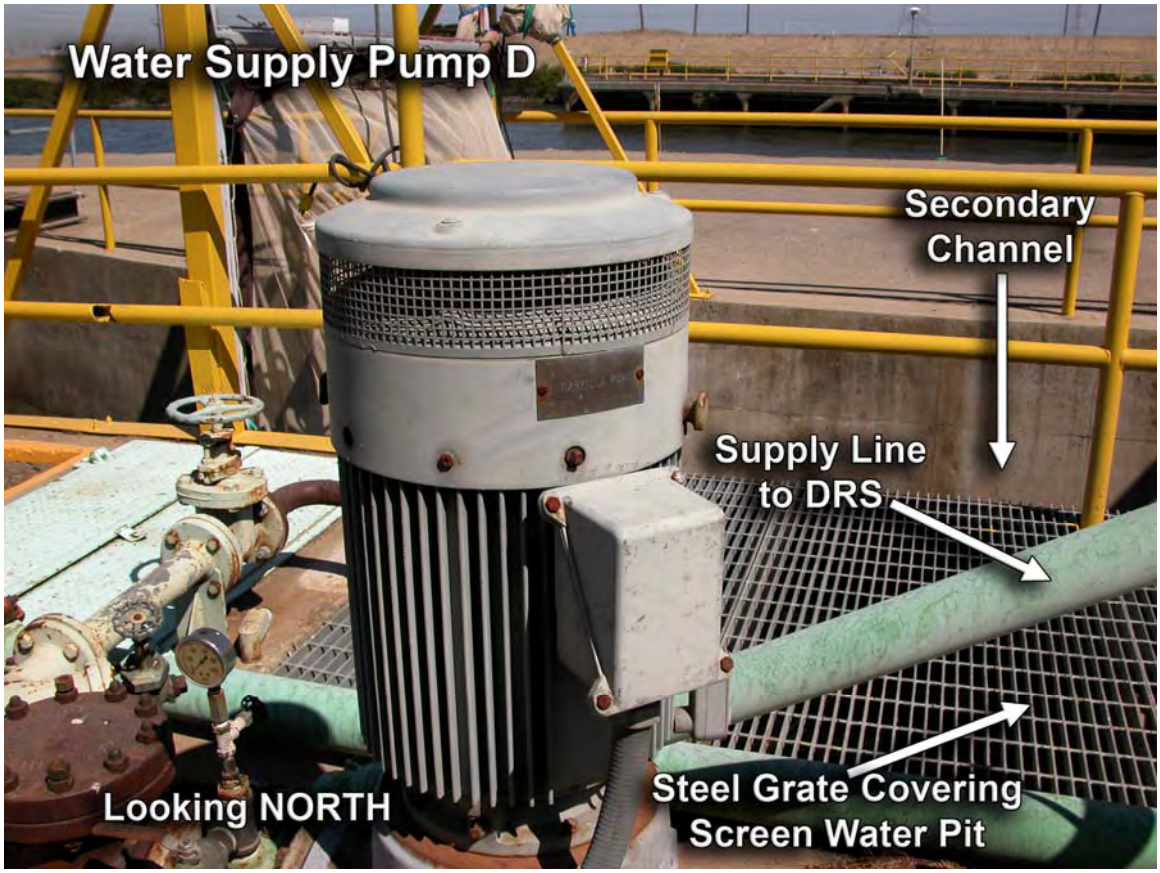


FIGURE 8.—North view of Water Supply Pump D.

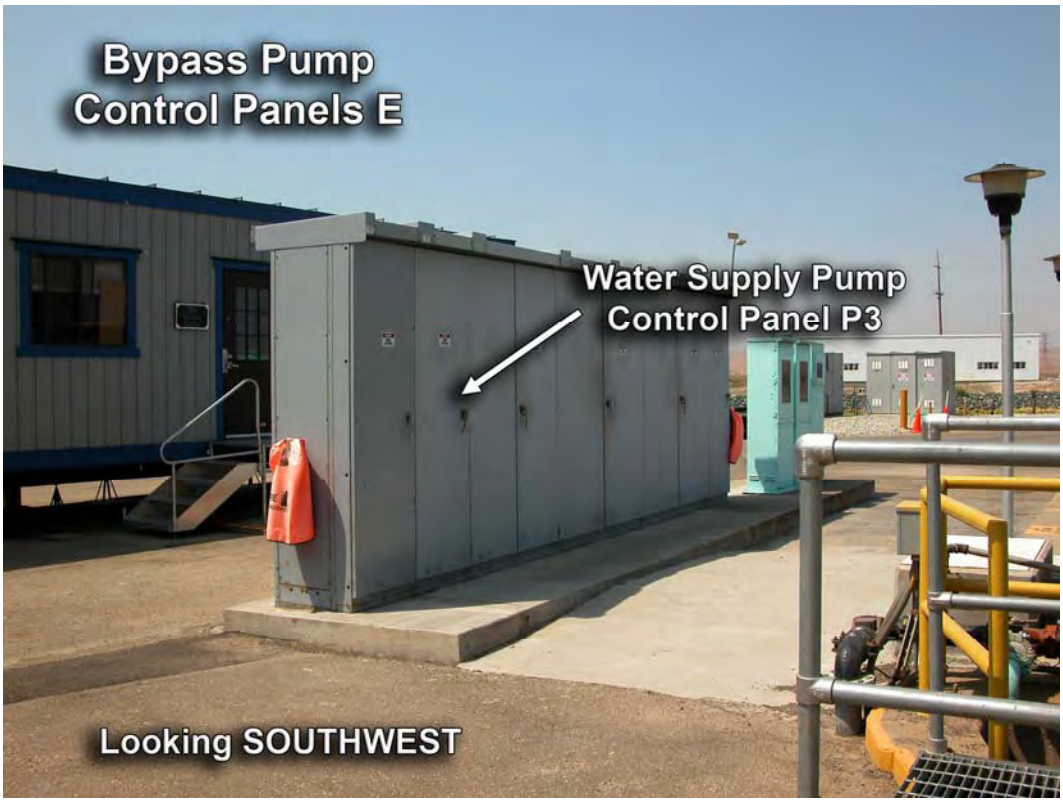


FIGURE 9a.—Southwest view of Bypass Pump Control Panels E. This set of panels includes Water Supply Pump Control Panel P3.

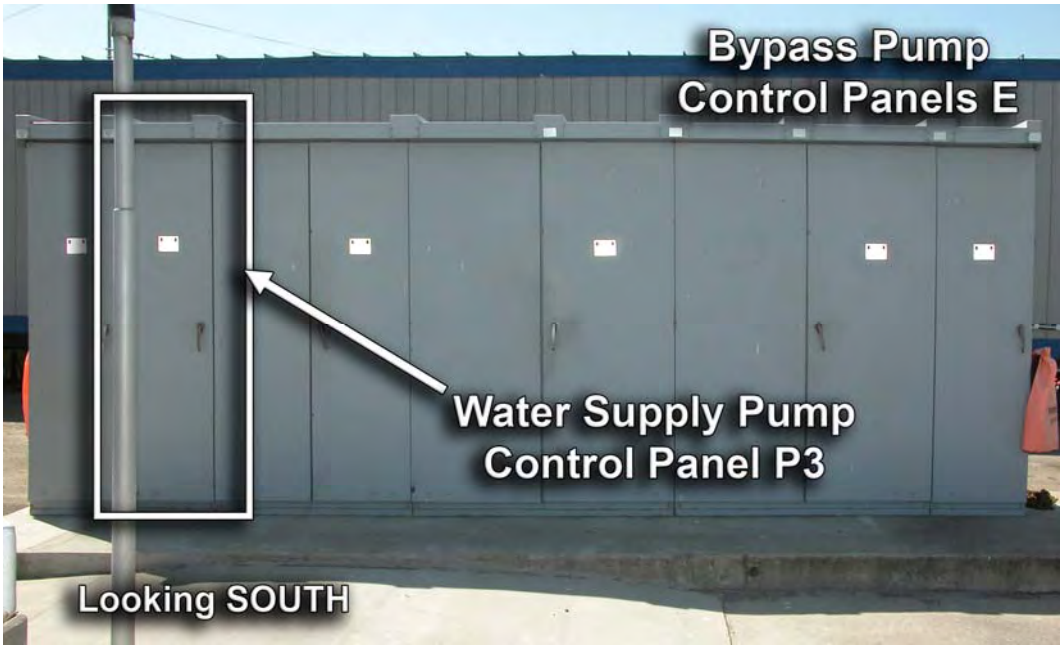


FIGURE 9b.—South view of Bypass Pump Control Panels E. The door for Water Supply Pump Control Panel P3 is highlighted in the white box.

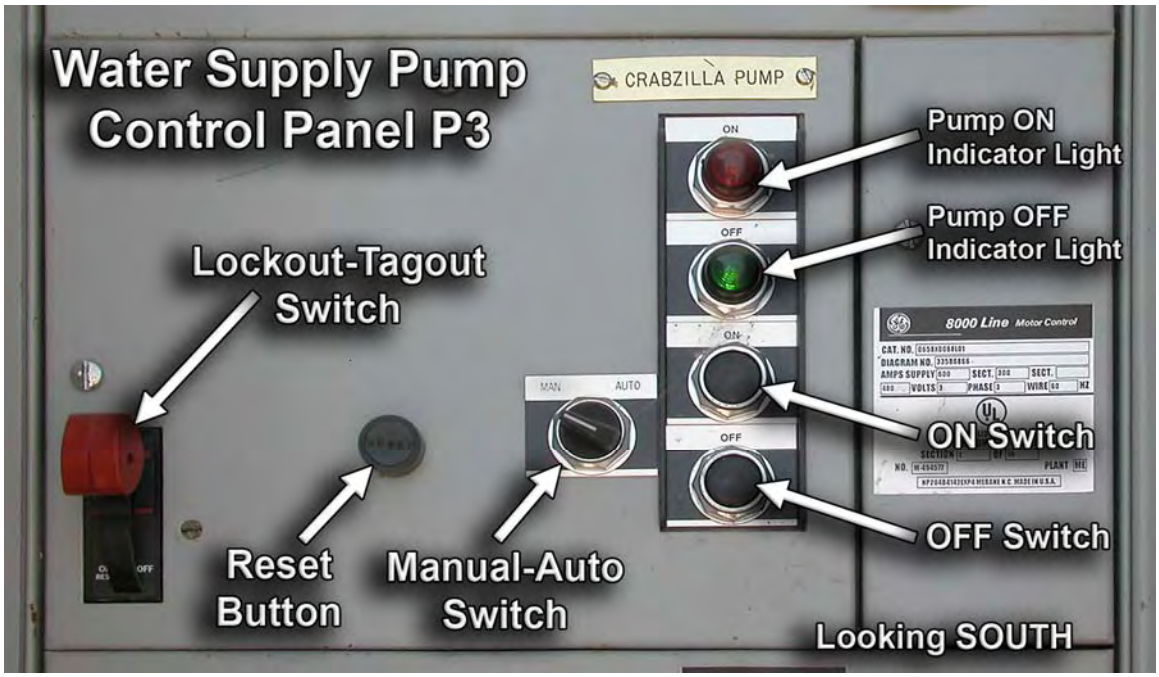


FIGURE 9c.—A close-up of Water Supply Pump Control Panel P3 showing pump controls and indicator lights. This panel and pump are labeled CRABZILLA PUMP.

Filtration, purging of water supply lines, and regulation of water pressure are accomplished at **Valve Assembly D2** (item **D2** in Figures 1, 2b, and below in Figures 10a–10c. This plumbing and collection of valves includes a blue green **Filter D3**, with two purge and pressure valves, **Larger Line DynaQuip Valve D4,** and **Smaller Line Apollo Valve D5**. Downstream of Filter D3 are supply lines and valves for the Spray Booms and Hopper Sprayers. Note that the orange filters seen in the Figure 2b foreground and in the following figures are NOT used to filter supply water.

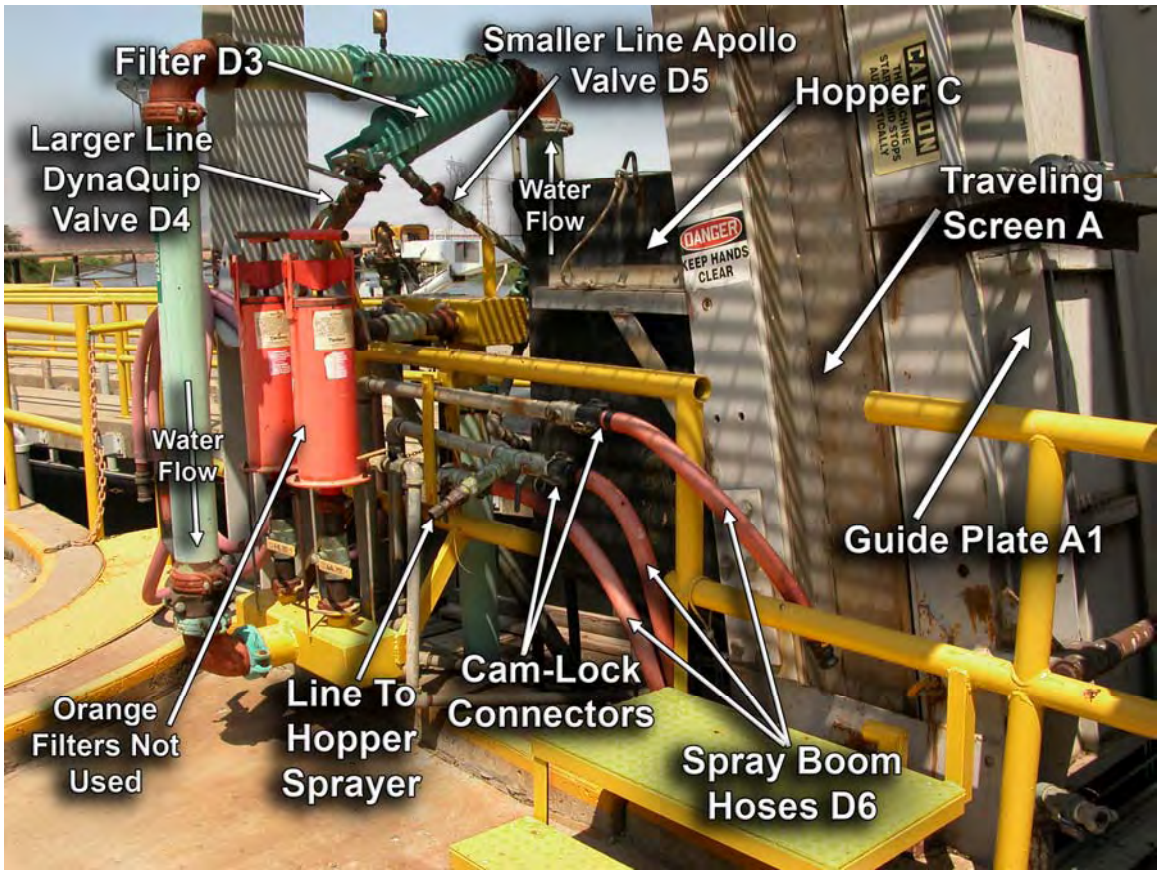


FIGURE 10a.—Northwest view of Valve Assembly D2 showing positioning of the valves in relation to Traveling Screen A and Hopper C. These valves are used to filter Debris Removal System (DRS) supply water and to distribute filtered water to the Spray Booms and Hopper Sprayer. The valves, connectors, and red hoses to the Spray Booms are located in the center of the image.

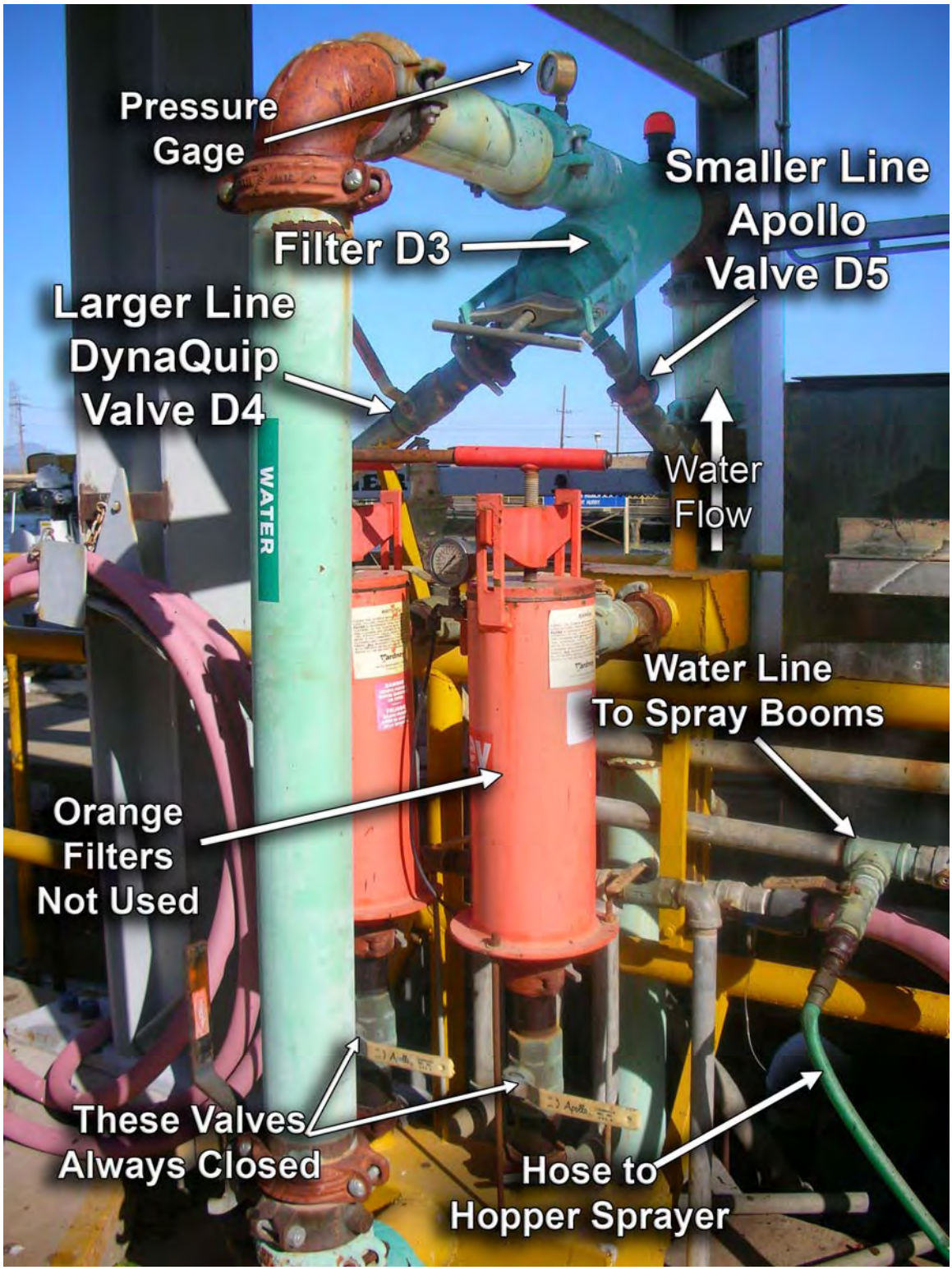


FIGURE 10b.—Closer view of Valve Assembly D2 (north-northwest view). Water supply enters from the 4-inch vertical pipe parallel to the northwest vertical superstructure beam towards the back of the photo. The blue green Filter D3 is angled downwards from the horizontal water pipe. The water lines are purged of debris by opening the Larger Line DynaQuip Valve D4 and Smaller Line Apollo Valve D5 lines attached to Filter D3.

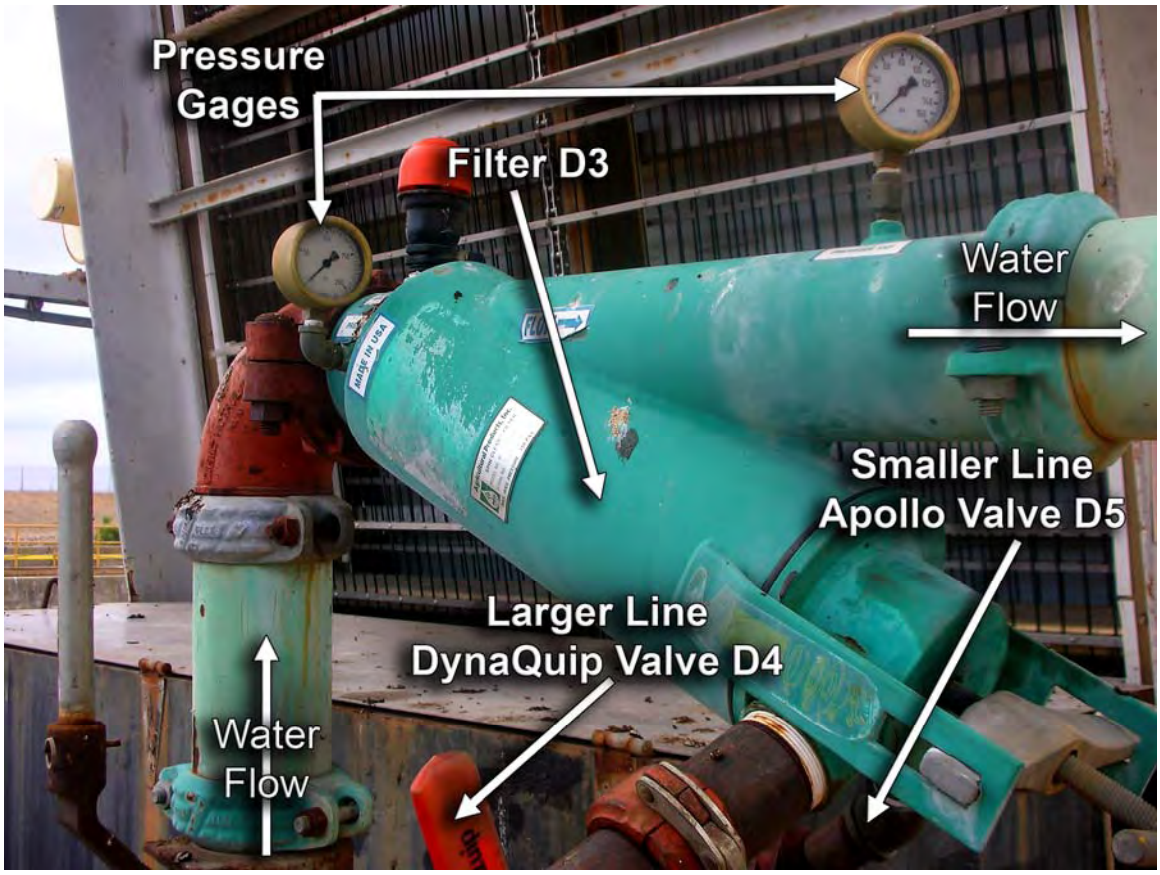


FIGURE 10c.—Northeast view of pressure gauges on the blue green Filter D3 with Traveling Screen A in the background.

SAFETY PRECAUTIONS

The DRS and its basic component parts are seen in the diagram and photos in Figures 1–6. Refer to these figures when reading or reviewing these procedures.

Mandatory Safety Equipment Use

All mandatory equipment and personal protective gear required for the TFCF must be used when working on or around the DRS, including hardhats and safety shoes. A safety harness and hardhat must be worn when getting inside the Hopper and a personal flotation device (PFD) must be worn when working or inspecting below the Hopper or when there is potential for falling into the water in areas having no hand or chain rails.

Perform Mandatory Safety Procedures

Follow all safety procedures to address safety hazards. Additional safety notes will be included in specific procedures below. Perform the following mandatory procedures before operating or working on the Traveling Screen.

Lockout and Tagout

Always follow proper procedures for lockout/tagout of circuit breakers before inspecting or working on the DRS. **Circuit Breaker Panel P1** (Figures 1, 3a–3c) for the DRS is located immediately to the east of the DRS. Make sure that **circuit breaker 15** (Figure 3c) is OFF and use the external panel doors latched to lockout/tagout the DRS. Water Supply Pump Control Panel P3 (Figure 9c) should use adapters for lockout/tagout as seen in Figure 11 below.

FIGURE 11.—Example Lockout/Tagout of electrical switch as found in Water Supply Pump Control Panel P3.

Emergency Shut-Off Switches

The Emergency Shut-Off switches are seen in Figures 12a and 12b. In case of emergency, press the red button to stop the Traveling Screen (Figure 12a) or the Conveyor (Figure 12b). Pressing either of these Emergency Shut-Off Switches will shut down power to the DRS. The Emergency Shut-off switches are not spring loaded, and must be manually reset after activation by pulling the red button OUT. All operators and trainees should be familiar with the location of these switches.

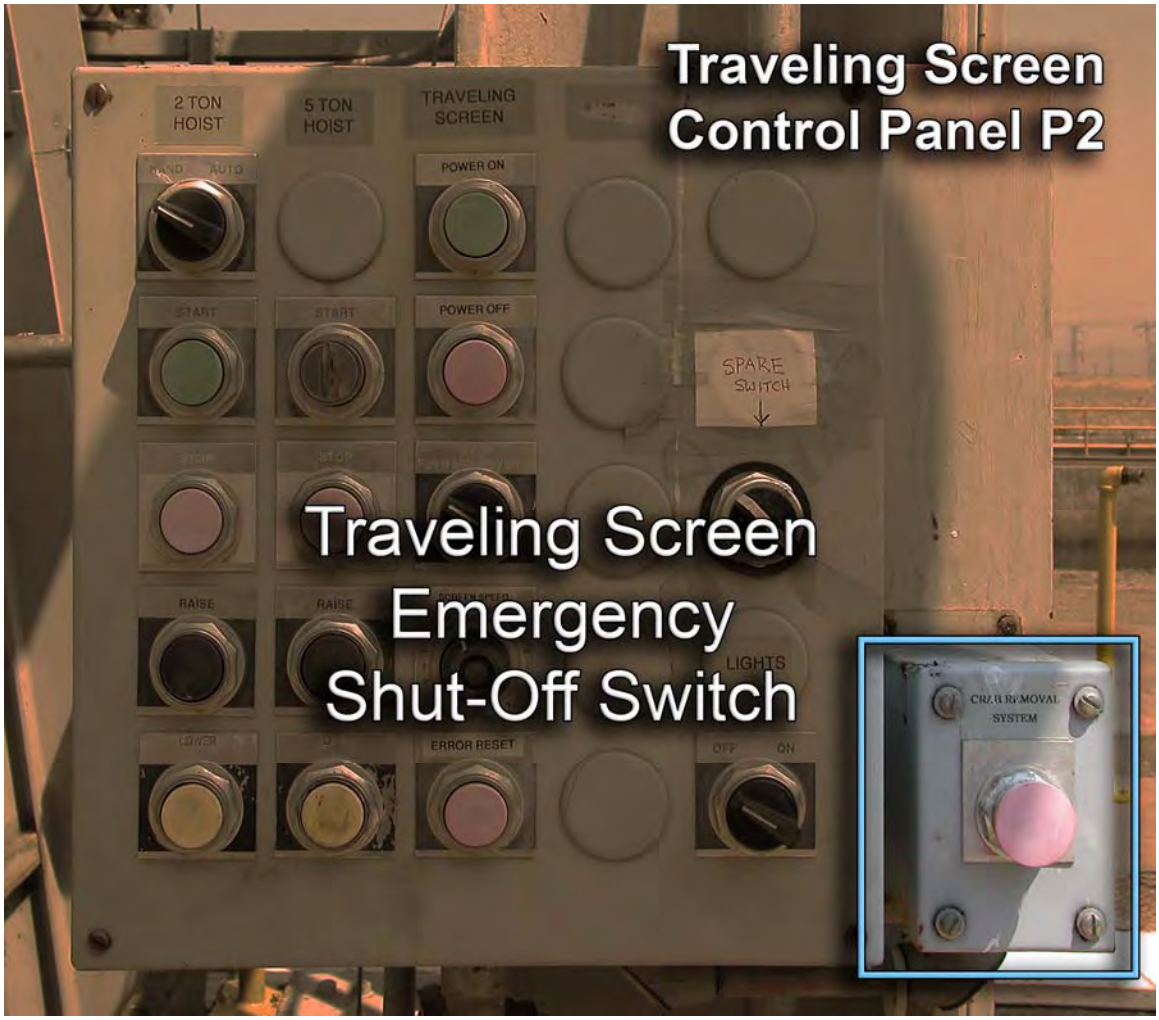


FIGURE 12a.—The Emergency Shut-off Switch on Traveling Screen Control Panel P2.

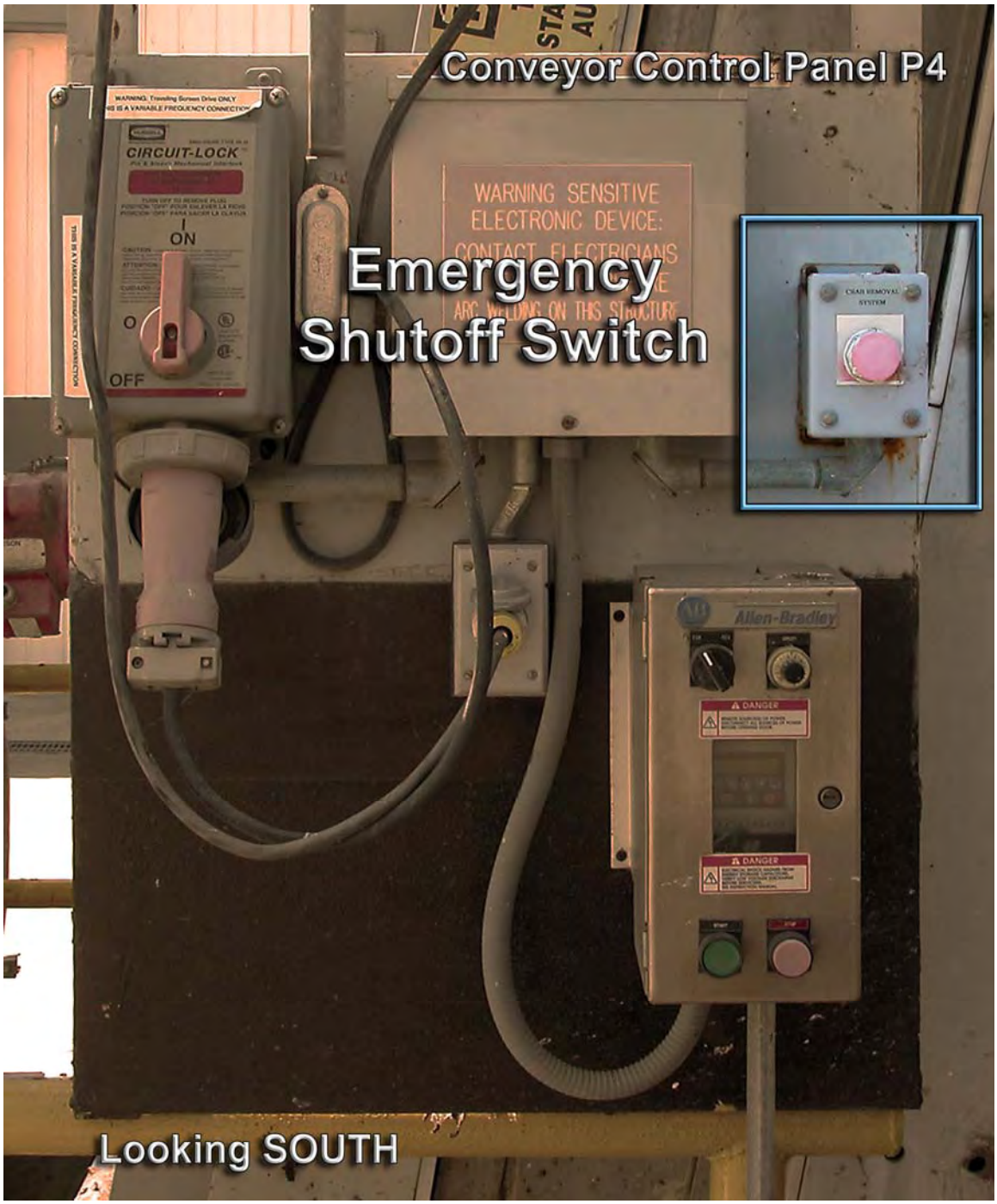


FIGURE 12b.—The Emergency Shut-off Switch on Conveyor Control Panel P4.

DEBRIS REMOVAL SYSTEM STARTUP PROCEDURE

The following procedure must be followed to start and operate the DRS. A checklist for DRS start up is provided in Appendix 2.

Perform Pre-Start Inspection of the Debris Removal System

Before operating the DRS, make sure that required circuits and control panels are OFF and lockouts/tagouts are properly installed. Then, thoroughly inspect the Traveling Screen, Hopper, Conveyor, and water supply plumbing before operating the DRS.

Check Traveling Screen Retaining Pin Bolts

Make sure the Traveling Screen is locked in the UP position and that **retaining pins** are installed (Figure 13). In the Locked UP position, the screen can be rotated for inspection using Traveling Screen Control Panel P2. Rotate the Traveling Screen carefully to avoid injury from crushing or pinching.

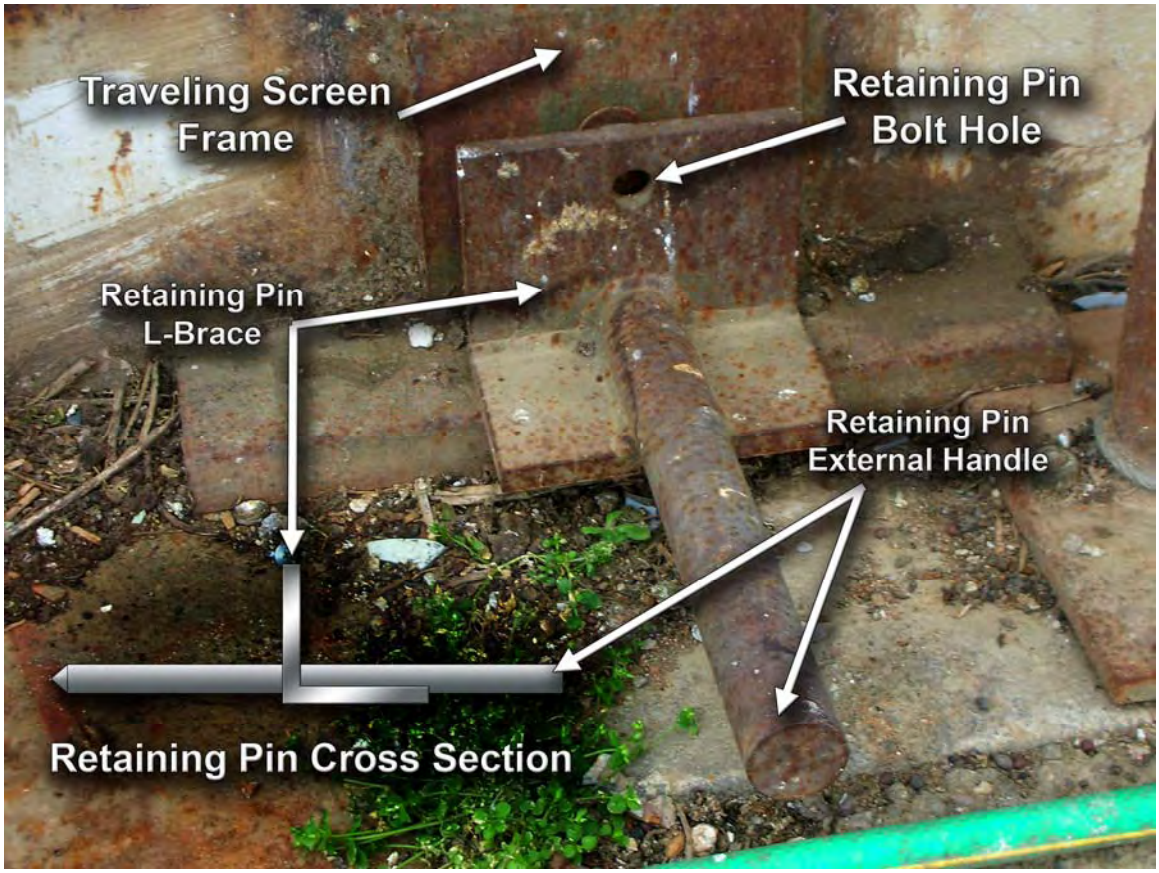


FIGURE 13.—Close-up image of the retaining pin assembly and cross-section of retaining pin (lower left). The retaining pin bolt is not shown. There are retaining pins on the north and south base of the Debris Removal System (DRS) where the Traveling Screen frame is located.

Inspect Traveling Screen

Inspect the **lifts and brushes** attached to the Traveling Screen, three **drive chains**, **nylon coated cables**, and **cable separators** (which keep the cables apart; Figures 4a and 4b). Check for loose nuts and bolts, missing hardware, broken welds, and the alignment and tension of the screen on the two large **rollers** located at the top and bottom of the screen. Check all **nylon roller guides** (Figure 4a) that the Traveling Screen slides and rests on.

NOTE: Perform more thorough inspections of brushes mounted on the walls and floor of the Secondary Channel during periods when the Secondary Channel is dewatered. These brushes tend to corrode rapidly because they are often submerged.

Inspect Hopper and Conveyor

Check for loose or broken component parts. Inside the Hopper, inspect the rubber gaskets for worn areas that do not seal and rubber flaps for tears that might cause friction.

NOTE: Poor gasket seals will cause an increase in the amount of water and debris that is back flushed into the Secondary Channel or onto the stainless steel tray below the Hopper (Figure 6b). Repair or replace faulty components and parts before operating the DRS.

Inspect Plumbing, Valves, Hoses, and Connectors

Check all hoses and water lines for signs of cracks, leaks, or breakage of components on connectors or valves. Repair or replace substandard equipment before operating the DRS.

Prepare Water Supply Line Valves for Pump Operation

Before starting Water Supply Pump D at Water Supply Pump Control Panel P3, make sure the valves for larger and smaller water supply lines on the blue green **Filter D3** (Figures 10a–10c) in the D2 Valves are OPEN so that water is initially flushed into the secondary channel when Water Supply Pump D is started. These are called the **Larger DynaQuip Valve D4** and the **Smaller Apollo Valve D5**. The DynaQuip valve has "DynaQuip" printed on the orange valve handle, and the Apollo valve has "Apollo" printed on the valve handle. These valves are located just upstream of the blue green Filter D3 (Figure 10c). These supply valves are OPEN when the valve handles are parallel to the pipe and CLOSED when perpendicular to the pipe as seen in Figure 14.

NOTE: *Never* start Water Supply Pump D without these two valves being OPEN.

Shut OFF Valves to Orange Filter Cylinders

CLOSE the Apollo valves located on the north side of the two orange filter cylinders. Each orange cylinder has a valve at the bottom and top. Four valves must be closed. Figure 15 shows a close-up of the valves at the top of these cylinders After OPENING the DynaQuip D4 and Apollo D5 valves on the blue green filter, and CLOSING the four valves on the two red filters, you are ready to turn on the Water Supply Pump D.

FIGURE 14.—Closeup of the DynaQuip valve showing OPEN and CLOSED valve positions. All valves operate similarly.

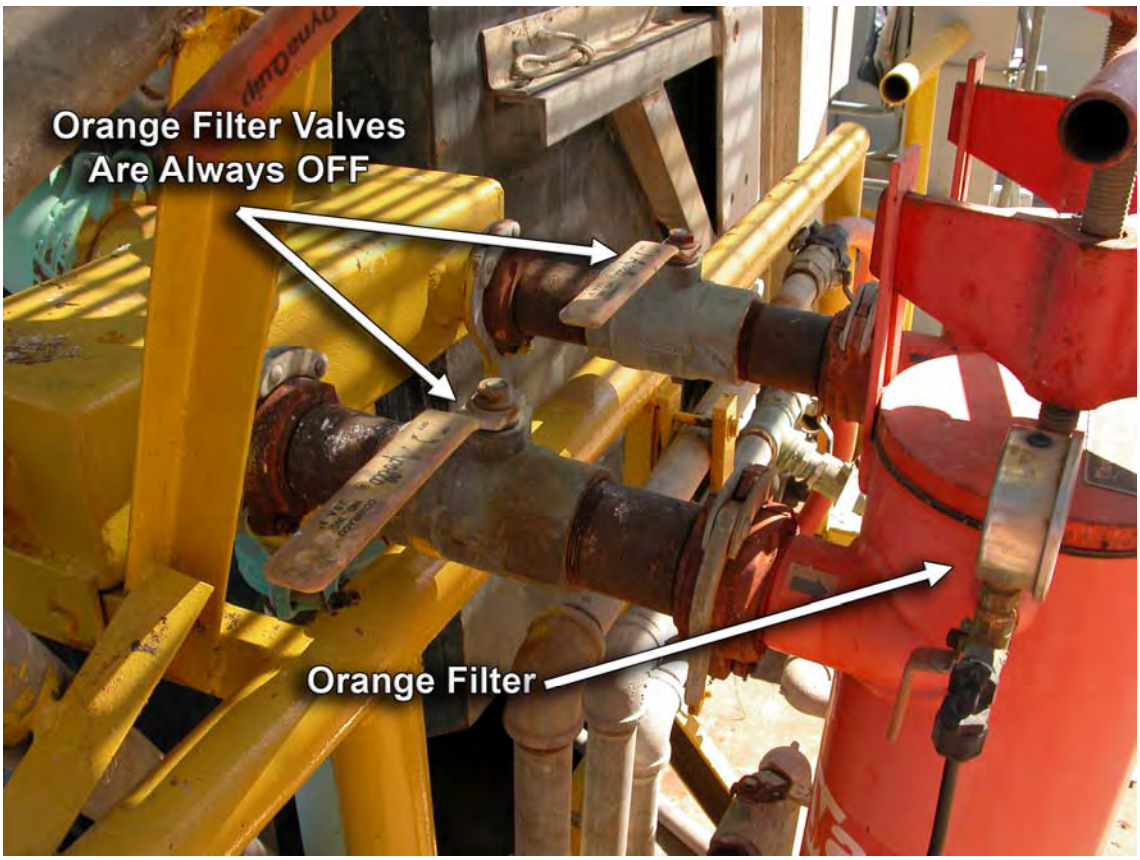


FIGURE 15.—Closeup of the properly CLOSED Apollo valves at the top of the red filter housings. The valves at the bottom of the two red cylinders should also be CLOSED.

Turn ON Water Supply Pump D

The Manual/Auto Switch should be set to MAN, for manual. Push the ON Switch button to start the pump. The red Pump ON light will illuminate and you should hear the Water Supply Pump D (Figure 8) motor start up.

Flush Water Supply Line

Flush the supply line out the two purge lines (the Larger Line DynaQuip Valve D4 and the Smaller Line Apollo Valve D5) just upstream of the blue green Filter D3 until water runs clear (see Figures 10 a–10c). This may take several hours if the screen has not been used for several months and only a few minutes if the screen is being used daily. This flushing procedure also back flushes Filter D3.

Park Dump Truck Beneath Conveyor

While the water supply lines are flushing, have a driver park the dump truck beneath the Conveyor on the north side of the DRS. Someone should direct the driver to optimize placement of the truck bed and to avoid damage to the Conveyor.

Remove Retaining Pins

Remove the two retaining pins (Figure 13) located at the base of the Traveling Screen on the north and south sides. Align holes in the Traveling Screen and Traveling Screen frame to remove retaining pins. Replace pins when the screen is not in use and lock retaining pins by installing stainless steel bolts through the pin bracket into the screen frame. Figure 2a and 2c show the Traveling Screen in the UP position.

NOTE: If the retaining pin is difficult to remove due to binding, slightly move the Traveling Screen using the 5-ton Hoist UP and DOWN buttons on Traveling Screen Control Panel P2.

Lower Traveling Screen

Lower the Traveling Screen using the 5-ton Hoist controlled at Traveling Screen Control Panel P2. These controls are in the right-hand column highlighted in Figure 16. Start the 5-ton Hoist by pressing the LOWER button. The Traveling Screen will automatically stop when it reaches the bottom of the Secondary Channel. The screen must be within 18 inches of the bottom of the secondary channel to allow installation of Spray Boom Hoses. There are markings on the screen nylon skid pads, near the Traveling Screen control panel, showing the completely down and 1 foot off the bottom positions.

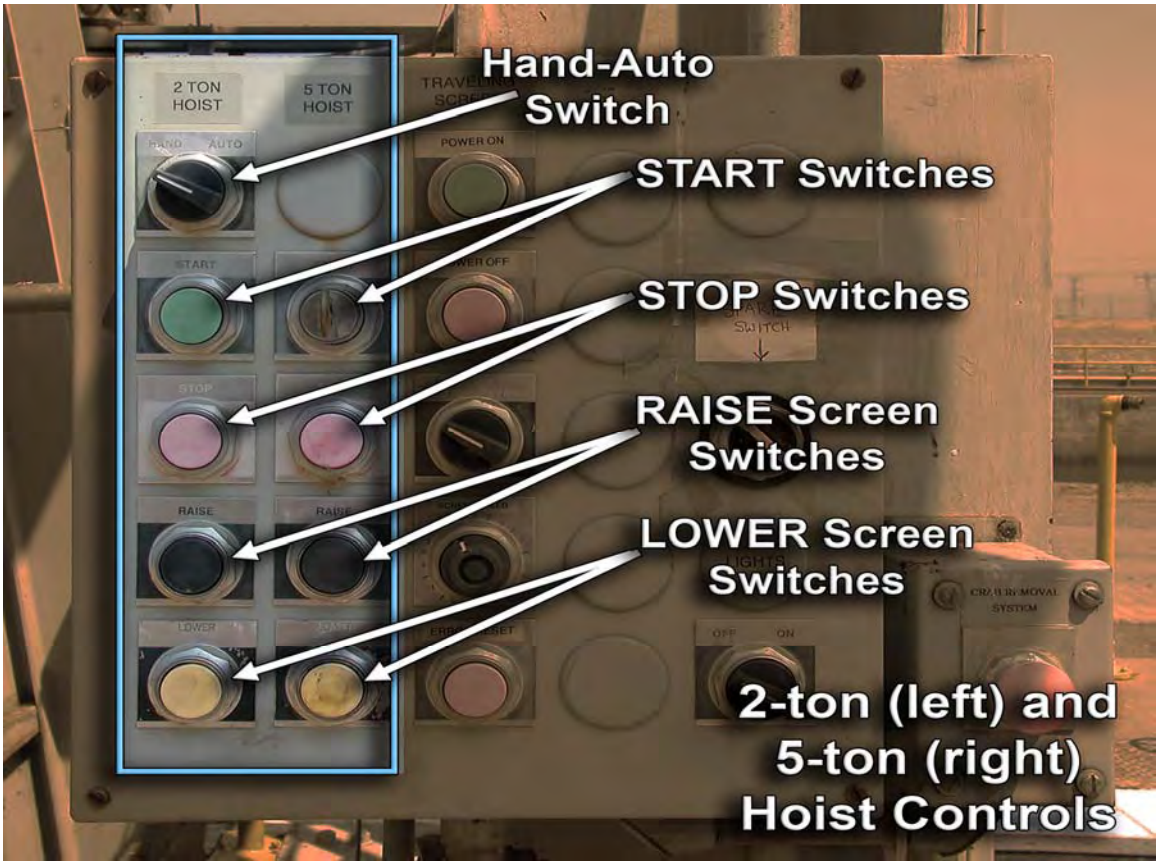


FIGURE 16.—Traveling Screen Control Panel P2 highlighting the 2-ton and 5-ton Hoist Controls.

If the screen does not lower or the power seems to be off, check the emergency stop buttons on the P2 Panel and Conveyor Control Panel P4. If either one of these Emergency Shut-Off switches are activated, electricity to the debris removal system will be OFF.

Lower and Position Guide Plate

Guide Plate A1, located on the east-facing side of the Traveling Screen (Figure 2a and 2c) is controlled using the left-hand column control buttons for the 2-ton Hoist on the P2 Panel (Figure 16). Turn the Hand-Auto Switch to the HAND position and press the green START Switch button. Press the LOWER Switch button to lower the Guide Plate. When the bottom of the Guide Plate is within 6-12 inches above the water surface in the secondary channel, press the STOP Switch button. Rotate the Hand-Auto Switch to the AUTO position to allow the Guide Plate to raise and lower automatically with changing water levels.

NOTE: In AUTO operation, the guide plate may move without warning.

If the guide plate does not maintain a distance of 6-12 inches above the water surface in AUTO mode, switch from the AUTO setting to the HAND setting, and manually adjust the level of the guide plate using the 2-ton Hoist LOWER, STOP, and RAISE switch

buttons. In the HAND mode the guide plate level will have to be adjusted every 30 minutes to accommodate water surface fluctuations from tides in the Secondary Channel.

Close Hopper Lid

Untie the lid to the Hopper, and CLOSE the Hopper Lid. Secure CLOSED using a rope.

Flush Spray Boom Water Hoses

Before connecting the three red Spray Boom Hoses D6 to the Spray Booms, flush each hose one at a time until water runs clear. Also flush the garden hose that connects to the two spray nozzles within the Hopper prior to connecting the hose. Each of the supply lines for the Spray Booms and the Hopper Sprayer Line have separate valves. Direct flow from blue green Filter D3 by partially closing the Larger Line DynaQuip Valve D4 and Smaller Line Apollo Valve D5 seen in Figures 10a–10c. This forces water through the filter and to the three valves for the three Spray Boom Hoses and the Hopper Sprayer Hose.

Connect Spray Boom Hoses

After flushing the three red Spray Boom Hoses D6, connect each hose to the three Spray Booms using the cam-lock connectors on the Traveling Screen (Figure 17). The levers on the cam-lock connectors must be in the full DOWN position and parallel to the boom hoses.

Connect Hopper Sprayer Hose

Connect the supply hose that feeds water to the spray nozzles in the Hopper and opens the Hopper Sprayer Hose Valve. Wet the Conveyor.

NOTE: Operating the Conveyor DRY will cause friction damage. Always make sure the Conveyor and Hopper are wet before operating.

Start Flow to Spray Booms and Hopper Sprayers

Open Spray Boom Hose Valves D7 upstream of each of the three red Spray Boom Hoses D6. Open the Hopper Sprayer Hose Valve and the Hopper Sprayer Hose to start water flow to the Spray Booms and Hopper Sprayers (Figure 18). Adjust the incoming water pressure to the Spray Booms by opening or closing the Larger Line DynaQuip Valve D4 just upstream of the green water filter cylinder. The Smaller Line Apollo Valve D5 must always remain partially open so that Filter D3 works properly. The pressure gauge upstream of Filter D3 should read around 40 psi, and the difference in pressure between the two pressure gauges before and after the filter (see Figures 10b

FIGURE 17.—Cam-lock connectors for attaching Spray Boom Hoses D6 to the Traveling Screen.

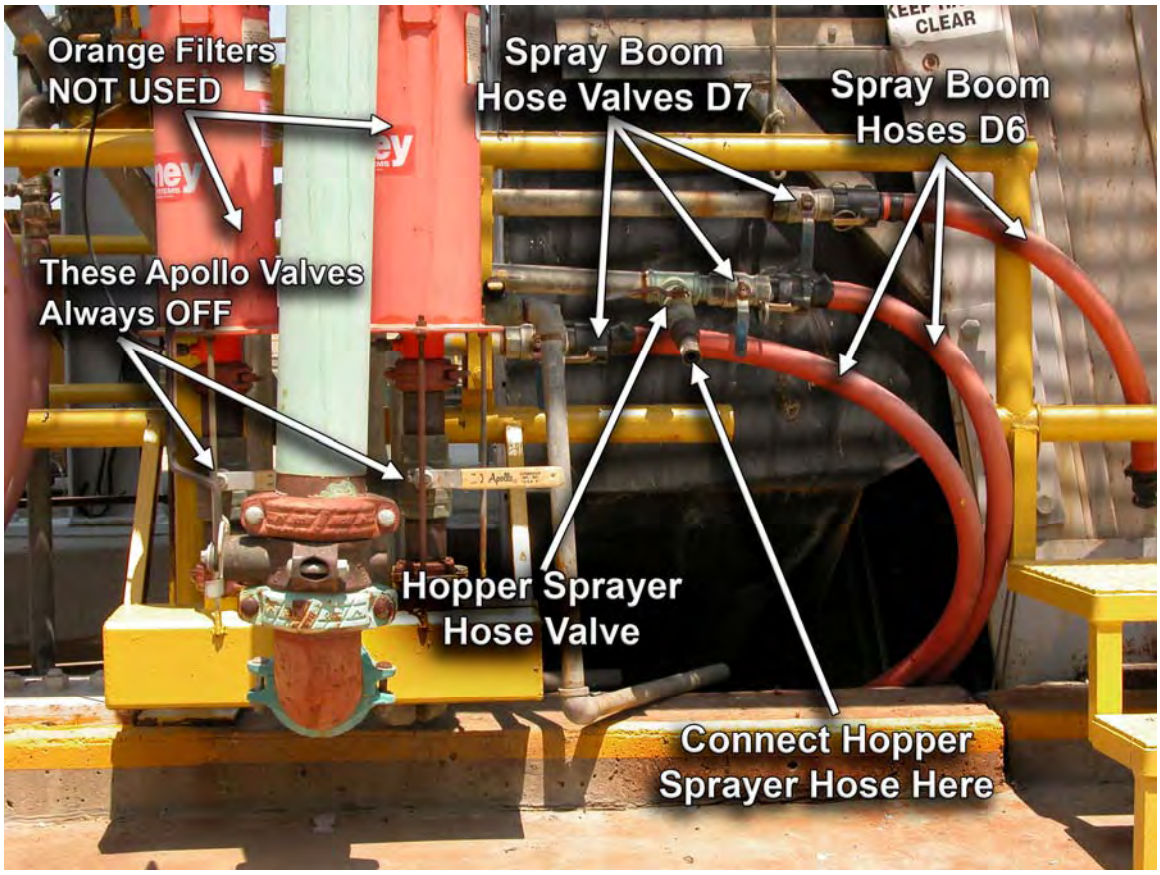


FIGURE 18.—North facing, close-up view of Spray Boom Hoses D6, Spray Boom Hose Valves D7, and Hopper Sprayer Hose and Valve.

and 10c) should be 10 psi or less. The flow of water to each of the three Spray Booms can be adjusted at the Spray Boom Hose Valves D7 (Figures 10a and 18), and the Hopper Spray Nozzle flow can be adjusted using the Hopper Sprayer Hose Valve (Figure 18).

NOTE: The flow from the Spray Booms should be adequate to knock debris from the screen without fragmenting the vegetation. If the water pressure is too high, the vegetation will break into smaller pieces becoming more difficult to collect.

Start Traveling Screen A

The controls that operate the rotation of the screen are found under the TRAVELING SCREEN column on the Traveling Screen Control Panel (Figure 19). Set the screen direction switch to the FORWARD position and push the POWER ON button. Set the speed of the Traveling Screen to 8 feet/minute with a setting of 2.5 on the screen speed dial.

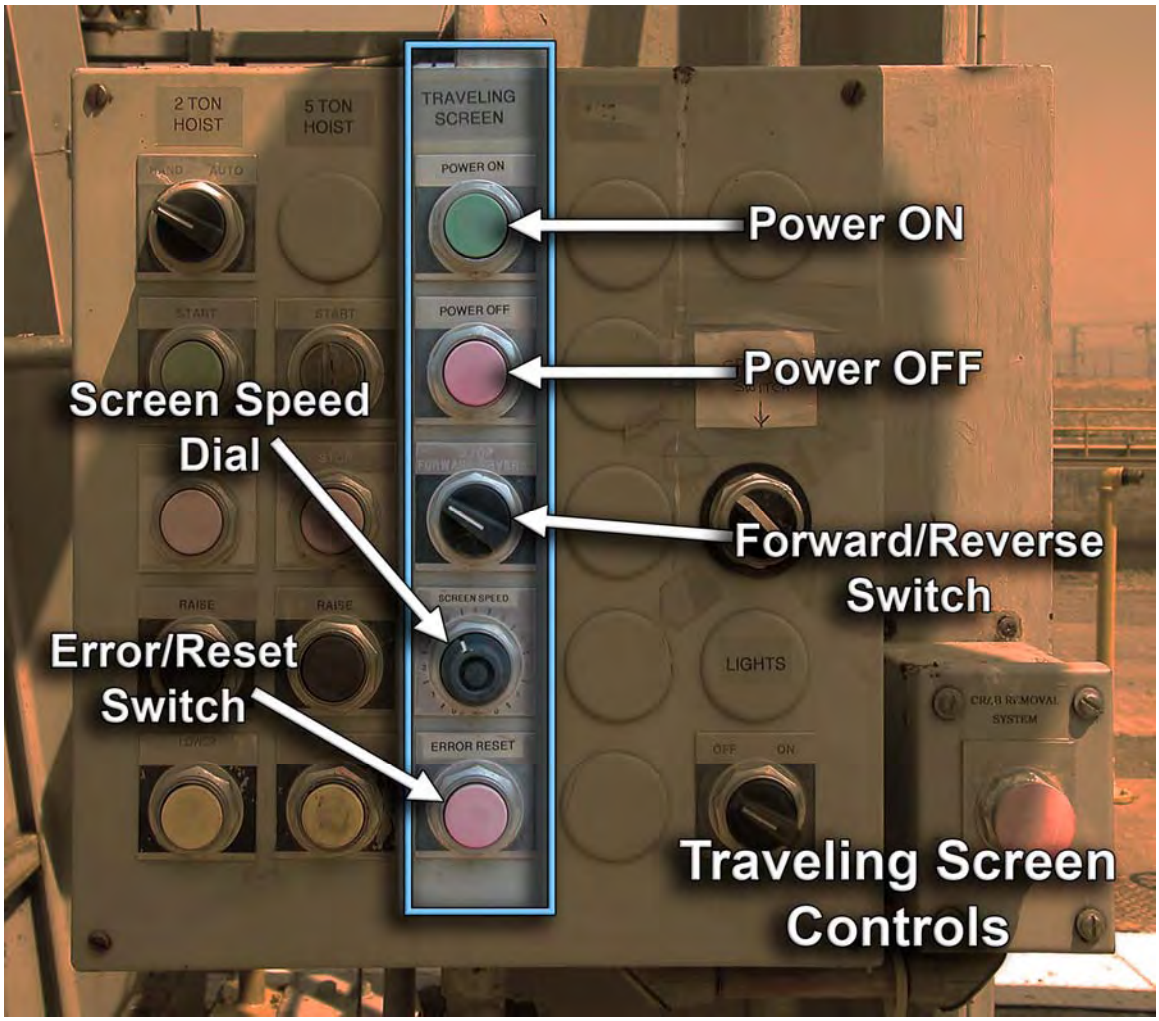


FIGURE 19.—North view of Traveling Screen Control Panel P2 with Traveling Screen controls highlighted.

CAUTION! Do not leave the Traveling Screen in the Secondary Channel for more than 5 minutes without the screen rotating. Debris can accumulate on the screen quickly causing Traveling Screen clogging and damage.

Start Conveyor B

Start Conveyer B after Traveling Screen A and Guide Plate A1 are positioned properly and the Spray Booms and Hopper Sprayers are operating, turn on the Conveyor at Conveyor Control Panel P4 (Figure 20). Check again to make sure the conveyor belt and all moving parts are wetted with the internal spray nozzles to reduce friction and avoid misalignment. Do not operate the conveyor belt dry.

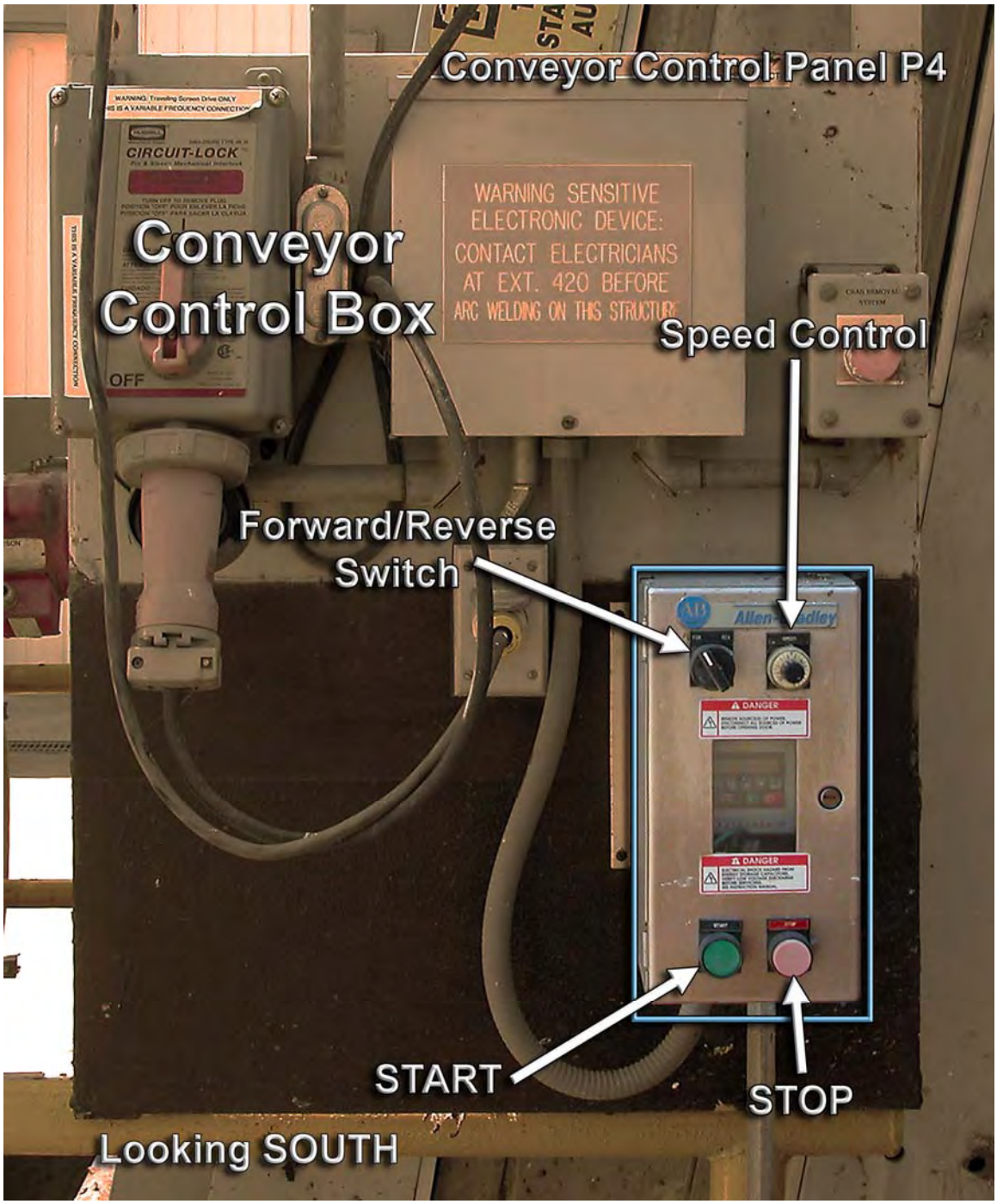


FIGURE 20.—Conveyor Control Panel P4 on the north side of the Debris Removal System (DRS).

Check Conveyor Alignment

Start the wetted conveyor belt by turning the **Speed Control** dial to a setting of 5.5, (Figure 20) and then press the START switch button. Temporarily shut OFF the water to the Spray Booms at the Spray Boom Valves (Figure 18) and inspect the alignment of the conveyor belt terminal end in the Hopper while the belt is rotating. If the Conveyor is out of alignment, call the Reclamation Facilities Manager and shut down the DRS.

Attach Sluice and Debris Basket to Hopper Tray

Suspend the sluice beneath the hole in the stainless steel tray below the Hopper and secure with chains from the walkway (Figure 6c). Hang a 20-gallon plastic basket with ropes below the sluice end to capture additional debris and small fish collected on the stainless steel tray when draining water from the Hopper.

OPERATING THE DEBRIS REMOVAL SYSTEM AND TROUBLESHOOTING

Once the DRS is started properly, the operator should perform the following checks during routine operation:

Monitor Hopper for Debris Buildup

Manually move accumulated debris to the Conveyor belt and keep debris moving up the Conveyor.

Monitor Stainless Steel Tray Beneath Hopper and Conveyor for Debris Buildup

If the tray is getting clogged, turn off the water to the Hopper Sprayers (Figure 10a and 10b) at the valve above the hose to the Hopper Sprayer. Use a hoe to move debris to the hole in the tray. Turn the water back on to the Hopper Sprayers and help push debris into hole with the hoe.

Monitor Brushes on Traveling Screen

If brushes or lifts on the Traveling Screen appear loose or damaged, shut down the DRS, call the Reclamation Facilities Manager, and effect repair or replacement.

1. Open purge valves D4 and D5 and shut off the Spray Boom water valves.

2. Raise the Traveling Screen A and Guide Plate A1 out of the Secondary Channel.

3. Repair or replace damaged lifts and brushes.

Monitor Guide Plate A1 Position

Tides may raise or lower the water level in the Secondary Channel, and the AUTO function may sometimes fail to adjust the Guide Plate position. If Guide Plate A1 is under water or more than a foot above the water level, adjust the Guide Plate.

1. Go to the Traveling Screen Control Panel P2 and find the 2-ton Hoist Controls (Figure 16) on the far left column.

2. Turn the Hand-Auto Switch to the HAND position and press the green START Switch button. Press the LOWER Switch button to lower the Guide Plate. When the bottom of the Guide Plate is within 6-12 inches above the water surface in the secondary channel, press the STOP Switch button.

3. Rotate the Hand-Auto Switch to the AUTO position to allow the Guide Plate to raise and lower automatically with changing water levels.

Monitor Debris at the Top of Conveyor B

Manually clear any debris clogging the top of the Conveyor belt.

Monitor Conveyor Belt and Gasket for Damage

Check the Conveyor belt for broken tines or missing or damaged rubber pads. Check the rubber flap gasket at the base of the Conveyor belt. This flap gasket should open and close with Conveyor operation. If the gasket remains in the open position (excess water will be spilling out of the Hopper), take corrective action. Call the Reclamation Facilities Manager, shut down the DRS, and effect repairs.

Monitor Pressure Gauges at Filter D3

Incoming water pressure at Filter D3 (Figures 10a–10c and 18) should be around 40 psi and the difference between the pressure readings on the upstream gauge and the gauge downstream of Filter D3 should 10 psi or less. Take corrective actions if pressure difference is greater than 10 psi or incoming water pressure is less than 40 psi.

Table 1 provides a troubleshooting guide as a quick reference for operators of the DRS.

TABLE 1.—Troubleshooting the DRS during operation.

Problem	Actions
Traveling Screen will not lower or rise from the support structure.	(1) Remove the screen retaining pins (2) Check Emergency Shut-off Switches on the Traveling Screen Control Panel P2 and the Conveyor Control Panel P4 (pull for run/push for stop). (3) Check Circuit Breaker 15 on the PF Panel in the Circuit Breaker Panel P1 (Figure 3a–3c). (4) Go to Traveling Screen Control Panel P2 (Figure 20). Push the STOP switch under 5-ton Hoist and then press the Power ON switch button. Then press the Raise Screen or Lower Screen Switches under the 5-ton Hoist control column.
Traveling Screen does not rotate	(1) Go to Traveling Screen Control Panel P2.(Figure 20). (2) Turn Forward/Reverse Switch to forward or reverse. (3) Traveling Screen Power OFF switch may be tripped. Push Power ON switch button. (4) Push the Error/Reset Switch button. Resetting is not normally needed; if required more than once daily have the screen checked.
Noisy Traveling Screen or Conveyor	(1) Check inside Hopper for loose deflection tines. (2) Check Traveling Screen parts (loose brushes, lifts, brackets). (3) Check alignment of the screen on the roller and the alignment of the Conveyor. (4) Check for loose or missing hardware.
Guide Plate is too high or low	(1) Go to Traveling Screen Control Panel P2 (Figure 17) and locate the 2-ton Hoist Control buttons. (2) Rotate the Hand/Auto Switch dial on the 2-ton Hoist Controls to HAND and adjust manually so that the guide plate is within 6-12 inches of the water, and then turn Hand/Auto Switch dial to AUTO. If the Guide Plate does not adjust automatically, switch back to HAND. Readjust every half hour depending on the changing water level. (3) Repair or replace the automatic height feature.
Incoming water pressure upstream of Filter D3 is less than 40 psi	(1) Flush water delivery lines. (2) Back flush or clean Water Filter D3. (3) Clean out the well pit. Check pump impeller for debris.
Spray Boom is clogged	(1) Clean nozzles using a small diameter wire. (2) Remove the end cap on the Spray Boom and back flush the Spray Booms. (3) Remove the clogged nozzles and clean with wire and brush.
Excess water is flushing out below the Hopper	(1) Check rubber gaskets between the Hopper and the conveyor. Replace gasket if needed.
Conveyor or Traveling Screen is out of alignment.	(1) Have TFCF O&M or Delta Mendota Water Authority realign.

DEBRIS REMOVAL SYSTEM SHUT-DOWN PROCEDURE

A shut-down checklist is provided for operator quick reference in Appendix 2.

Shut Down Water Supply at Filter

Fully OPEN the Larger Line DynaQuip Valve D4 and Smaller Line Apollo Valve D5 at the blue green water Filter D3 so that water going to the Spray Booms is diverted to the secondary channel.

Shut Down and Disconnect Spray Booms

After water is diverted to the Secondary Channel, close the three Spray Boom hose valves (Figure 18) and close the valve to the garden hose that delivers water to the Hopper Spray Nozzles. Disconnect the cam locks that attach the three hoses to the three Spray Booms on the Traveling Screen.

Shut Down Traveling Screen A

Press the Power OFF button on the Traveling Screen Control Panel in the TRAVELING SCREEN column (Figure 19) to stop the rotation of the Traveling Screen.

Stop 2-Ton Hoist

Press the red STOP button in the 2-ton Hoist Column on Traveling Screen Control Panel P2 (Figure 16) to stop any up or down movement of the guide plate that may occur while shutting down and lifting the screen.

Stop Conveyor B

Push the STOP button on the Conveyor Control Panel P4 (Figure 20) to stop the rotation of the conveyor.

Open and Secure Hopper Lid

The Hopper Lid should be opened and positioned so that it is out of the way of the brushes on the Traveling Screen. After positioning open, secure the lid with rope ties so wind cannot blow it shut.

NOTE: If the Hopper Lid is not opened it will be lifted by the brushes and lifts when the Traveling Screen is raised. This creates stress on the brushes and lifts and causes a loud noise when the lid falls shut after being lifted by the brushes. If

the screen is not going to be used for several days the lid should be closed to keep animals out of the Hopper and keep the sun off the rubber conveyor belt.

Raise Guide Plate A1

Go to Traveling Screen Control Panel P2 (Figure 16). Under the 2-ton Hoist Column turn the Hand-Auto Switch to HAND and restart the hoist using the green start button. Press the RAISE button to lift the guide plate. Observe the top of the guide plate as it rises so that it does not trip the Automatic Shut-Down Switch, located near the winch spools (Figures 2a and 2c), at the top of the sloped Traveling Screen framework. The guide plate should only be raised to within 3-5 feet of the Automatic Shut-Down Switch.

Raise Traveling Screen A

Press the RAISE button under the 5-ton Hoist Column on the Traveling Screen Control Panel P2 (Figure 16) to raise the Traveling Screen. If the hoist does not rise, use the RESET switch key to restart the 5-ton Hoist. Observe the top of the screen as it rises so that it does not trip the Automatic Shut-Down Switch, located near the winch spools, at the top of the sloped Traveling Screen framework. The Traveling Screen should come no closer than 3–5 feet from the Automatic Shut-Down Switch.

Shut OFF Water Supply Pump D

Go to Bypass Pump Control Panels E and water Supply Pump Control Panel P3 (Figure 9c). Push the OFF button to turn off the pump. The green Pump OFF Indicator Light should illuminate.

Clean Up Debris

Remove debris from the stainless steel tray and the plastic collection bucket. The interior of the Hopper can be checked at this time for any debris that failed to be collected by the conveyor and transferred to the debris hauling truck.

Reinstall Retaining Pins to Secure Traveling Screen

Raise and lower the Traveling Screen using the 5-ton Hoist (Figure 16) to align the holes in the Traveling Screen frame with the retaining pinholes. Install the retaining pins on both sides of the screen framework to secure the Traveling Screen. If the Traveling Screen is not going to be used for several days or longer, install the stainless steel bolts through the retaining pin bracket to more permanently lock the Traveling Screen in the UP position.

Activate Emergency Shut-Off Switch

Push one or both of the emergency stop switches so that the Traveling Screen cannot be inadvertently activated.

MAINTENANCE AND INSPECTION

SAFETY REMINDER: Always shut down and lockout/tagout the Traveling Screen, Conveyor, and Water Supply Pump. Confirm that the water supply lines are drained and all Spray Boom and Hopper Sprayer Valves are closed before working on any portion of the DRS. Turn OFF **circuit breaker 15** on the PF Panel at Circuit Breaker Panel P1 (Figures 3a–3c). The circuit breaker for Water Supply Pump D on **Water Supply Pump Control Panel P3** should also be OFF with proper lockout/tagout (Figures 9a–9c; Reclamation, 2002).

Daily Inspection

During routine DRS operation, all mechanical components (Traveling Screen A, Conveyor B, Water Supply Pump D) should be moving and operating smoothly, aligned properly, and water should be flowing from the Spray Booms and the Hopper Sprayers. The following daily inspections are similar to the procedures previously covered in the DRS STARTUP AND OPERATING PROCEDURE section, item 1.

Corrective Action

Do NOT operate the DRS if broken or faulty parts are seen, or if any operating components are misaligned. If any major mechanical components are NOT operating properly or faulty component assemblies or parts are found, shut down the DRS following the procedures in the DRS SHUT-DOWN PROCEDURE section and take corrective actions to repair or replace damaged, worn, or faulty component parts.

Inspect Traveling Screen A

Inspect the Traveling Screen components during operation for the following items and take corrective action as appropriate:

> broken cables, broken or loose welds on cable separators, the screen, cable brackets, drive chains and chain tightening components as well as lifts and brushes attached to them (Figures 4a–4c). The alignment of the entire screen on the rollers should also be observed.

Inspect Conveyor B and Hopper C

Inspect the Conveyor and Hopper for alignment. Inspect the rubber seals within the Hopper at the bottom of the conveyor, and the conveyor housing. On the outside of the conveyor box, inspect the debris guides at the top of the conveyor and the conveyor framework. Inspect the Hopper, the two spray nozzles within the Hopper, the debris

deflection tines, and the screens covering the drains and other components within the Hopper for smooth operation and any damage. The Traveling Screen should run quietly and not be heard above the noise of the spraying water. With all of the debris removal components wet, the water supply can be shut off temporarily so that any unusual noise can be heard without the water noise at the Spray Booms. Observing the screen and the conveyor during operation is often an easier way to pinpoint any misalignment.

Inspect Spray Booms

Inspect the spray nozzles for clogging. If clogging is noted in the Spray Boom Nozzles or Hopper Sprayer Nozzles, shut off the water supply and perform corrective action.

Spray nozzles can usually be unclogged with a small diameter wire or by removing the clogged nozzle and cleaning. Back flush **Filter D3** and flush the water delivery lines before connecting the line to the Spray Booms each day. The end caps to the Spray Booms can be removed to flush out the Spray Booms but this is not usually needed on a daily basis.

Weekly Maintenance

Back Flushing and Cleaning Filter D3

There are two pressure gauges at each end of Filter D3 (Figures 10b and 10c), one upstream, one downstream of Filter D3. If the pressure difference between the two gauges is greater than **10 psi**, the filter needs to be back flushed. If back flushing does not reduce the difference in pressure to less than 10 psi, then remove and clean the filter element/cartridge. Pay close attention to the order of the washers, seals, and screens when dismantling the filter so that it can be reassembled properly.

Lubrication

Grease the three drive chains of the Traveling Screen with biodegradable grease.

Secondary Channel Brushes and Guides

When the Secondary Channel is dewatered for cleaning, closely inspect the brushes and holders on the sides and bottom of the Secondary Channel. Repair or replace as needed.

Monthly Maintenance

Inspect and lubricate the screen speed reduction chains and sprockets. Inspect for broken sprocket teeth, and broken or worn links on the drive chain.

Have motors and all grease points oiled or greased by TFCF operation and maintenance personnel.

Semi-Annual, Annual, or Longer Maintenance

This maintenance can be found in Appendix 1, *Standard Operating Procedures, Traveling Water Screen, Mitten Crab Removal Project*. This is the original SOP from 1999 and routine maintenance greater than one month can be found on pages 2 through 3 (Hanna, 1999).

REFERENCES

Boutwell, J. E., and D. Sisneros. 2006. Water Born Debris Removal Evaluations Using a Traveling Screen at the Tracy Fish Collection Facility, Tracy, California. Tracy Fish Collection Facility Studies, Volume 33. U.S. Department of the Interior, Bureau of Reclamation, Mid-Pacific Region and Denver Technical Service Center.

Hanna, L. 1999. Standard Operating Procedure, Traveling Water Screen, Mitten Crab Removal Project, January, 1999. Tracy Fish Collection Facility Studies. U.S. Department of the Interior, Bureau of Reclamation, Mid-Pacific Region and Denver Technical Service Center.

Reclamation, 2002. Reclamation Safety and Health Standards and Resources, 2002. U.S. Department of the Interior, Bureau of Reclamation. Control of Hazardous Energy, Section15.

APPENDIX 1–Original SOP

Standard Operating Procedures

TRAVELING WATER SCREEN
Mitten Crab Removal Project

US Bureau of Reclamation
Tracy Fish Collection Facility
Tracy, CA

TABLE OF CONTENTS

Background and Purpose of Project

In the fall of 1998 The Tracy Fish Collection Facility (TFCF) (figures 1 and 2) experienced an invasion of Mitten crabs. The crabs are an exotic species that first showed up in the Sacramento River Delta around 1991. When the crabs migrate downstream to the ocean to lay their eggs the TFCF becomes inundated with the crabs. This interferes with normal operation of the fish facility which is responsible for collecting fish drawn into the Delta Mendota canal and returning the fish to the delta.

As a result, the Bureau of Reclamation has installed a traveling water screen in the TFCF secondary channel. The screen was specifically designed to remove crabs while allowing safe fish passage through the screen into fish holding tanks. Farm Pump and Irrigation (FPI) Co manufactured the screen. The custom cable belt installed on the screen was developed through testing at Reclamation's Water Resource Research Laboratory (WRRL) in Denver, Colorado.

Drawings for the components of the crab screen facility are located in Section I. Miscellaneous photographs of the facility are located in Section J.

Assignment of Responsibility

A. Regularly Scheduled Duties

During screen operation, daily inspections should be conducted by the TFCF staff. If any problems, damage or excessive wear is detected during these inspections the Delta Mendota Water Authority (DMWA) and Reclamation's Water Resources Research Laboratory (WRRL) in Denver should be notified immediately. All other inspections, maintenance, and repairs shall be conducted by DMWA or under their supervision.

Daily

1. Visually inspect screen, auger, and components for smooth operation and damage.

    a) The screen should run quietly, and the water jets and auger should operate while the screen is running.

    b) All three screen belt drive chains shall be lubricated with a biodegradable grease.

    c) Each inspection should include looking for damage to cables, welds, and other components and noting anything unusual such as noises or misalignment of cables, support rods or chains.

d) Visually inspect spray nozzles for plugging. If more than three nozzles on a single bar are plugged contact DMWA.

2. Back-flush spray wash filters.

3. A fish-flush of the secondary channel should be conducted daily between the hours of 1300 and 1500 (this is when crab migration numbers are generally lowest) to allow passage of large fish and predators. The screen must be raised and pinned during this operation.

4. The guide plate position should be visually checked to ensure the plate is positioned correctly.

Weekly

1. Auger bearings and upper drive chain should be inspected and lubricated

2. Inspect the screen brush holders and all welds for cracks.

Monthly

1. The screen speed reduction chains and sprockets should be inspected and sprayed with a chain lubricant. Look for broken teeth on the sprocket; broken or worn links on the drive chain.

Semi-annually

1. The screen (2) pillow block bearings and the two take up bearings should be greased. **Do Not Over-grease.**

2. Gear units for the 2-ton and 5-ton hoists should be checked for increased noise, surface temperature, vibration, shaft movement and amperage draw. Units with inspection covers should not be operated with out the inspection cover removed.

3. The DYNA-SWITH for the 2-ton and 5-ton hoists should be serviced as follows:

   a) Attachment fittings – check for unusual wear, deformation, looseness, and corrosion. Replace if damaged or loose. Clean off corrosion; oil compression steel ball fitting as required.
   b) Micro-Switches – Replace if wires are frayed or if the connection plunger or housing is damaged in any way. Check accuracy of micro-switch and reset as required. Switch setting procedures are outlined in paragraph 2-6 of Section G-II under "Screen System Operations".

c) Overload stop – Make sure no foreign material is present in over-load stop gap, since this could cause errors.
d) Adjustment screws, overload devices, switch and screw mounting brackets – Replace the component if it is damaged or deformed enough not to work as designed.
e) Force beams – Cleaning corrosion and painting are the only authorized services. If the force beam has suffered damage of permanent deformation, replace the entire DYNA-SWITCH.

Annually

1. After the screen is removed for the season a detailed inspection of all components should be conducted.
2. The motor bearings on the 2-ton and 5-ton hoists should be re-lubed. A high quality ball bearing grease should be used. Please refer to Section G under "Screen System Operations" for details of the appropriate grease and procedure.
   a) Inspect the fan guard and remove any accumulated debris from under it and around the motor and gear.

Every Two Years

1. The gear units for the 2-ton and 5-ton hoists should have the oil changed every two years. For adverse operating conditions the interval should be shorter. Please refer to section G under "Screen System Operations" for the appropriate lubricants.

General Description and Guidelines

A. Crab Traveling Water Screen

a. General

Screen

The 8-ft wide by 19-ft tall traveling water screen is installed in the secondary channel at the TFCF at an angle of 80 degrees in order to provide adequate fish passage through the screen. Four-inch long brushes are attached to angle iron stiffeners (positioned about every 4 ft on the screen belt) across the width of the screen to assist in carrying crabs and debris up and over the screen. A floor ramp is located upstream from the screen and is positioned at a 5:1 slope to the height of the top of the bottom roller on the screen. The floor ramp as well as side wall ramps were installed to provide a smooth flow transition from the flume area to the open area of the traveling screen and to help maintain strong flow velocities along the channel invert and side walls. A flat brush is positioned at the end of the floor ramp to seal the 3-inch gap between the ramp and traveling screen. The speed of the screen is controlled by a variable speed controller located on the control panel, and allows a maximum speed of 8 ft/min. The crab guide plate (drawing C-Plate in Section I) is a reinforced steel plate that rides parallel and at a distance of 4-in from the screen to trap the crabs as they rise above the water surface.

The custom cable belt or "fish-friendly" belt is to be installed on the screen at all times with the exception of when repairs require the removal of the custom belt. If this situation should occur the FPI standard wire weave belt can be used temporarily, with the approval of resource agencies, until the custom belt can be re-installed.

Custom Cable Screen Belt

A custom belt design was developed by Reclamation and uses 3/16-in black nylon coated cables threaded through spacer bars located at 6-in vertical intervals. The resulting screen mesh is a rectangular shape with openings 1.5 inches horizontal by 6 inches vertical.

FPI Standard Belt (to be used only as a backup in the event the custom belt is unavailable)

FPI's conventional wire weave belt is similar in geometry to that of a chain link fence with 2-in wide by 4-in high openings (figure 3a). This belt was purchased as a backup belt in the event the custom belt must be removed for repairs.

b. Operation

The belt speed can be adjusted from 0 to 10 with the dial on the control panel. The number "10" on the dial represents the maximum travel speed.

In general the screen speed should be kept on speed of about "2" during operation, since slow speeds are more conducive to fish passage. However, the speed can be

increased if necessary to accommodate large numbers of incoming crabs or large quantities of debris.

c. Inspection and Maintenance

A visual inspection of the screen during operation should be conducted weekly. The inspection should include noting any damage to cables, or welds, etc.. and noting anything unusual such as noises or misalignment of cables, support rods or chains. If any problems are detected, DMWA should be contacted immediately. Lubrication scheduled under "Regularly Scheduled Duties" should be adhered to.

B. Guide Plate

a. General

The guide plate installed at Tracy is controlled to maintain a 6 to 12-in clearance above the water surface. Plate movement is activated by the water surface sensor at the site that feeds into a controller and computer to set the position of the plate with a drum hoist . The guide plate design is shown in Section I (drawing CPLATE).

b. Operation

The guide plate setting on the control panel should be set to Auto. This will allow the controller to position the plate at a constant distance above the water surface throughout the tidal cycles.

c. Inspection and Maintenance

The guide plate position, relative to the water surface, should be checked daily. If the guide plate is too high or too low with respect to the water surface, or if the plate is "hunting" for position excessively, contact the Electric Shop (ext.420) or the Tracy Control Room (ext.445) for a repair technician.

C. Screen Cleaning system

a. General

A high-pressure spray wash system was designed to remove crabs and debris from the screen belt into a hopper as the belt rotates over the backside of the screen. Water is supplied at a pressure of 60 psi to three spray wash bars located inside the screen.

Two spray wash filters are connected in series on the supply line from the pump to the screen so that one filter can be operated at all times while the other filter is back-flushed for cleaning.

b. Operation
Normally the three spray wash bars will be operated at full throttle with the three valves in full open position. However they may be throttled back if a lighter spray is desired. Prior to throttling the spray nozzles, both canister flush valves should be open.

c. Inspection and Maintenance
The three spray wash bars should be visually inspected daily for plugged nozzles. If more than 3 nozzles on a single bar are plugged DMWA should be notified.
The Spray wash filters should be back-flushed daily.

D. Crab Auger

a. General
The crab auger is positioned at a 30-degree angle across the width of the channel and is used to transport the crabs from the hopper to a truck bed or disposal bin.

b. Operation
The auger will normally be operated in forward motion by pushing the auger "forward" button on the control panel. The auger can also be operated in reverse if necessary. If the auger is making any unusual noises, stop it immediately and contact DMWA

c. Inspection and Maintenance.
The auger bearings and upper drive chain should be inspected weekly and lubricated as necessary to access the bearings, each of the bands around the auger can be slid to one side after loosening bolts).

E. Screen Removal for Predator-Flush or Maintenance

a. General
During the months the screen is in operation, the screen will be raised daily to flush large fish and predators through the system. A 5-ton hoist, attached to the support structure, is used to raise the screen within the screen guide system. In addition the screen may have to be removed completely from its support structure periodically for repairs, maintenance or storage at the end of the crab season. To accomplish this, specific members of the support structure must be removed. (see Section F under "Screen System Operations" and associated drawings in Section I)

b. Operation

5-Ton Hoist
The 5-ton hoist can be used to raise or lower the screen for predator flush or for complete removal. When the screen is raised for flushing predators it must be pinned in place during the flush.

Fish-flush

During the fish-flush all velocity control pumps should be turned on. Each of the four bypasses should be flushed one at a time to achieve maximum velocity through each tube. Each bypass valve should be opened for five minutes. As each valve reaches about 70 % closure the next valve can begin opening. During the fish flush a separate holding tank should be used

SCREEN SYSTEM OPERATIONS

A. Traveling Water Screen

Operation
Press "Power On" button.

1. Turn the selector switch to "Forward".

2. Adjust the belt speed from 0 to 10, using the Screen Speed dial. Normally it will be near the 2 setting, but speed can be varied to accommodate the number of crabs on the belt at any given time.

Shut Down

1. Turn the Selector switch to "Stop".

2. Press the "Power Off" button.

Troubleshooting:
If unusual noises are coming from the unit, press the "Emergency Stop Switch", then visually examine the screen for apparent damage. Contact the Tracy Pumping Plant (TPP) Control Room at extension 445 or the TPP Machine Shop at extension 470.

If the Traveling Water Screen stops operating , then press the "Error Reset" button, and follow the direction described to operate the Travelling Water Screen.

B. Crab Guide Plate

The 2-ton hoist is used to move the Crab Guide plate. It can be operated in either the Manual or Auto Mode. The Auto Mode will place the bottom of the plate approximately 6-12 inches above the water surface. The Manual Mode will allow the operator to move it into any position.

2-Ton Hoist (Crab Plate) Operation

1. Press the "Start" button.

2. Rotate the selector switch to either Manual or Auto.

3. If in Manual, then prior to pressing the "Raise" or "Lower" button, ensure that everyone is clear and all equipment is clear. When lowering the plate, be careful not to lower the plate below the water surface in the secondary channel.

4. When the hoist is in the Auto mode, the plate will be controlled by position unit. The plate location should be checked on a regular basis to ensure that it is functioning properly.

5. If the plate location is not within 12 inches of the water level, then place the hoist into the Manual mode and contact the TPP Electric Shop.

6. With the hoist in the Manual Mode its position must be checked on an hourly basis to ensure that it is within that 12-inch zone between the water and the bottom of the plate.

C. Screen Spray Wash System

The Traveling Water Screen Spray wash system consists of
1) the existing Spray Wash pump,
2) two (2) filter canisters and
3) three spray bars.

The spray wash pump is controlled by a hand switch in the Motor Control Center on the South end of the fish facility. The filter canisters are located on the East side of the structure. The spray bars are located inside of the traveling water screen near the top.

a. Spray Wash Pump Operation

1. Open both filter canister flush valves (the valves are located on the backside of the filter canisters near the bottom, and they discharge into the secondary channel). This ensures that when the pump is started, it doesn't start against a closed system.

2. Open the system isolation valve completely if it is not already open. (This valve is located on the South side of the Spray Wash pump and is in line with the 4-inch pipe that runs to the filter canisters. It is a butterfly valve that is Open when its lever is in line with the pipe and Closed when it is perpendicular with the pipe.)

3. In the Motor Control Panel, turn the selector switch for the Spray Wash pump to "Hand". (The pump can be heard on start-up.)

4. Check the pump on the way back to the Crab Screen to ensure it is operating normally.

b. Spray Bar Operation

1. Confirm that the three hoses are connected to the valves and to the traveling water screen. The cam lock type connectors should be firmly connected with all of the

levers down, or next to the hose. Open all three ball valves that are located between the handrails.

2. The three valves will normally be in the full open position, but they may be throttled back if a lighter spray is wanted. Prior to throttling the spray nozzles, first open both of the canisters flush valves.

3. Check the spray nozzles occasionally to confirm that they are not plugged. Contact TPP Machine Shop if more than three nozzles on a single bar are plugged.

c. Filter Canisters

There are two (2) filter canisters located on the East side of the structure. Only one filter at a time is needed to filter the water for the spray bar nozzles. The other filter is used as a standby filter and will be put into operation when the operating filter requires back flushing.

Each filter canister has a ball valve on the inlet and outlet for isolation purposes. The inlet to the filters is on the top and the outlet is out of the bottom.

These filter canisters are designed to be manually backflushed when the differential pressure is greater than 10 psi. The pressure differential is monitored by a pressure gauge and valve on the side of the filter canister.

a) Filter System Operation

Open the inlet and outlet ball valves on one of the filter canisters. The valves are open when the handle is in line with the pipe and closed when the handle is perpendicular with the pipe.

1. Close the inlet and outlet valves on the other filter canister. This places it into the Standby Mode.

2. Check the differential pressure across the filter, by locating the valve under the pressure gauge attached to the filter canister. The pressure gauge is located near the top of the canister and on the left side. There is a valve under the gauge and its handle is on the backside of the valve. Rotate the valve handle back and forth from left to right. The pressure differential is the difference between the two gauge pressure readings with the handle in the left and right positions. (The pressure gauge should be around 90 lb/in^2)

3. When the differential pressure is greater that 10 lb/in^2, the filter requires backflushing. To backflush the filter follow the filter backflushing directions.

4. Open the inlet and outlet valves on the Standby filter and close the inlet valve on the "dirty" filter canister.

b) Filter Back-flush

1. With the Inlet valve closed and the Outlet valve open, open the flush valve on the backside of the filter canister. The flushing valve is plumbed to dump directly into the secondary channel.

2. Leave the flush valve open for 3 to 5 minutes.

3. Close the flush valve.

4. Open the Inlet valve and check for differential across the filter. It should be less than 5 psi. If not, then go to Step 1 again. If the differential pressure does not go below 5 psi after four (4) backflushes, then the filter cartridge must be changed. Contact TPP Machine Shop.

5. Close the filter canister Outlet valve.

6. This filter is now clean and ready to be placed into the Standby Mode.

Notes:

The filter system has a pressure relief valve set at 110 psi.

1. The filter system will normally operate at 90 to 100 psi.

2. Opening a valve at the original spray wash system near the pump can reduce the pressure. Contact your supervisor prior to operating any of these valves.

3. When the secondary channel is lowered for louver cleaning, then the pump must be shut down.

D. Crab Auger

The crab auger is used to transport the crabs from the hopper to a truck bed or disposal bin. The auger can be operated in either forward or reverse. There is a safety disconnect switch located on the same side as the auger motor. This switch must be used to lock out the auger if the auger must be worked on or any covers removed.

Auger operation:

1. Press the "Forward" button.

2. The auger will now be operating. To Reverse the direction of the auger, the auger must first be stopped, then pressing the Reverse button will reverse the motor.

3. To stop the auger, press the "Stop" button.

E. 5-Ton Hoist

The 5-Ton hoist is used to move the Traveling Water Screen. It can either raise it out of the channel or lower it into the channel. (NOTE: Prior to lowering the screen into the channel, the floor of the channel must be checked for sand or debris buildup.)

The 5-Ton hoist controls have a key lock device which is installed as a safety feature. The key must be turned to unlock the "Start" button. (The TFF supervisor, Electric Shop foreman and the Machine Shop foreman have copies of the key.) The Traveling Water Screen has water attachments which must be removed prior to lifting it out of the channel.

5-Ton Hoist operation:

1. Turn the Traveling Water Screen selector switch to OFF. Depress the Stop button of the TWS, this will take the TWS off line.

2. Ensure that all three water hoses are removed.

3. Ensure both safety retaining pins are removed. (The retaining pins are located on each side of the Traveling Water Screen right at the top of the concrete slab).

4. Unlock the "Start" button, and depress it. **NOTE: The 5-ton hoist will not operate until the Traveling Water Screen is shut down, which includes depressing the STOP button.**

5. Have another person stationed on the far side of the structure to monitor the Traveling Water Screen as it is moving.

6. Ensure that all parties are clear of moving equipment.

7. Press the "Raise" or "Lower" button to move the screen in the appropriate direction. Once the screen is in the desired location, release the button.

8. Depress the "Stop" button. This takes the hoist off line.

9. Lock the "Start" button.

10. If people are to be working below the screen, then the retaining pins must be installed. Slip them through the plate and into the screen. Then screw the nut onto the stud to ensure the pin doesn't come free.

Notes:

1. The Emergency Stop Switches are located on either side of the structure. They will stop all equipment when pressed, but will leave the lights operating. Once the switch is pulled back into the Reset position, the equipment must be re-started at the control panel.

2. The Control Panel is located on the structure and can control all of the equipment for the Crab Removal equipment with the exception of the spray wash pump.

3. The Spray Wash pump must not be started unless one or more valves are open to allow for water to be moving through the system.

4. If the secondary channel water level is lowered for cleaning or other reasons, then the Spray Wash pump must be shut off.

5. Prior to moving the Traveling Water Screen with the 5-ton hoist, all cables and hoses must be removed. The retaining pins must also be removed before moving screen.

F. CRAB SCREEN INSTALLATION

a. Initial Installation of Crab Screen, Crab Guide Plate and Support Frame

1. Assemble the crab screen support frame together (columns, top beams, that are welded together, and braces). Position the support frame over the secondary channel, aligning as shown and noted on drawing CBFRAME. Install the anchor bolts.
2. Install the extended screen guide (north and south sides) and the plate guide supports.
3. Install the 5 –ton screen hoist and its supporting sub structure, and the 2-ton plate hoist with its sub structure on the top of the beams by bolting to the pre-drilled holes.
4. Install the crab screen by lifting the screen with a mobile crane (double hook the screen, which will allow for the screen to be lowered at the 80 degree angle) over the top of the support frame and down through the structure. When the bottom of the screen reaches the top of the exiting guides, rotate the screen back using the mobile crane hoists to the 80 degree angle and the lay the screen back onto the screen guides. Lower the screen until its pinning holes line up with the pinning holes on the side plates of the screen guides. Install the holding pins and bolt to retain the pins. Lower the screen until it is supported by the pins.
5. Clamp the screen to the extended guides as required for stability, Unhook the mobile crane and attach the 5-ton screen hoist wire rope to the screen. Remove any clamps that were used.
6. Hinge the plate guides to perpendicular and clamp in place. Install the plate stops. Install the crab guide plate by lifting with a mobile crane over the top of the support frame and down through the structure. When the plate bottom reaches the top of the exiting guides, lower into the guides to the stops. Unhook the crane from the plate.
7. Install the center removable section of the 2-ton plate hoist. Align with the existing pre-drilled holes and bolt into place. Unhook the mobile crane from the center section.
8. Hinge the guides and the plate back against the screen using an appropriate winch or manual chain fall hoist. Install the guide supports and bolt the hinged portion to the stationary section.
9. Install the plate hoist wire rope around the sheave and attach to the top of the crab guide plate.

10. Attach the electrical power supply and controls to the crab screen, hoists, positioning transducer, and the controller.
11. Lower the screen into the secondary channel, using the 5-ton hoist, after removing the pins.
12. Attach the flexible water supply lines to the crab screen spray water pipes.

b. Removal and Installation of Crab Screen from Support Structure

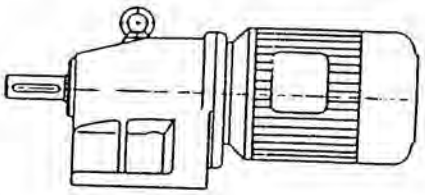
1. Disconnect the electrical lines from the crab screen drive motor (always turn off the power first, and lockout and tagout at the appropriate disconnect switch).
2. Disconnect the water supply hoses to the screen spray wash pipes, and remove the three (3) spray bars.
3. Completely raise the crab guide plate, install the stops and then lower it onto the stops.
4. Disconnect the plate hoist wire rope from the crab guide plate and remove it from around the sheave.
5. Remove the plate guide supports and use an appropriate winch to hinge the plate and guides to the perpendicular position. Place slings around the 10 X 10 beam below the 2-ton hoist. Clamp in position for stability.
6. Using the 5-ton screen hoist lift the screen up out of the channel until it lines up with the retaining pin holes in both the guides and the screen. Install the pins in both sides and bolt in place. Clamp the screen to the guides for stability.
7. Unbolt and remove the center removable section of the plate hoist using a mobile crane.
8. Disconnect the wire rope from the screen and move it out of the way.
9. Attach the mobile crane to the screen (preferably in a double hook condition. i.e. have the auxiliary hoist attached to two slings near the bottom of the screen and the main hoist attached to the lifting eye at the top of the screen). Remove the clamps and the retaining pins. Remove the screen from the structure. Must have at least one crew member at the top of the structure to ensure that the screen clears the opening as there is less than an inch of clearance.
10. To install the crab screen, do the reverse order.

SECTION G

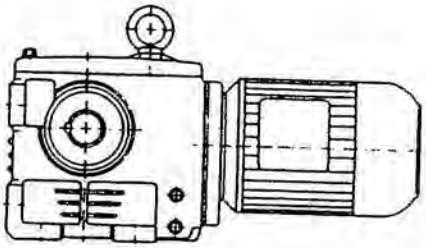
2-TON and 5-TON Operating and Maintenance Instructions.

(As provided by the manufacturer)

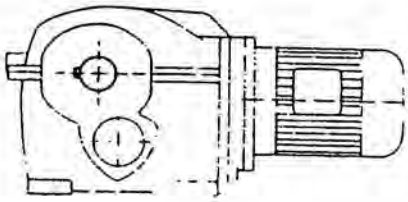
OPERATING & MAINTENANCE INSTRUCTIONS



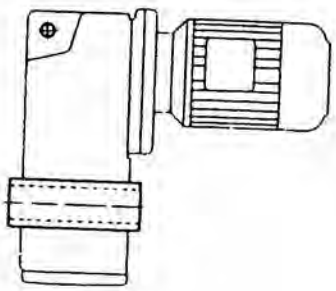
HELICAL



HELICAL-WORM



BEVEL-HELICAL



SHAFT MOUNT

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318-618/93

INSTALLATION

The gearmotor or reducer should be mounted on a structure with enough rigidity to prevent vibration or flexture caused by dynamic loading. The mounting surface should be flat so stresses are not introduced during assembly of the unit on the structure. Externally mounted gears, sprockets and sheaves should be carefully aligned to prevent stresses caused by poorly aligned members.

If a coupling is used it should be a flexible coupling and the halves should be aligned in accordance with the coupling manufacturer's recommendations.

When mounting anything on the shaft of the gear unit the member should be heated if possible to make assembly easier.

Gears, sprockets or sheaves should be mounted as close to the gear housing as possible. Coupling guards should be provided by the customer.

ELECTRICAL CONNECTIONS

Check the motor nameplate to verify the phase, hertz and voltage agrees with the available power supply. Connection should conform to local codes. A connection diagram for the motor is located inside the conduit box and on the motor nameplate. The motor starter should incorporate an overload protector.

START-UP

All units are lubricated before shipment. The breather is plugged for shipment. Before start-up or prolonged storage remove the plastic wick from the breather. The lubricant level should be checked with the unit mounted in it's correct operating position. Lubricant should be added or removed to bring it to the correct level. The catalog for the gear unit shows the oil level for various mounting positions.

MAINTENANCE
A. MOTOR

During maintenance, inspect the fan guard and remove any accumulated debris from under it and around the motor and gear. Motor bearings are greased during assembly. For re-lubrication the following suggestions are offered:

HOURS OF SERVICE PER YEAR	HP RANGE	SUGGESTED RELUBE INTERVAL
5,000	¼ to 7½ 10 to 40 50 to 150	5 years 3 years 1 year
CONTINUOUS Normal Application	¼ to 7½ 10 to 40 50 to 150	2 years 1 year 9 months
SEASONAL SERVICE Motor is idle for 6 months or more	All	1 year (beginning of season)
CONTINUOUS High ambients, dirty or moist locations, high vibrations, or where shaft is hot (pumps—fans)	¼ to 40 50 to 190	6 months 3 months

Use high quality ball bearing grease. Use consistency of grease suitable for class of insulation stamped on nameplate as follows:

INSULATION CLASS	CONSISTENCY	TYPE	TYPICAL	FRAME TYPE
A & B	#2	Lithium Base	Shell Alvania Grease R 3	215 T & smaller
A & B	Medium	Polyurea	Shell Dolium Grease R	254T & larger
F & H	Medium	Polyurea	Shell Dolium Grease R	All

Procedure:

If motor is equipped with Alemite fitting, clean tip of fitting and apply grease gun. Use 1 to 2 full strokes on motors in NEMA 215 frame and smaller. Use 2 to 3 strokes on NEMA 254 through NEMA 365 frame. Use 3 to 4 strokes on NEMA 404 frames and larger. On motors having drain plugs, remove grease drain plug and operate motor for 20 minutes before replacing drain plug.

On motors equipped with slotted head grease screw, remove screw and apply grease tube to hole. Insert 3 to 3 inch length of grease string into each hole on motors in NEMA 215 frame and smaller. Insert 3 to 5 inch length on larger motors. Motors having grease drain plugs, remove plug and operate motor 20 minutes before replacing drain plug.

Caution: Keep grease clean. Lubricate motors at standstill. Remove and replace drain plugs at standstill. Do not mix petroleum grease and silicone grease in motor bearings.

B. GEARS

Gear units should have the oil changed every 10,000 hours or 2 years. If synthetic lubricant is used it should be changed every 20,000 hours or 4 years. For adverse operating conditions the interval should be shorter. DO NOT MIX SYNTHETIC & MINERAL BASE OILS. Units should be checked periodically for increased noise, surface temperature, vibration, shaft movement & amperage draw. Units with inspection covers should not be operated with the inspection cover removed.

The table below offers suggestions on the viscosity & manufacturers of recommended lubricants.

VISCOSITY RANGE FOR AGMA LUBRICANTS

RUST AND OXIDATION INHIBITED GEAR OILS	VISCOSITY RANGE ‡	EQUIVALENT ISO GRADE ◄	EXTREME PRESSURE GEAR LUBRICANTS ‡‡	VISCOSITIES OF FORMER AGMA SYSTEM ◄◄
AGMA Lubricant No.	mm²/s (cSt) at 40 °C		AGMA Lubricant No.	SSU at 100 °F
1	41.4 to 50.6	46		193 to 235
2	61.2 to 74.8	68	2 EP	284 to 347
3	90 to 110	100	3 EP	417 to 510
4	135 to 165	150	4 EP	626 to 765
5	198 to 242	220	5 EP	918 to 1122
6	288 to 352	320	6 EP	1335 to 1632
7 Comp	414 to 506	460	7 EP	1919 to 2346
8 Comp	612 to 748	680	8 EP	2837 to 3467
8A Comp	900 to 1100	1000	8A EP	4171 to 5098

NOTE: Viscosity ranges for AGMA lubricant numbers will henceforth be identical to those of ASTM 2422.

‡ "Viscosity System for Industrial Fluid Lubricants", ASTM 2422. Also British Standards Institute, B.S. 4231.

◄ "Industrial Liquid Lubricants—ISO Viscosity Classification." International Standard, ISO 3448.

‡‡ AGMA 250.03, May, 1972 and AGMA 251.02, November, 1974.

◄◄ Oils marked Comp are compounded with 3% to 10% fatty or synthetic fatty oils.

RECOMMENDED LUBRICANTS FOR HELICAL & BEVEL-HELICAL GEARING

Type of Lubricant	Ambient Temperature Range (°F)	kin Viscosity (cSt) at 40°C (mm 2/S)	Viscosity SUS 175 100°F	AGMA Lubricant No.	ISO Grade	AMOCO	CHEVRON	EXXON	MOBIL	SHELL	TEXACO
Oil	15 to 125	198 to 242	900 to 1100	5EP	220EP	AMOGEAR EP220	NL GEAR Compound 220	SPARTAN EP220	Mobil Gear 630	Omala Oil 220	Meropa 220
	-10 to +75°	90 to 765	465 to 185	3-4EP	100-150EP	AMOGEAR EP150	NL GEAR Compound 150	SPARTAN EP 150	Mobil 629	Omala Oil 100	Meropa 150
	Below 10°‡‡	15 to 680	135 to 165	—	—	—	E.P. Hydraulic Oil 22	UNIVIS J13	Mobil D.T.E. 11	—	Texamatic Fluid 9226 or Texamatic Type F
Oil— Synthetic	-40° to 175°‡ **	—	90 to 4000	—	—	—	—	—	Mobil SHC 629 or 634	—	Synstar GL75W-140
Fluid Grease	5° to 120°	—	—	—	—	—	—	—	—	—	MARKFAK 00

For bearings not lubricated in oil bath use a lithium base bearing grease, NLGI #2 or #3
‡ Ambient temperatures below -20°F and above 140°F require special oil seals
‡‡ Consult with Nord Gear Corporation for these applications
Bold ambient temperature indicates factory filled

Actual capacity should be established by opening the oil level plug and filling until oil runs out of the oil level hole.

RECOMMENDED LUBRICANTS FOR HELICAL-WORM GEARING

TYPE OF LUBRICANT	AMBIENT TEMP RANGE °F	KIN VISCOSITY (cSt) AT 40°C (mm 2/S)	VISCOSITY SUS 175 100°F	ISO GRADE	MOBIL	TEXACO
Oil Synthetic	-40° to 175°‡	198 to 352	900 to 1600	220	Glygoyle 30	Synstar GL75W 140

For bearings not lubricated in oil bath use a lithium base bearing grease, NLGI #2 or #3
‡Ambient temperatures below 0°F and above 100°F require special oil seals
Consult NORD GEAR CORPORATION for these applications

STORAGE

Units shipped from Nord are intended to be used within 30 days after receipt and presumed to be stored indoors in a heated building. If you intend storing units under adverse conditions or for a long period of time special storage precautions will be necessary.

1. Store in a sheltered area away from chemical vapors or steam.
2. Cover.
3. Do not store in sunlight or near high heat.
4. Remove plastic wick from breather.
5. Spray oil on exposed shafts & seals. Remove oil on start-up.
6. Rotate output shaft 360° every 3-4 weeks.

DILLON

Dyna-Switch & Cranegard

Operator's and Installation Manual

DYNA-SWITCH® AND CRANEGARD® INSTRUCTION MANUAL

TABLE OF CONTENTS

DYNA-SWITCH® GENERAL INFORMATION

1-1. Introduction

The primary purpose of Model DS DYNA-SWITCHES® is to protect cranes, hoists and other lifting machinery against weight or force overload damages. They can also be used to perform control functions proportional to weight such as shutting down a pump when a tank is filled. As many as four standard micro-switches can be installed on the Dillon DYNA-SWITCH® to perform multiple automated functions.

1-2. General Description

Dillon DYNA-SWITCHES® are designed to work with either a tension or compression load. All DYNA-SWITCHES® consist of a U-shaped force beam, a micro-switch (or micro-switches), and attachment fittings for applying load at mounting points. The force beam bends as force is applied and causes the micro-switches to open or close electrical circuits. Figure 1-A & 1-B on pages 3 and 4 show various tension and compression models and micro-switches.

1-3. Safety

All DYNA-SWITCH® force beams and attachment fittings have a safety factor of 5:1. In addition, all models have an overload stop, set slightly in excess of rated capacity to prevent damage to measuring capability.

1-4. Compression Models

When loads are applied to compression models, the force beam legs tend to come closer together. Paragraph 2-6-A explains how to hook up safety overload circuits and auxiliary circuits of compression models' micro-switches. Compression models contain threaded holes on the bottom leg for mounting to machinery and a spherical bearing on the top leg to concentrate the applied load at one point. The stops for measuring capability protection are adjustable bolts in all capacities except 25K and 50K, where this stop is integral with the force beam.

1-5. Tension Models

When loads are applied to tension models, the force beam legs tend to spread apart. Paragraph 2-6-B explains how to hook up safety overload circuits and auxiliary circuits to tension models' micro-switches. Tension model attachment fittings include spherical rod end connectors, shackles, lifting eyes, non-swivel hooks and thread-studs. Attachment fittings are mounted on opposite legs and are in-line axially so the applied load will not cause rotation of the beam. The stops for measuring capability protection are adjustable bolts in all capacities.

1-6. Key Specifications and Options

Table 1-1, below, contains key specifications and options available.

Basic Beam Part Number	DSW-1	DSW-2	DSW-3	DSW-4	DSW-5	DSW-6	DSW-7
Rated Capacity pounds	100	1000	2000	5000	10000	25000	50000
Minimum Set point*	15	100	200	500	1000	1250	2500
Repeat-ability pounds	±3	±30	±60	±150	±300	±750	±1500
Nominal full Cap. beam de-flection in inches	0.02	0.03	0.05	0.05	0.05	0.06	0.06
Option A	Ava	Ava	N/A	Ava	N/A	N/A	N/A
Option J	Ava	Ava	N/A	Ava	N/A	N/A	N/A
Option B	N/A	N/A	Ava	N/A	Ava	Ava	Ava
Option C	N/A	N/A	Ava	N/A	Ava	Ava	Ava
Option D	Ava	Ava	N/A	N/A	N/A	N/A	N/A
Option E	Ava	Ava	Ava	Ava	Ava	Ava	Ava
Option F	N/A	N/A	Ava	N/A	Ava	N/A	N/A
Option G	N/A	N/A	Ava	Ava	Ava	Ava	Ava
Option H	N/A	N/A	Ava	N/A	Ava	N/A	N/A
Option S	Ava	Ava	Ava	Ava	Ava	Ava	N/A

* Multiply by 3 for EXA-0 switch (option C)

Option A - .001" differential travel switch; small size. P/N 26419-0026 Type 11SM401-T. Maximum 4 per unit.

Option J - .004" differential travel switch; weatherproof, small size. 26420-0015. Type 1SE1. Maximum 4 per unit.

Option B - .002" differential travel switch; weatherproof. P/N 17891-0048 Type BZG1-2RN. Maximum 4 per unit.

Option C - Explosion proof switch. 26424-0029. Type EXA-0. Maximum 2 per unit.

Option D - Spherical rod end connector (one).

Option E - Compression loading spherical ball fitting assembly (one).

Option F - Lifting eye (one).

Option G - Adapter, shackle & pin (one set).

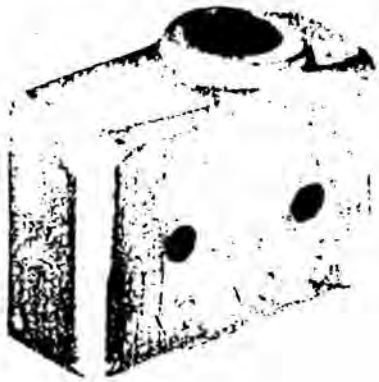
Option H - Non-swivel hook (one).

Option S - Stud for tension loading (one)

1-7. Micro-Switches

Figure 1-A, below, shows the four micro-switches available and lists the specifications of each.

OPTION A:
0.001" differential travel switch. Small size. Dillon p/n 26419-0026 (Cat. #11SM401-T.) S.P.D.T. 5 amps. resistive at 28 vdc or 250 vac.



OPTION J:
0.004" differential travel switch. Small size. Weather-proof. Dillon p/n 26420-0015 (Cat. #1SE1.) S.P.D.T. 5 amps. resistive at 28 vdc, 125 or 250 vac.

OPTION B:
0.002" differential travel switch. Weatherproof. Dillon p/n 17891-0048 (Cat. #BZG1-2RN.) S.P.D.T. 15 amps. resistive at 125, 250 or 480 vac. 1/2 amp. at 125 vdc.

OPTION C:
0.060" differential travel switch. Explosion proof. Dillon 26424-0029 (Cat. #EXA-Q.) S.P.D.T. 20 amps. resistive at 125, 250 or 480 vac. 1/2 amp. at 125 vdc.

1-8. Attachment Fittings

Figures 1-B below, show attachment fittings for tension and compression models.

OPTION D:
Spherical rod end connector.

OPTION E:
Compression loading spherical ball fitting assembly.

OPTION F:
Lifting eye.

OPTION G:
Adapter, shackle and pin (one set.)

OPTION H:
Non-swivel hook.

OPTION S:
Threaded stud.

(Illustrations not to scale)

INSTALLATION

2-1. Mounting Positions - Tension Models

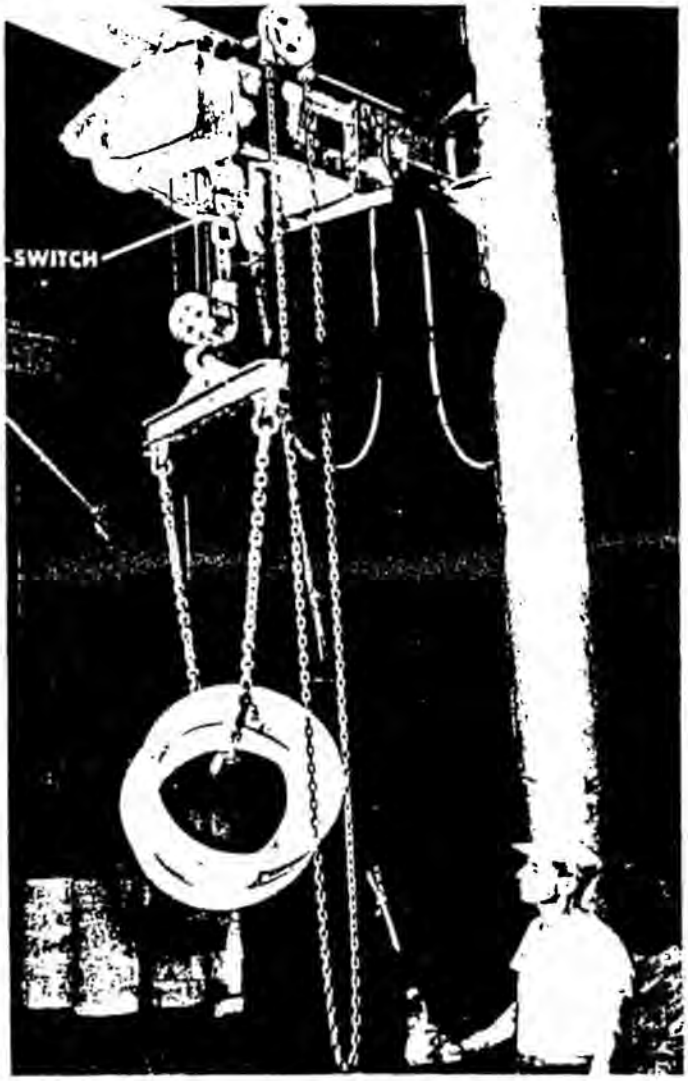
The best mounting position for a tension model is on the dead end of the line or on a crane anchor point. This mounting minimizes the effects of the machinery's motion on the DYNA-SWITCH®. It keeps the switch in one relative position which reduces the possibility of wire tangling and connector damage.

2-2. Mounting Positions - Compression Models

Position the DYNA-SWITCH® so that all of the supported load is transmitted through the compression ball fitting. (Some compression models have flat-top balls; rest the applied load on the flat surface of the flat-top ball.) Bolt the bottom leg to the loading machinery or the facility foundation. Make sure the load contacts the DYNA-SWITCH® only at the top of the steel ball and nowhere else! If the load rests on the upper leg as well as on the ball, the micro-switches will not actuate at the proper load setting. Do not restrict free motion of the upper leg since this too could cause the DYNA-SWITCH® to activate improperly.

2-3. DYNA-SWITCHES® & Reeving Setups

Below are some examples of hoist and reeving setups which utilize the DYNA-SWITCH® for control and/or safety purposes.



(Figure 2-B)

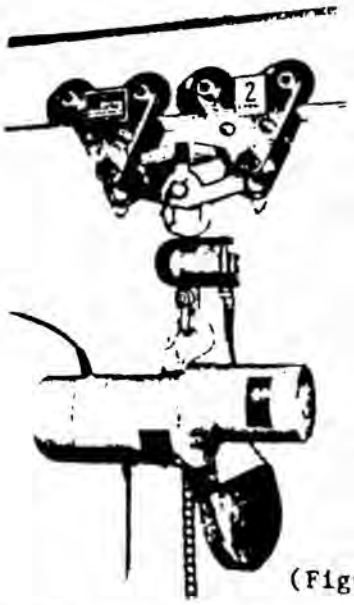
(Figure 2-A)

2 ROPES, 2 PART SINGLE REEVING

With two parts of line to the hook, the DYNA-SWITCH® should be installed in series between wire rope and its dead end point. Micro-switch is set for 1/2 maximum capacity of the hoist.

4 ROPES 4 PART SINGLE REEVING

As shown above, DYNA-SWITCH® is installed in series with rope to the dead end. The micro-switch is set for 1/4 capacity of the crane because there are four parts of line to the hook.

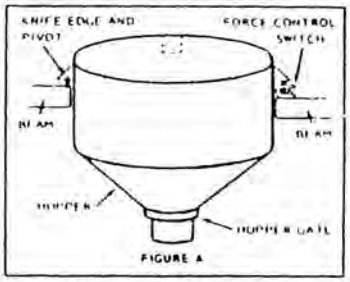


(Figure 2-D)

The DYNA-SWITCH® may also be placed be-

2-4. Other Installation Possibilities

Figures 2-E and 2-F, below, show other uses for the DYNA-SWITCH® when either tension or compression loads are present.



(Figure 2-E)

BATCHING OPERATIONS at preset load points are greatly simplified by means of economical Dillon DYNA-SWITCHES®. Figure 2-E above shows a typical hopper with 3 point suspension. DYNA-SWITCH® under one suspension point is set for 1/3rd maximum load. It opens hopper gate automatically at this point. Contents of tank should preferably be liquid, since solid materials tend to pile and cause erroneous results.

(Figure 2-F)

IDEALLY SUITED FOR AUTOMATION

A highly important function of the Dillon DYNA-SWITCH® is also to be found in the field of automatic control. The setup shown in Figure 2-F above right is an excellent example. Sand used in foundry operations is brought up from the floor below by conveyor. It falls into the chute and thence spills into the hopper. Hopper itself is suspended from the Dillon DYNA-SWITCH® at upper left. DYNA-SWITCH® is set to open the conveyor motor circuit at 1000 pounds which represents a full hopper. At same instant, a trap in bottom of hopper also opens permitting contents to flow out into a mixer below. A time delay switch on hopper trap holds it open until all sand has been discharged at which time the reduced load on the DYNA-SWITCH® causes it to again close conveyor motor circuit and repeat the cycle endlessly. In addition to controlling this highly important plant function, the Dillon DYNA-SWITCH® is also acting as a precision scale since it is set to function at a specific load point. Any form of batching operating can be easily automated by this simple yet effective arrangement.

2-5. DYNA-SWITCH® Selection

To pick the proper sized DYNA-SWITCH® for the job, do the following:

A. Determine the mounting position.

B. Calculate the load to be applied to the DYNA-SWITCH®.

C. Refer to table 1-1 to select a DYNA-SWITCH® with the proper capacity and minimum/maximum set point range.

2-6. DYNA-SWITCH® Field Installation Procedures

Loads applied to compression DYNA-SWITCHES® cause the force beam legs to deflect and come closer together. Loads applied to tension units cause the force beam legs to deflect outward and spread apart. Micro-switch(es) are S.P.D.T. and have three contact terminals. One is normally open, one normally closed, and one is common. Therefore they can be wired to make or break a circuit (start or stop an operation) at specific set point(s).

A. Wiring the Compression Model DYNA-SWITCH®

1. To MAKE a circuit:

a.) on increasing compression load, use common and normally open contacts.

b.) on decreasing compression load, use common and normally closed contacts.

2. To BREAK a circuit:

a.) on increasing compression load, use common and normally closed contacts.

b.) on decreasing compression load, use common and normally open contacts.

B. Wiring the Tension Model DYNA-SWITCH®

1. To MAKE a circuit

a.) on increasing tension load, use common and normally closed contacts.

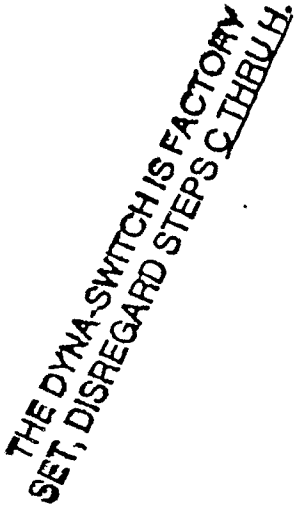
b.) on decreasing tension load, use common and normally open contacts.

2. To BREAK a circuit

a.) on increasing tension load, use common and normally open contacts.

b.) on decreasing tension load, use common and normally closed contacts.

If your Dyna-Switch is factory set, disregard steps C thru H. It is factory set if switch settings appear on the switch cover box label.



NOTE 1: The operator can put together a test assembly consisting of an indicator light or horn, a power source and two leads with alligator clips to simulate the machinery's control circuit. Using this test assembly makes it unnecessary to wire the micro-switches into the machinery's control circuit.

NOTE 2: Any time the DYNA-SWITCH® is removed from the machinery and reinstalled, the operator must check the switch operation. Failure to do so could result in inaccurate actuation as the calibration could change

C. Figure the desired set point (in pounds) for each micro-switch. In setting two, three or four switches, set the highest set point first, then work down according to weight. Any other sequence will cause a shutdown during the adjusting process.

D. Turn the adjustment screw:

1. In compression models, back the adjustment screw as far as it will go away from the switch plunger.

2. In tension models, turn the adjustment screw as far as it will go into the switch plunger without damaging the switch.

E. Apply a load on the unit equal to the desired setting. (The operator must apply an accurately measured load, because the set point accuracy will be no better than the known accuracy of the measured load.)

F. Slowly turn the adjustment screw:

1. In compression, turn the screw until it is just low enough to actuate the switch. Then tighten the jam nut to hold the adjustment.

2. In tension, turn the screw until it is just high enough to actuate the switch plunger. Then tighten the jam nut to hold the adjustment.

G. Remove, then reapply the load to check the set point. It is properly set if the machinery (or the test assembly) functions as planned within desired tolerances.

H. Repeat steps C through G as many times as required to obtain correct setting(s).

2-7. Recap

To ensure the DYNA-SWITCH® is properly installed and is controlling circuits as planned, retrace these steps:

A. Install the DYNA-SWITCH®.

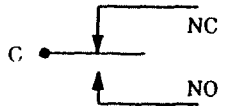
B. Hook up all micro-switch leads.

C. Adjust all micro-switches.

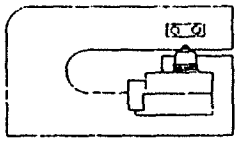
D. Test them to ensure they can perform the overload safety function and all other planned functions.

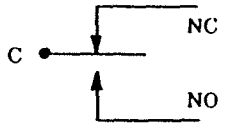
The setup is now ready for controlled operation.

LOW DIFFERENTIAL TRAVEL SWITCH
(For 100, 1,000 and 5,000 lb BEAMS ONLY.)

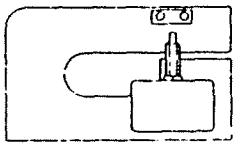
CIRCUITRY	ELECTRICAL DATA
 SINGLE-POLE DOUBLE-THROW	UL Rating: 5 AMPS, 125 or 250 VAC

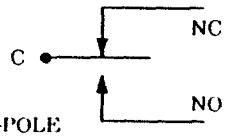
WEATHERPROOF LOW DIFFERENTIAL TRAVEL SWITCH
(For 2,000, 10,000, 25,000 and 50,000 lb BEAMS ONLY.)



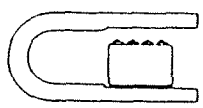
CIRCUITRY	ELECTRICAL DATA
	UL/CSA Rating; L 74 15 AMP, 125, 250 or 480 VAC; 2 AMP, 600 VAC; 1/8 HP, 125 VAC; 1/4 HP, 250 VAC; .5 AMP, 125 VDC; .25 AMP 250 VDC.

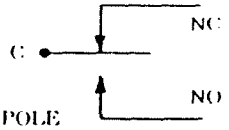
EXPLOSION-PROOF SWITCH
(For 2,000, 10,000, 25,000 and 50,000 lb BEAMS ONLY.)



CIRCUITRY	ELECTRICAL DATA
 SINGLE-POLE DOUBLE-THROW	UL/CSA Rating; L 23 20 AMPS, 125, 250 or 480 VAC; 10 AMPS, 125 VAC "L"; 1 HP, 125 VAC; 2 HP, 250 VAC; .5 AMP, 125 VDC; .25 AMP, 250 VDC.

WEATHERPROOF LOW DIFFERENTIAL TRAVEL SWITCH
(For 100, 1,000 and 5,000 lb BEAMS ONLY.)



CIRCUITRY	ELECTRICAL DATA
 SINGLE-POLE DOUBLE THROW	5 AMPS RES., 3 AMPS IND., (Sea Level), 4 AMPS RES., 2 AMPS IND., (50,000 FEET) 28 VDC 5 AMPS RES. OR IND. 115 VAC, 60 Hz. UL/CSA RATING: 5 AMPS, 250 VAC

SECTION IV

MAINTENANCE

4-1. General Instructions

Service the DYNA-SWITCH® at least once every six months (more often if it is exposed to extreme climate or working conditions) according to paragraph 4-2, below. In addition, check the accuracy of the micro-switch at least once every six months (more often if it is part of a setup which receives frequent use) and reset the micro-switch as required. Switch setting procedures are outlined in paragraph 2-6.

4-2. Service Instructions

A. Attachment Fittings - Check for unusual wear, deformation, looseness and corrosion. Replace if damaged or loose. Clean off corrosion; oil compression steel ball fitting as required.

B. Micro-Switches - Replace if wires are frayed or if the connection plunger or housing is damaged in any way.

C. Overload Stop - Make sure no foreign material is present in overload stop gap, since this could cause errors.

D. Adjustment screws, overload devices, switch and screw mounting brackets - Replace the component if it is damaged or deformed enough not to to work as designed.

E. Force Beams - Cleaning corrosion and painting are the only authorized services. If the force beam has suffered damage or permanent deformation, replace the entire DYNA-SWITCH®.

4-3. Authorized Replacement

A. Attachment Fittings - The customer is authorized to replace only shackle and pin attachment fittings at his facility. Customers desiring replacement of any other attachment fitting must return the DYNA-SWITCH® to the Dillon Company for attachment fitting replacement. The reason for this is that all attachment fittings other than shackles and pins are pinned to the force beam after assembly.

B. Micro-Switches - Addition and replacement of micro-switches, as well conversion from one type to another is authorized as long as the user orders the proper Dillon micro-switches. Micro-switch mounting brackets and adjustment screw mounting brackets are available for all authorized configurations.

C. Other Parts - The replacement of parts other than shackle and pin attachment fittings, authorized micro-switches and micro-switch mounting hardware is not authorized. Attempting to make unauthorized repairs on the DYNA-SWITCH® automatically voids the Dillon warranty.

5-5. Key Specifications

Table 5-1, below, indicates capacities and other specifications.

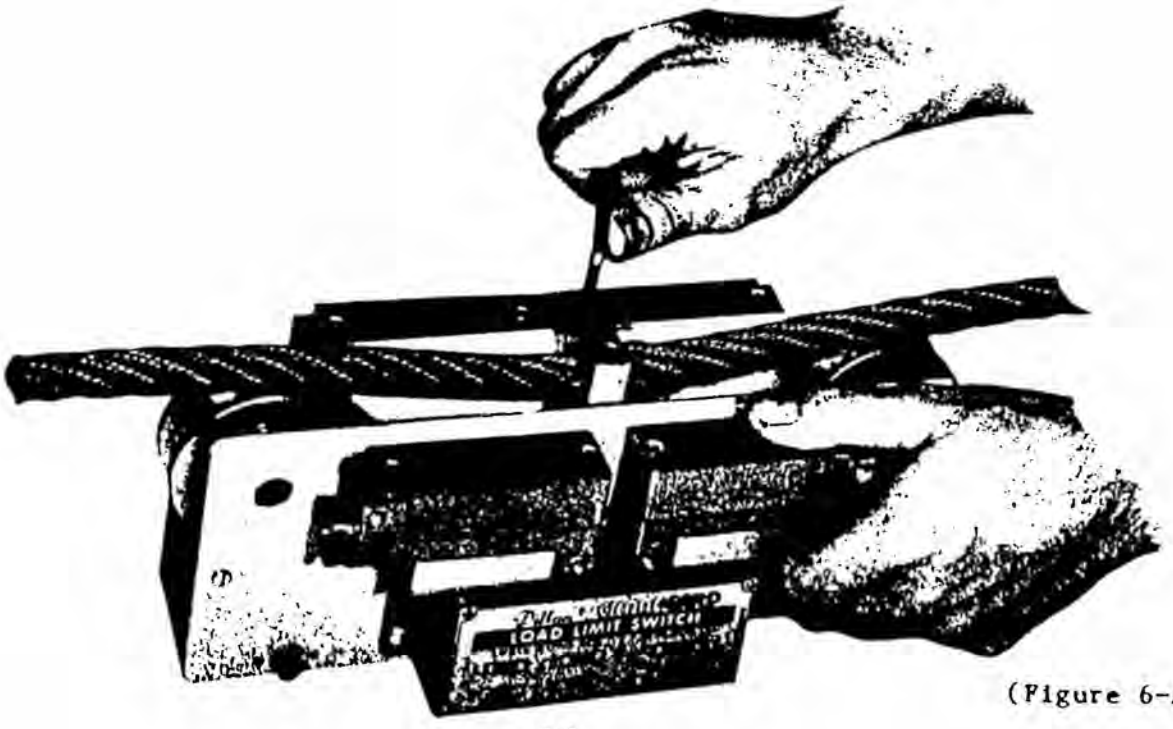
Part Number	Capacity Pounds	Min. Set Point Lb	Repeatability Pounds	Rope Diameter Inches	
				Minimum	Maximum
CGS-1	2500	100	75	3/16	1/2
CGS2	5000	200	150	3/8	7/8
CGS-3	10000	400	300	7/16	7/8
CGS-4	20000	800	600	5/8	1 1/4

SECTION VI

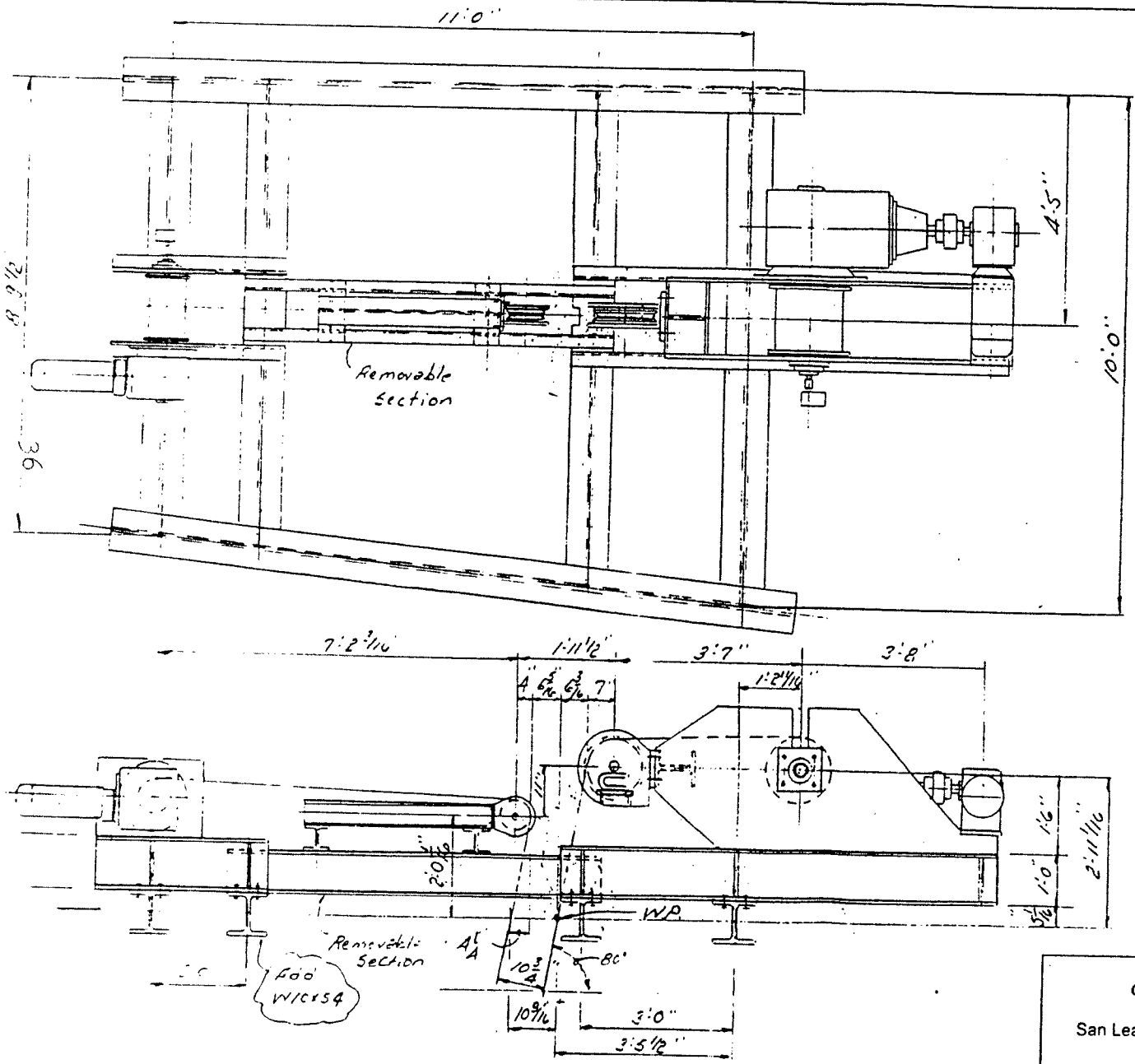
INSTALLATION

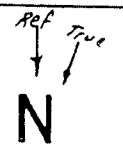
6-1. Mounting Positions

The best mounting position for the CRANEGARD® Load Limit Switch is adjacent to the wire rope dead end point. It also could be installed adjacent to the equalizer sheave where wire rope movement is small (a few inches). The amount of wire rope movement around the equalizer sheave should be measured by marking the wire rope, noting the amount of movement, and allowing enough clearance for such movement when mounting the CRANEGARD® unit.



(Figure 6-A)



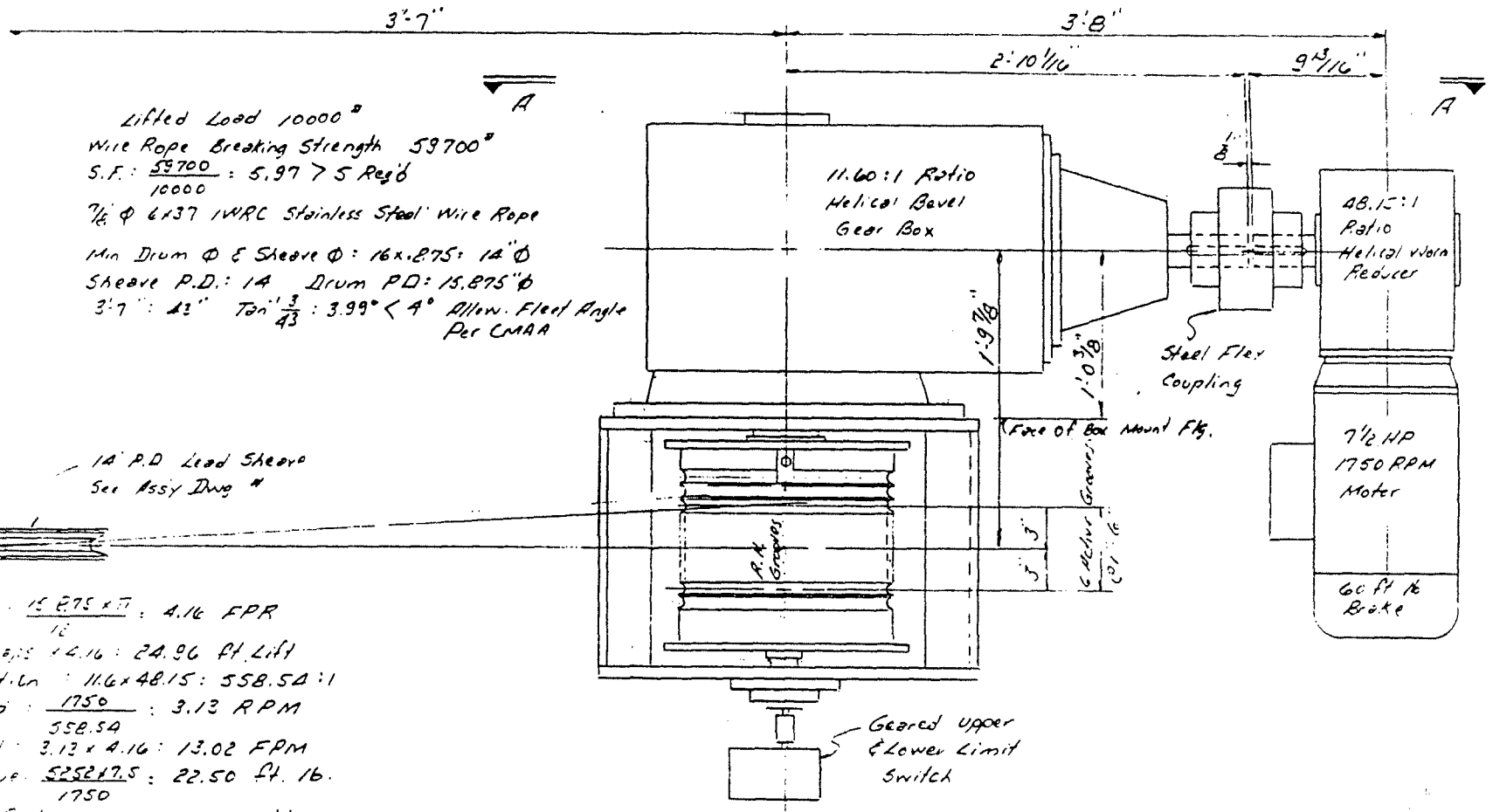


CraneWorks, Inc.
PO Box 2463
San Leandro, CA 94577-0246
510-357-4000

GENERAL ARRANGEMENT
2 5 5 TON SINGLE LINE
WINCHES

E1	7.19.99	99117-03

Power : 460V · 3Φ · 60 Hz
Control : 115V · 1Φ



Lifted Load 10000 #
Wire Rope Breaking Strength 59700 #
S.F. : $\frac{59700}{10000}$: 5.97 > 5 Req'd
7/8" Φ 6x37 IWRC Stainless Steel Wire Rope
Min Drum Φ & Sheave Φ : 16 x .875 : 14" Φ
Sheave P.D. : 14 Drum P.D. : 15.875" Φ
3'-7" : 43" Tan⁻¹ $\frac{3}{43}$: 3.99° < 4° Allow. Fleet Angle Per CMAA

Drum Wrap : $\frac{15.875 \times \pi}{12}$: 4.16 FPR
6 Active Wraps : 4.16 : 24.96 Ft. Lift
Total Reduction : 11.6 x 48.15 : 558.54 : 1
Drum Speed : $\frac{1750}{558.54}$: 3.13 RPM
Line Speed : 3.13 x 4.16 : 13.02 FPM
Motor Torque : $\frac{525247.5}{1750}$: 22.50 ft. lb.
$\frac{60 \text{ ft. lb Brake}}{22.50 \text{ ft lb Motor}}$: 2.67 > 1.5 Req'd

Torque Req'd To Lift Load : 10000 x $\frac{15.875}{2}$: 79375 "#
Reflected C.F. Torque Of Helical Worm : 11487 "#
C.F. Torque @ Drum : 11487 x 11.6 : 133249 "# > 79375 "#
Control Braking : Worm Gear & Squirrel Cage Motor Regeneration
Paint Thermec White Epoxy Primer
Thermec Safety Yellow Enclosure Shield Finish
Conforms Specification : CMAA 70

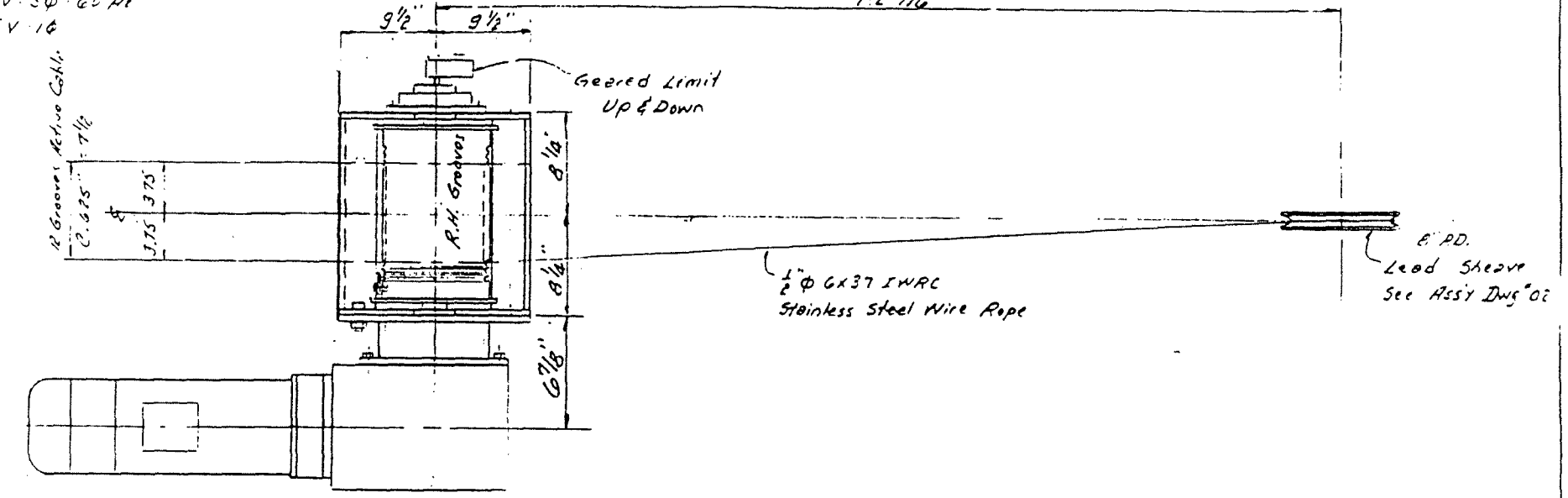
CraneWorks Inc
P.O. Box 2463
San Leandro, CA 94577-0246
510-357-4000

5 TON CAPACITY
SINGLE LINE WINCH

E1	7-7-99	99117-02

37

Power 460V · 3Φ · 60 Hz
Control 115V · 1Φ



38

Drum P.D. : 8.5"

$\frac{8.5 \cdot \pi}{12}$ · 2.22 FPR

12 × 2.22 · 26.64" Lift

Drum Speed = $\frac{1740}{380.39}$: 4.57 RPM

Line Speed : 4.57 × 2.22 = 10.14 FPM

7:2 3/16 : 86.19 $\tan^{-1}\frac{3.75}{86.19}$: 2.49° < 4° All. Fleet Angle

Rope to Drum Ratio $\frac{8.5}{.5}$: 17:1 > 16:1 All.

Motor Torque : $\frac{5252 \times 2}{1740}$: 6.04 "# $\frac{10\text{"\#}\ \text{Brake}}{6.04\text{"\#}\ \text{Motor}}$: 1.65 > 1.5 Req'd

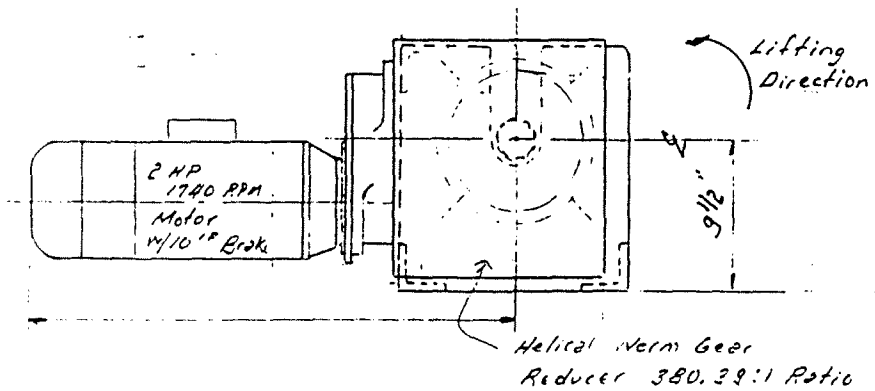
Control Brake : Worm Gear & Squirel Cage Motor Regeneration

Torque Req'd To Lift Load : 4000# × $\frac{8.5}{2}$: 17000 "#

Output Torque of Gearbox : 20346 "# > 17000 "#

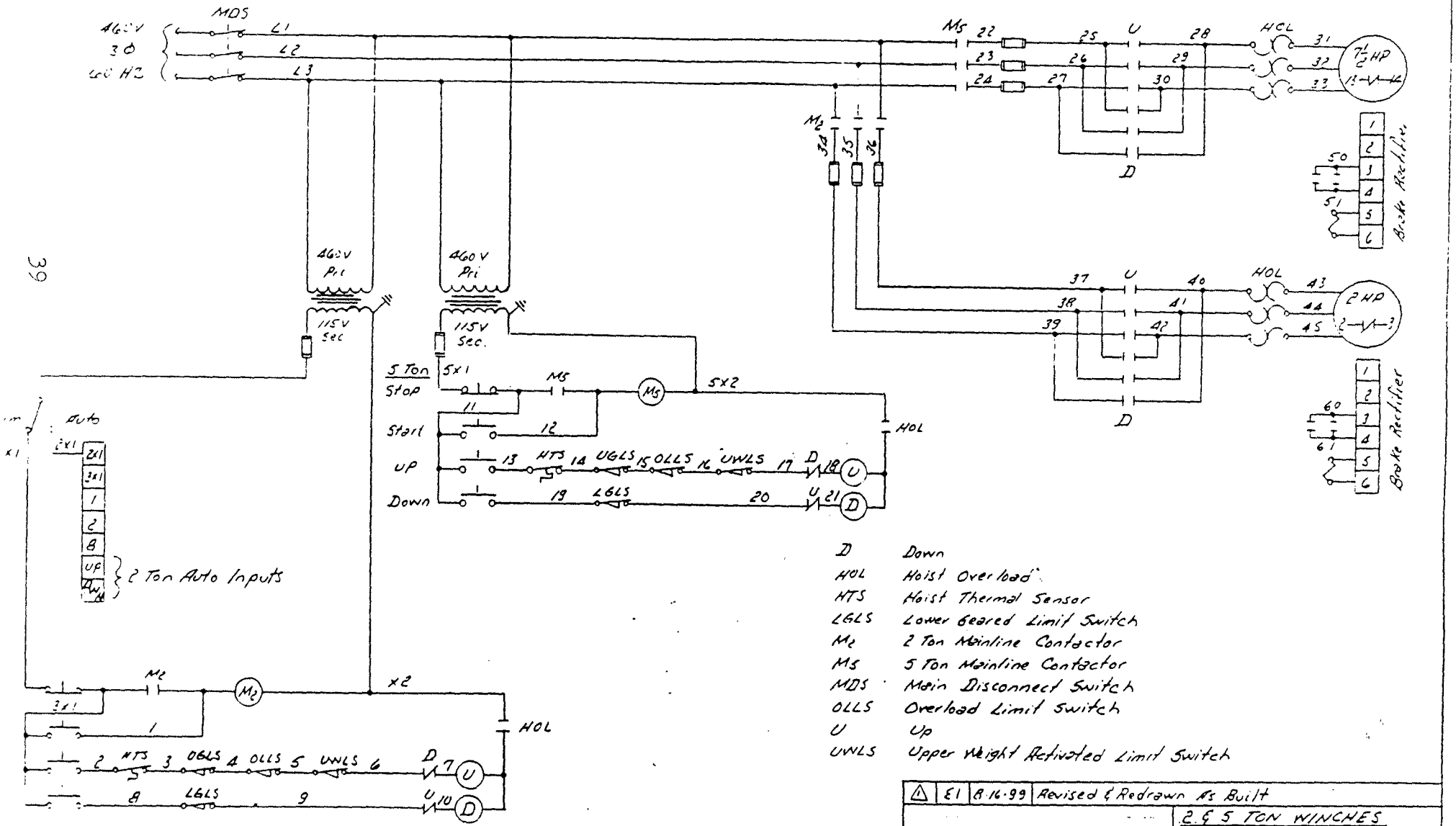
Compliance Specification CMAA 70

Paint : Tnemec White Epoxy Primer
Tnemec Safety Yellow Enduro Shield Finish



2 TON CAPACITY SINGLE LINE WINCH

Crane Works Inc P.O. Box 2463 San Leandro, CA 94577-0246 510-357-4000	2 TON SINGLE LINE WINCH	
	E1 | 7-1-99	99117-01



D	Down
HOL	Hoist Overload
HTS	Hoist Thermal Sensor
LGLS	Lower Geared Limit Switch
M2	2 Ton Mainline Contactor
MS	5 Ton Mainline Contactor
MDS	Main Disconnect Switch
OLLS	Overload Limit Switch
U	Up
UWLS	Upper Weight Activated Limit Switch

Δ	E1	8-16-99	Revised & Redrawn As Built

CraneWorks, Inc.
PO Box 2463
San Leandro, CA 94577-0246
510-357-4000

2 & 5 TON WINCHES
SCHEMATIC WIRING DIAGRAM

E1	8-16-99	99117-E1

SECTION H

FPI's Traveling Screen

Maintenance Manual

F P I

Traveling Water Screens

Operators Manual

for

San Luis & Delta Mendota Water Authority

Tracy Crab Screen

Serial No. 0999021

TABLE OF CONTENTS

I. Installation of Machine

A. Site Preparation

Prior to the delivery of the Screen, the location should be prepared to properly secure the Screen in its location, Electrical power should be available to the site. This power should be sufficient to operate the Screen and the pressure wash pump. Voltage and phase must match the screen drive motor and the pump motor requirements.

A proper container or pad must be in place to receive the trash and debris that the screen will remove from the water.

B. Delivery – Placing in Position

The Screen is shipped to the site completely assembled. One (1) lifting eye is located on the top frame of the Screen. Use a lifting bar with cables and clevace to raise the Screen. Lifting eye was installed as Customer Request.

A crane of sufficient capacity and reach is required to place the Screen into location. This screen weighs Approximately 2000. pounds.

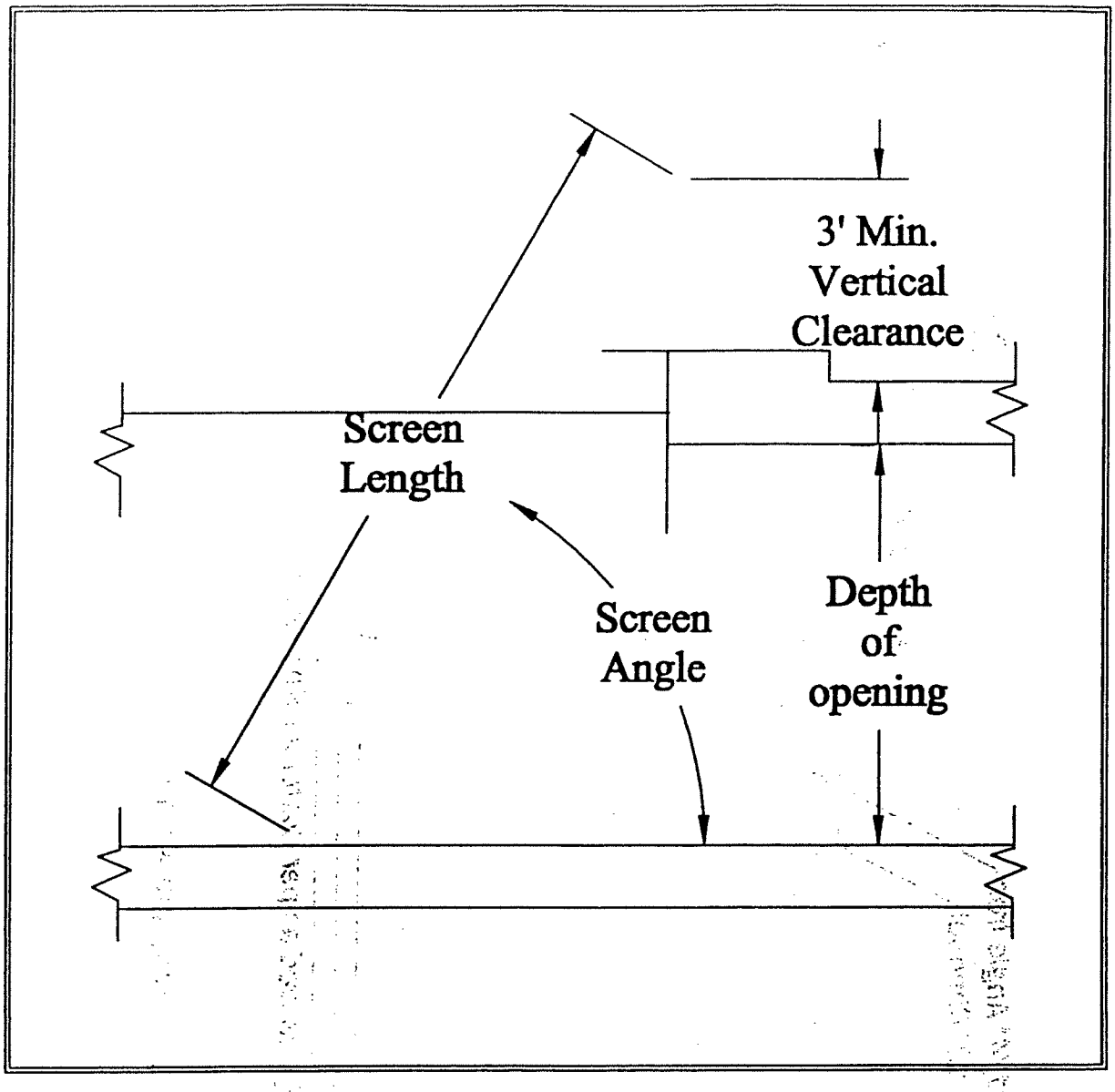
Lift Screen into position. Care should be taken to not ***jar*** or ***bump*** the Screen in the process of placing the screen into position. Following placement of screen the Electrical connections to the main drive motor can be made. Connections of the pump discharge line can be made to supplied filter then to the Screen wash bar.

C. Pump

The Screen wash pump is a stainless steel submersible pump with a 1 1/2 h.p. submersible motor. A special water proof connection device is furnished to connect the motor leads to the power cable. The pump capacity is 35 gals. The pressure delivered to the screen wash jets is 40 the pump is a Grundfos, Model # 4F35A10 with a Franklin Motor. The pump should be located on the downstream side of the screen. Sufficient water depth must be available to keep inlet area of pump submerged. This is a three phase motor therefore proper rotation must be verified prior to placing pump into service, (note: incorrect rotation will not harm pump or motor, however the performance of the pump will be greatly reduced).

D. Screen Wash Filter

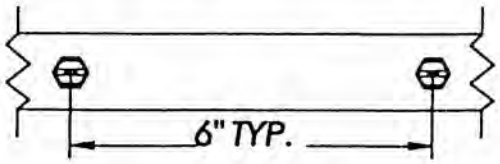
It is necessary to screen the wash water prior to the water reaching the jets. The filter provided with this unit is a Yardney Model #SF 6-40, screen. If it becomes necessary to clean the filter element the top of the filter case must be removed and the screen should be washed of all sediment and replaced. **Warning,** do not remove top when system is operating (see detail of filter on page 5).



Traveling Water Screen
7' - 9 1/2" Width x 19' - 4" Length

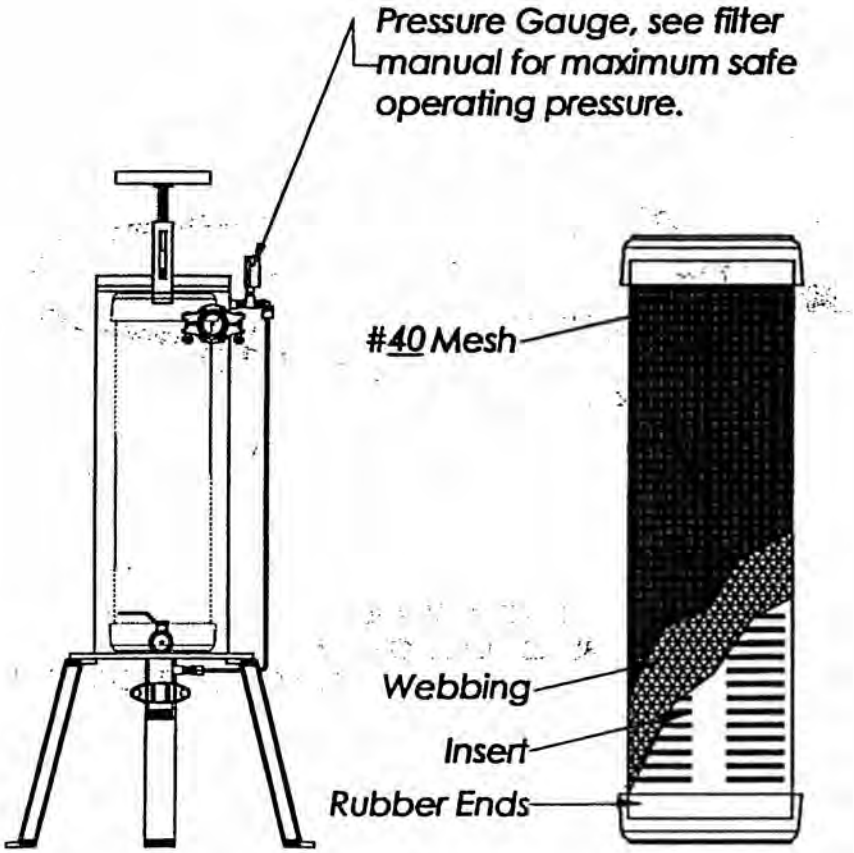
Chain Wash Spray Bar

1 1/4' x 110" long Galv. steel pipe Threaded both ends.



15 - #8020 Brass Spray Nozzles at 6" c.c

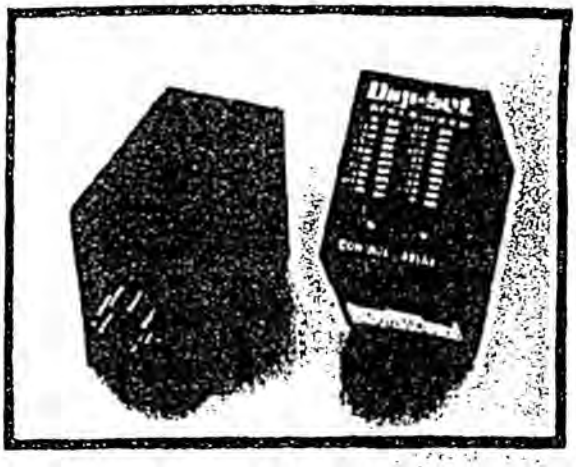
Wash Water Filter



Digi-Set TIME DELAY RELAY

TDR Series
(Recycling)

- Digital Integrated Circuitry
- Switch Selectable Time Delays from 0.1 to 2.8 Hours
- Independent Adjustability of ON time and OFF time
- ± 2% Setting Accuracy
- ± 0.1% Repeat Accuracy
- Standard Octal Plug-In Base
- DPDT 10 Ampere Output Contacts



DESCRIPTION

Digi-Set timers with digital circuitry result in unequaled performance, features, and reliability. C/MOS digital circuitry for high accuracy and stability. Digital selection of the time period by use of (10) binary coded switches for both the ON and OFF periods. Proven 10 ampere output relay provides isolated double-pole-double-throw output switching.

SPECIFICATIONS

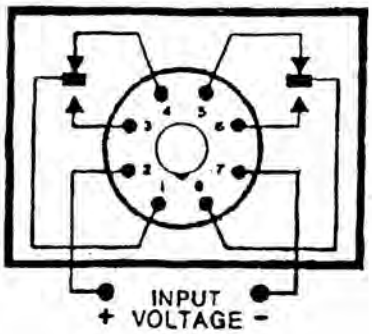
1. **Time Delay**
   - 1.1 Type: Digital C/MOS circuitry
   - 1.2 Range:
     - a. 0.1 to 102.3 sec. adj. in 0.1 sec. increments
     - b. 1 to 1023 sec. adj. in 1 sec. increments
     - c. 10 to 10,230 sec. adj. in 10 sec. increments

     Selection of the ON and OFF time delays is obtained by adding the switch closures of each 10 position switch.
   - 1.3 Repeat Accuracy: ± .1%
   - 1.4 Setting Accuracy: ± 2%
   - 1.5 Reset Time: 150 milliseconds maximum
   - 1.6 Recycle Time: 500 milliseconds maximum
   - 1.7 Time Delay vs. Voltage & Temperature: ± 5%
2. **Input**
   - 2.1 Operating Voltage: 12, 24, 120 & 230 volts
   - 2.2 Tolerance: ± 20% of nominal
   - 2.3 Line Frequency: 50 or 60 Hertz
3. **Output**
   - 3.1 Type: Electromechanical relay
   - 3.2 Form: Double pole double throw
   - 3.3 Rating: 10 amperes resistive at 240VAC
   - 3.4 Life: Mechanical — 10,000,000 operations
     Full Load — 1,000,000 operations
4. **Protection**
   - 4.1 Transient Protected
   - 4.2 Dielectric Breakdown: 1500 volts RMS minimum at 60 Hertz between input and output terminals
5. **Mechanical**
   - 5.1 Mounting: Plug-in
   - 5.2 Termination: Octal Plug (8 Pin)
6. **Environmental**
   - 6.1 Operating Temperature: -20°C to + 60°C
   - 6.2 Storage Temperature: -30°C to + 85°C
7. **Panel Mounting Accessory**

BZ1 PANEL MOUNT KIT available for SSAC Plug-In Controls. Also, Octal 8 pin and 11 pin flush mount sockets. See *Accessories*

PO Box 1300 Baldwinsville, NY 13027 Application Assistance 800-377-SSAC (7722)
Internet Address http://www.ssac.com Phone (315) 638-1300 Fax (315) 638-0333

CONNECTION



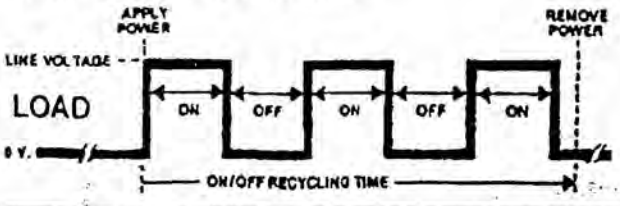
Octal (8 Pin) Base

Note: Relay contacts are isolated from input voltage.

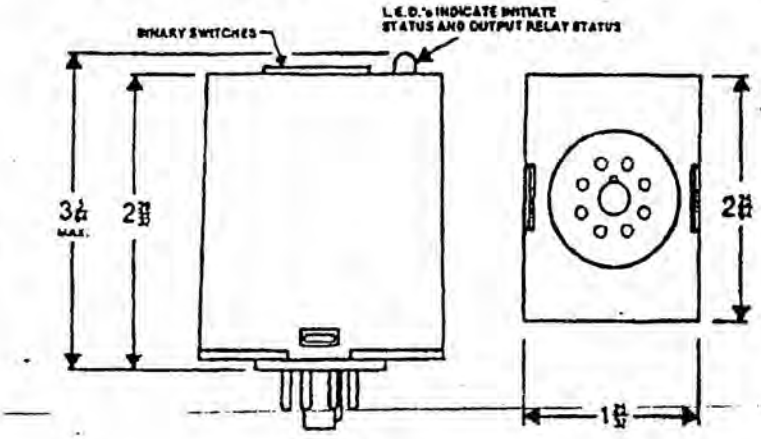
OPERATION

Recycling: Upon application of power to the input terminals, the first time delay begins and the load assumes a state determined by selection of the ON time or OFF time first. At the end of the first delay period, the load condition changes state and the second delay period begins. At the end of the second delay period, the load reverts to its initial state and a new first delay period begins. The recycling action will continue as long as the power is applied.

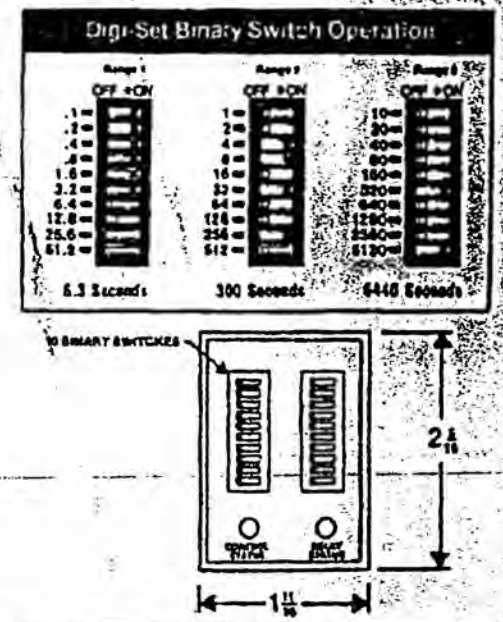
Time Diagram: Output Contacts



MECHANICAL



Note. All dimensions in inches.



ORDERING INFORMATION

Series	Operating Voltage	Operating Sequence	ON Time	OFF Time
☆ TDR	1—12VDC* 2—24VAC 3—24VDC ☆ 4—120VAC 5—110VDC 6—230VAC	☆ A. ON Time First B. OFF Time First	☆ **Range 1:** .1 to 102.3 sec. in .1 sec. increments **Range 2:** 1 to 1023 sec. in 1 sec. increments **Range 3:** 10 to 10,230 sec. in 10 sec. increments	**Range 1:** .1 to 102.3 sec. in .1 sec. increments ☆ **Range 2:** 1 to 1023 sec. in 1 sec. increments **Range 3:** 10 to 10,230 sec. in 10 sec. increments

☆ Example Part Number: TDR4A12 is a recycling timer with a 120 volts AC input voltage, ON time first and with an adjustable delays of 0.1 to 102.3 seconds for the ON period and 1 to 1023 seconds for the OFF period.
*Control status LED not available on 12VDC units.

II. Inspection / Maintenance

Following the installation of the screen, visual inspection should be made frequently. If the site is staffed with an operator, the machine should be observed several times a day. If there is not a resident operator a visual inspection should be made at least once a day. During periods of severe weather such as heavy winds, or extremely heavy rains a more frequent inspection should be scheduled.

The inspection should consist of viewing the machine in operation. The machine should run quietly; the water jets should operate when the machine operates; if operation on cycle timer the machine should start and stop on the set frequency.

P. Controllers

Primary Screen/Pump Control, these controls should be inspected only by a competent technician. These devices contain HIGH VOLTAGE, and must be disconnected prior to any inspections or adjustments.

Q. Speed Reduction Assembly

The chains and sprockets making up the speed reduction assembly should be inspected each time they are lubricated. Look for broken or worn teeth on the sprocket; broken or worn links on the drive chains.

R. Torque Clutch

The torque clutch was set at the factory, this clutch should not require any resetting or inspection during normal operation. If it becomes necessary to reset or adjust see special section on clutch on the following page.

INSTRUCTION MANUAL FOR TORQUE-TAMER™

with Easy-Set Adjustment Sizes 25 thru to 70

INSTALLATION INSTRUCTIONS

WARNING

To ensure that drive is not unexpectedly started, turn off and lock out or tag power source before proceeding. Failure to observe these precautions could result in bodily injury.

CAUTION:

Friction discs must be kept clean and free of oil or moisture at all times to obtain proper functioning of the TORQUE-TAMER. Do not use washers under heads of tension screws.

1. Back off tension screws 28 at least three turns.
2. Loosen setscrew 26 nine full turns. (Size 25 six full turns). Remove nut 24.
3. Remove one pressure plate 18 and one friction disc 20. Place bushing 22 on hub 12.
4. Slide center member (sprocket, sheave, etc.) on bushing 22. NOTE: Bore finish must not exceed 125 micro-inch and both sides of center member, where contacted by discs 20, must be ground parallel (65 to 125 micro-inch) and must be clean and free of oil or moisture.
5. Replace friction disc 20 and pressure plate 18 with ground side of plate against friction disc.
6. Replace nut 24 and tighten finger tight.
7. Tighten setscrew 26 in nearest spline notch.
8. Tighten tension screws 28 alternately and evenly until heads bottom; then back off one turn.

TO ADJUST TORQUE

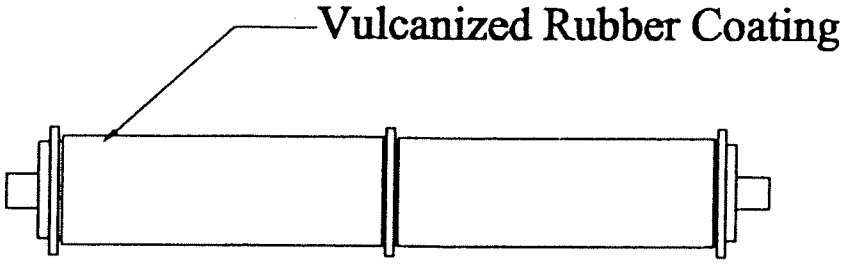
1. Back off tension screws 28 at least three turns.
2. Loosen adjusting nut setscrew 26 at least nine turns.
3. Reset adjusting nut 24 (Turn clockwise for more torque or counterclockwise for less. Do not tighten adjusting nut beyond finger tight.) Refer to "Calibration" over.
4. Tighten adjusting nut setscrew 26 in nearest spline notch. (Do not tighten set screw on threads of hub.)
5. Tighten tension screws 28 alternately and evenly until heads bottom. Do not use washers under heads of these screws.
6. Check alignment of drive. If necessary, loosen hub setscrew 14 and shift hub 12 on shaft.

WARNING: Because of the possible danger to person(s) or property from accidents which may result from the improper use of products, it is important that correct procedures be followed: Products must be used in accordance with the engineering information specified in the catalog. Proper installation, maintenance and operation procedures must be observed. The instructions in the instruction manuals must be followed. Inspections should be made as necessary to assure safe operation under prevailing conditions. Proper guards and other suitable safety devices or procedures as may be desirable or as may be specified in safety codes should be provided, and are neither provided by Reliance Electric Industrial Company nor are the responsibility of Reliance Electric Industrial Company. This unit and its associated equipment must be installed, adjusted and maintained by qualified personnel who are familiar with the construction and operation of all equipment in the system and the potential hazards involved. When risk to persons or property may be involved, a holding device must be an integral part of the driven equipment beyond the speed reducer output shaft.

DODGE / P.O. Box 499 / 6040 Ponders Court / Greenville, S.C. 29602-0499 / 864-297-4800

Rockwell Automation
Dodge

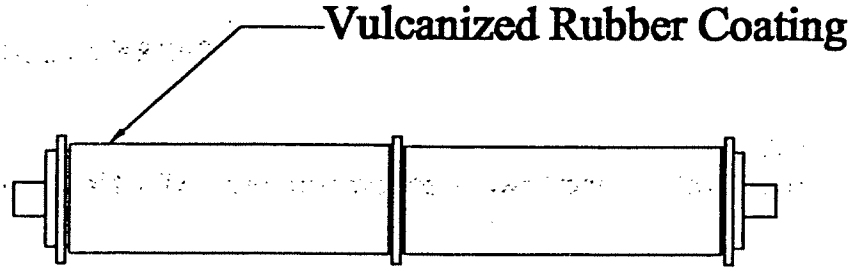
Printed in U.S.A. Instruction Manual 499966 9/91 15M-K



1 11/16" Shaft SS

6034 Sprocket with 34 Teeth

Drive Drum



Stoody #4 Sleeve on Stoody #6 Wearing Surfaces - Lower Shaft

Lower Drum

Major Parts Description Identification / Material List

Main Drive Motor – U.S Electric – Division Emerson Electric Co.
1H.P. Model #CN315515. Motor Shaft Sprocket = 18 drawing pg. 6

Gear Reduction Assembly – Pillow block bearings = 2.
Mfg. by Fafnir. Size 1 3/16"

Sprockets #1 54 #2 20 #3 50.

Drive Chain = #40.

Torque Clutch #40 Dodge.

Main Drive Chain = #40.

Wear Strip – (on Main frame), ¼" UHMW Material Held in place with
¼ 20 x ¾ stainless steel screws, with nylon lock nuts.

Flyte Pads – 1/8" x 1" 1 ½" stainless steel flat stock – welded to main drive chain under flyte.

Belt Rods – 5/16" x 85 ½" 300 series stainless steel rods. 5/16" stainless steel 300 series washer welded to each end.

Lower Deflector – 16" wide x 3/8" rubber belt, (note: cutouts to allow tines to pass). Belt held in place by stainless steel strip and ¼ x 1 ¼ screws.

Spray Bar – 1 ¼" galv. steel pipe 110" long, threaded both ends. Iron pipe thread.
1" Matco brass ball valve (flush).
15 nozzles with 1/8" opening, located on 6" inch centers. Mfg. by Veejet, model # 8020.

Safety Sign – Bi-Lingual sign – 8" x 10" **"Danger: This Machine May Start at any Time".**

Wash Water Pump and Motor – Pump Mfg. By Grundfos – Model # 4F35A10.
Pump Motor Mfg. By Franklin 1 ½ H.P. 230V 3 Phase.

Belt Width 42 ¾" and # CUSTOM 4" x 2".

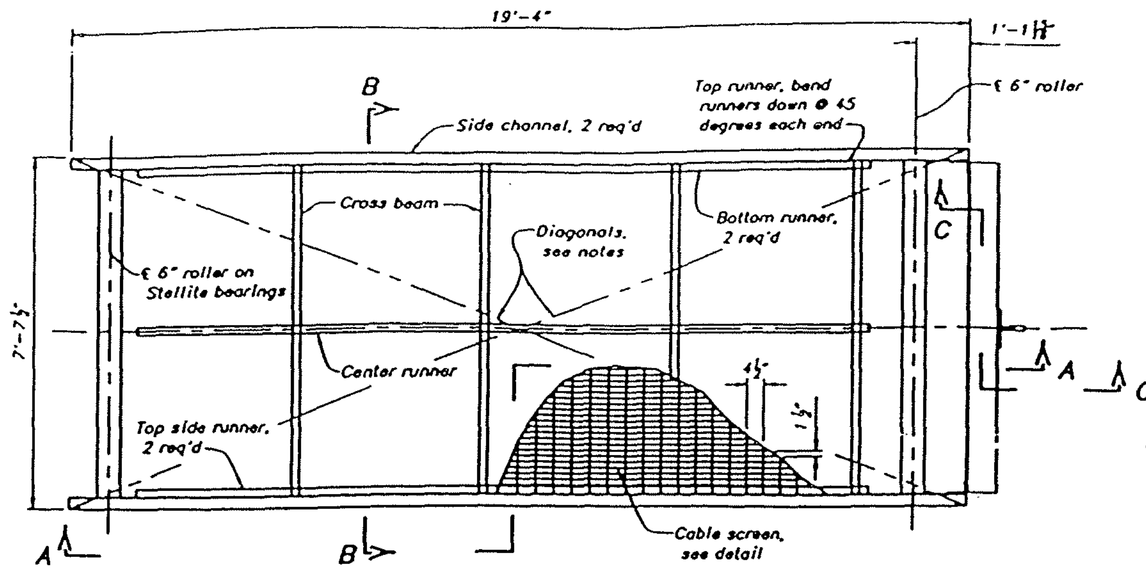
Pump Motor Cable - # 12. 4 conductor flat submersible cable.

Pump Discharge Pipe – schedule 80 P.V.C. with sch. 80 P.V.C. fittings, or Galvanized.

Primary Screen / pump Control – See drawing page 9, for details within control.

SECTION I

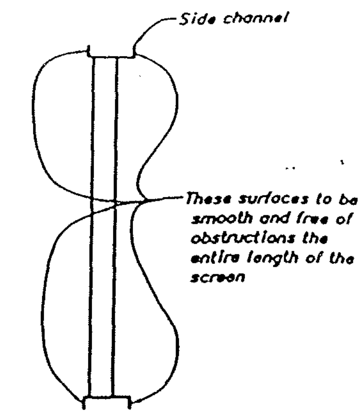
Drawings



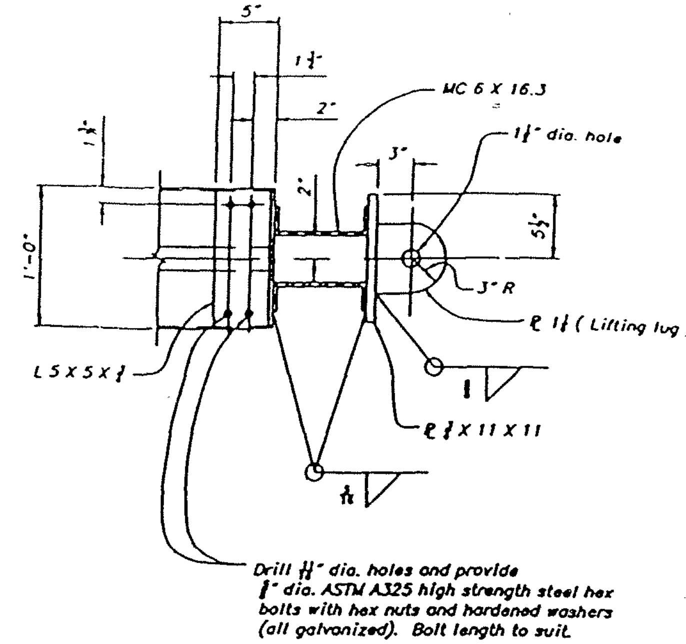
PLAN – LOOKING UPSTREAM

SCALE OF FEET

Mount motor and gear box on top and left side of screen (looking upstream). Motor and gear box assemblies shall not project upstream of the plane of the upstream screen face or downstream of the plane of the downstream screen face.

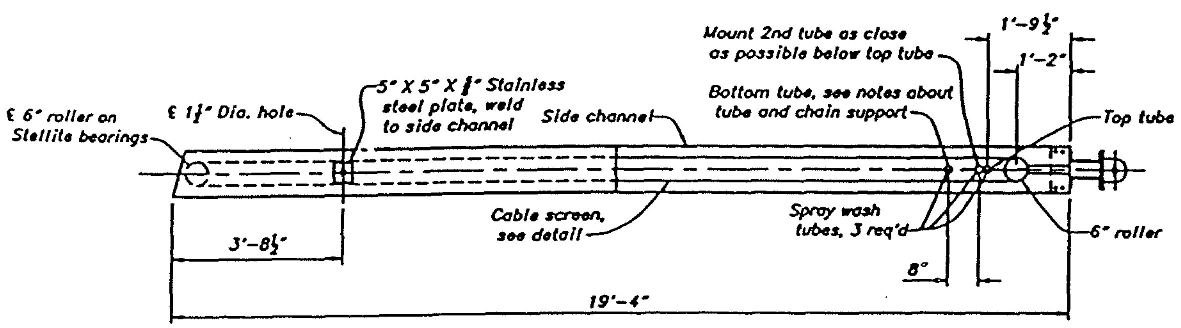


SECTION B–B

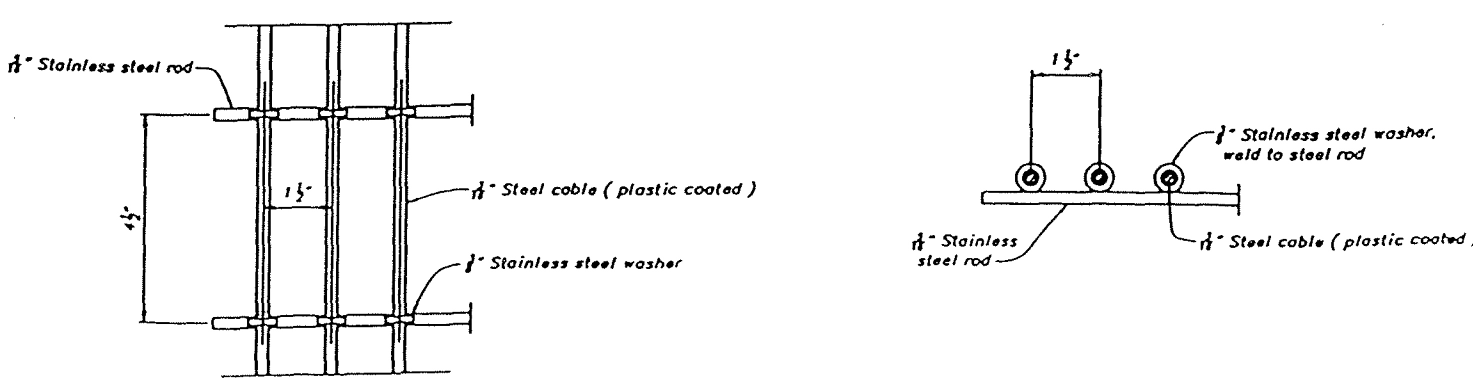


SECTION C–C

SCALE OF FEET



SECTION A–A



CABLE SCREEN DETAIL

NOTES

Length of diagonals shall be no more than 1/8" difference.
Chain supports on downstream side of screen shall not extend above lowest edge of bottom spray wash tube.

ALWAYS THINK SAFETY

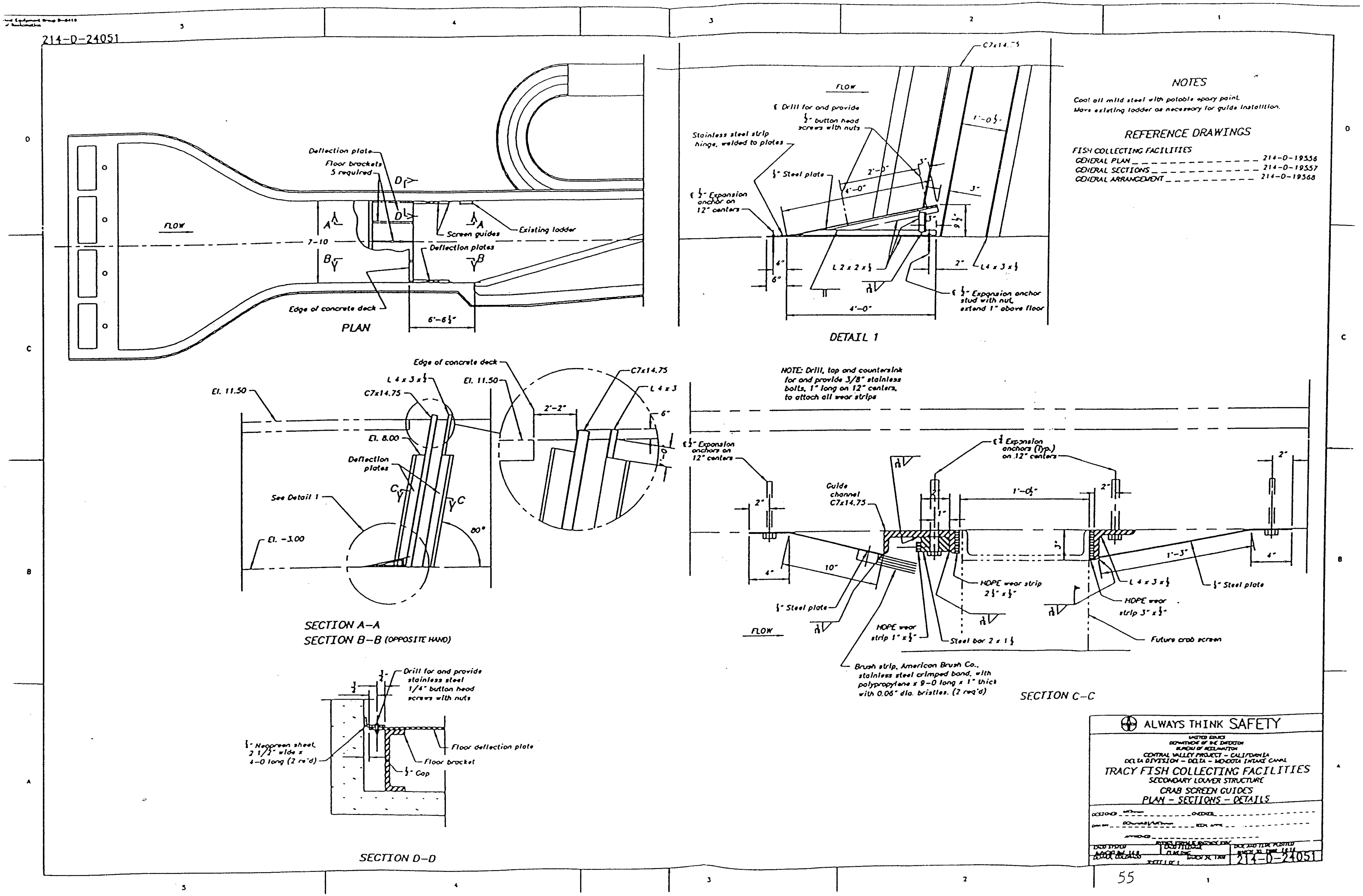
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

TRACY CRAB SCREEN

DESIGNED ______ TECH. APPR. ______
DRAWN ______
CHECKED ______ APPROVED ______

DENVER, COLORADO

WRRL 1


214-D-24051
FLOW
7-10
Deflection plate
Floor brackets
5 required
Screen guides
Existing ladder
Deflection plates
Edge of concrete deck
6'-6½"
PLAN
FLOW
Drill for and provide ½" button head screws with nuts
Stainless steel strip hinge, welded to plates
½" Steel plate
½" Expansion anchor on 12" centers
C7x14.75
1'-0½"
2'-0"
4'-0"
3"
L 2 x 2 x ¼
L 4 x 3 x ½
½" Expansion anchor stud with nut, extend 1" above floor
4'-0"
DETAIL 1
NOTES
Coat all mild steel with potable epoxy paint.
Move existing ladder as necessary for guide installation.
REFERENCE DRAWINGS
FISH COLLECTING FACILITIES
GENERAL PLAN — 214-D-19556
GENERAL SECTIONS — 214-D-19557
GENERAL ARRANGEMENT — 214-D-19568
Edge of concrete deck
L 4 x 3 x ½
C7x14.75
El. 11.50
El. 8.00
Deflection plates
See Detail 1
El. -3.00
80°
2'-2"
L 4 x 3
6"
SECTION A-A
SECTION B-B (OPPOSITE HAND)
NOTE: Drill, tap and countersink for and provide 3/8" stainless bolts, 1" long on 12" centers, to attach all wear strips
¾" Expansion anchors on 12" centers
¾" Expansion anchors (Typ.) on 12" centers
Guide channel C7x14.75
1'-0½"
10"
1'-3"
L 4 x 3 x ½
½" Steel plate
HDPE wear strip 2½" x ½"
HDPE wear strip 3" x ½"
HDPE wear strip 1" x ½"
Steel bar 2 x 1½
Future crab screen
FLOW
Brush strip, American Brush Co., stainless steel crimped band, with polypropylene x 9-0 long x 1" thick with 0.06" dia. bristles. (2 req'd)
SECTION C-C
Drill for and provide stainless steel 1/4" button head screws with nuts
½" Neoprene sheet, 2 1/2" wide x 4-0 long (2 re'd)
Floor deflection plate
Floor bracket
½" Gap
SECTION D-D
ALWAYS THINK SAFETY
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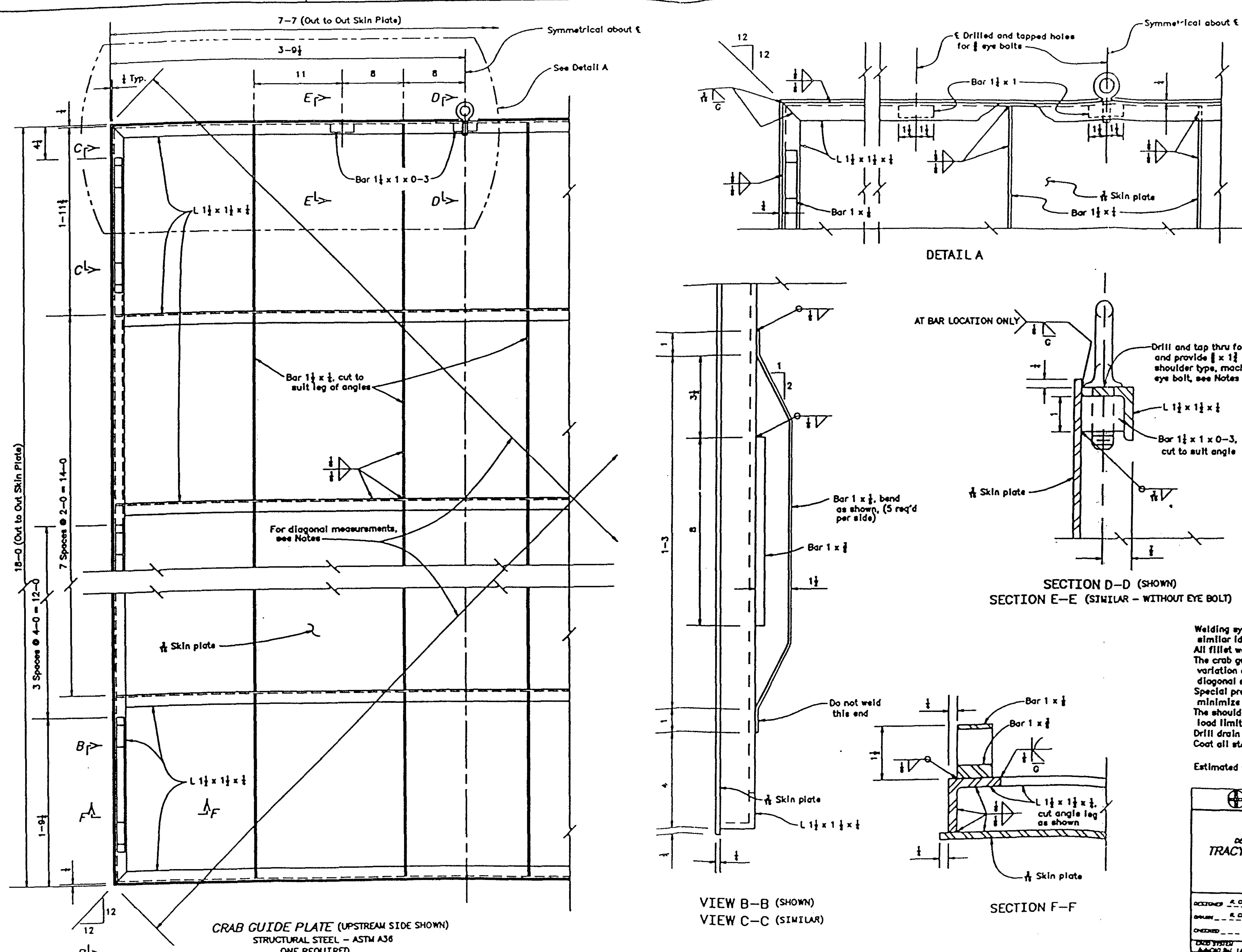
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
CENTRAL VALLEY PROJECT - CALIFORNIA
DELTA DIVISION - DELTA - MENDOTA INTAKE CANAL
TRACY FISH COLLECTING FACILITIES
SECONDARY LOUVER STRUCTURE
CRAB SCREEN GUIDES
PLAN - SECTIONS - DETAILS
214-D-24051



NOTES

Welding symbols apply to the joints of all members of similar identification.
All fillet welds shall be returned.
The crab guide plate shall be square with an allowable variation of not more than 0.25-inch between overall diagonal measurements.
Special precaution and measures shall be taken to minimize and control warpage while welding the members.
The shoulder type, machine eye bolt shall have a working load limit of at least 5200 pounds.
Drill drain holes in skin plate and/or angles as required.
Coat all steel with potable epoxy paint.

Estimated weight _ _ _ _ _ _ _ _ _ _ _ _ _ 1420 pounds.

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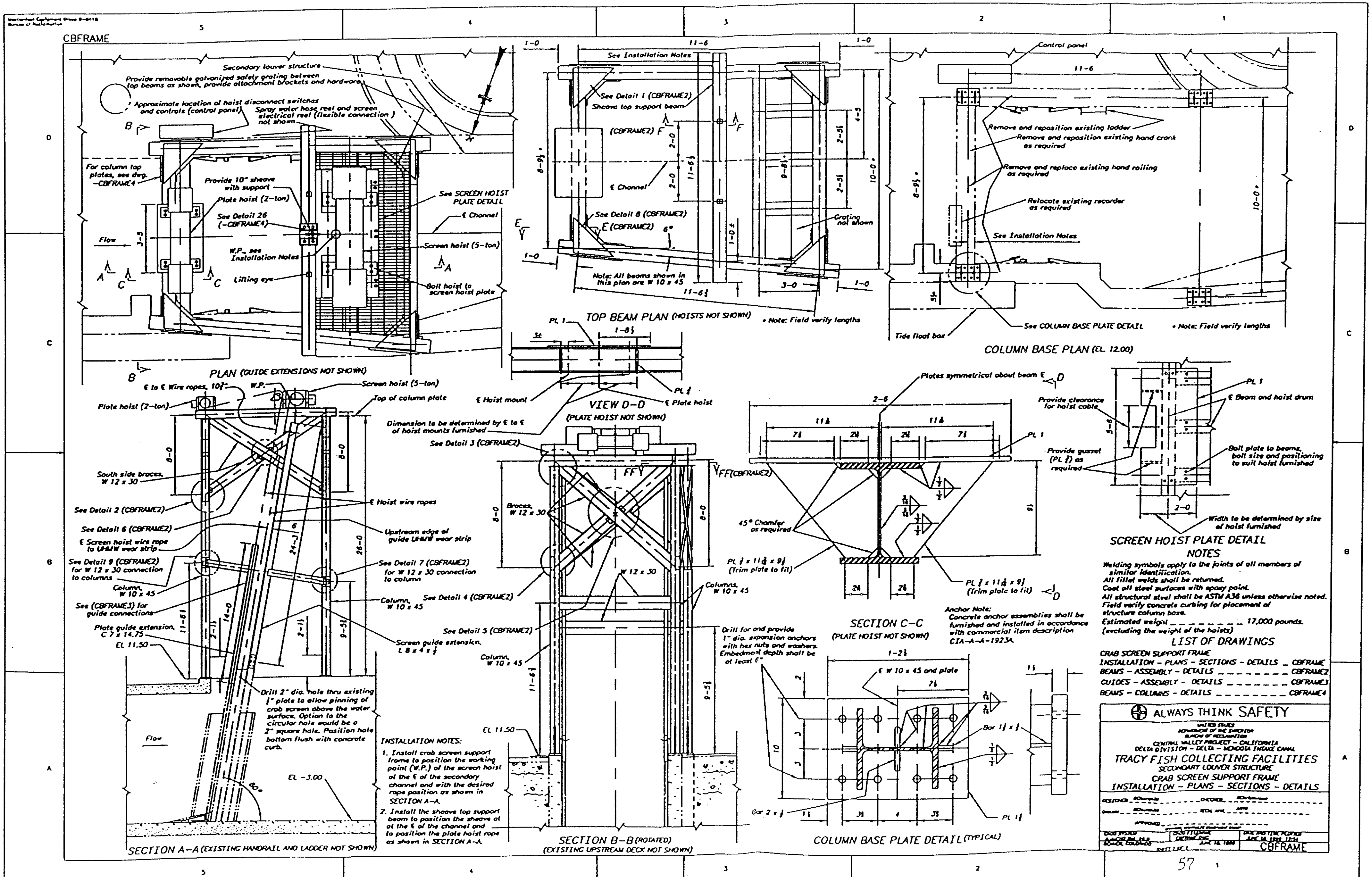
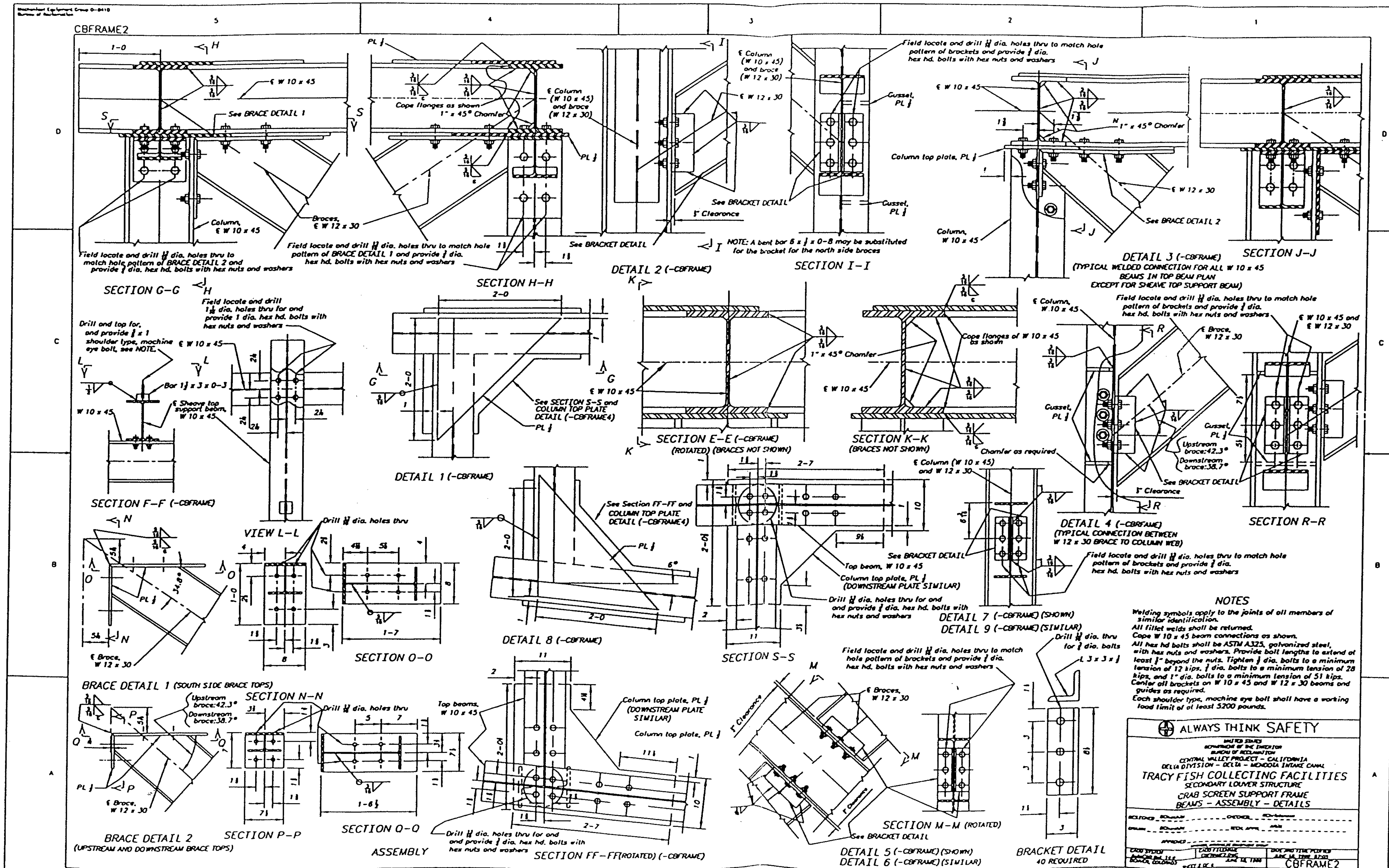
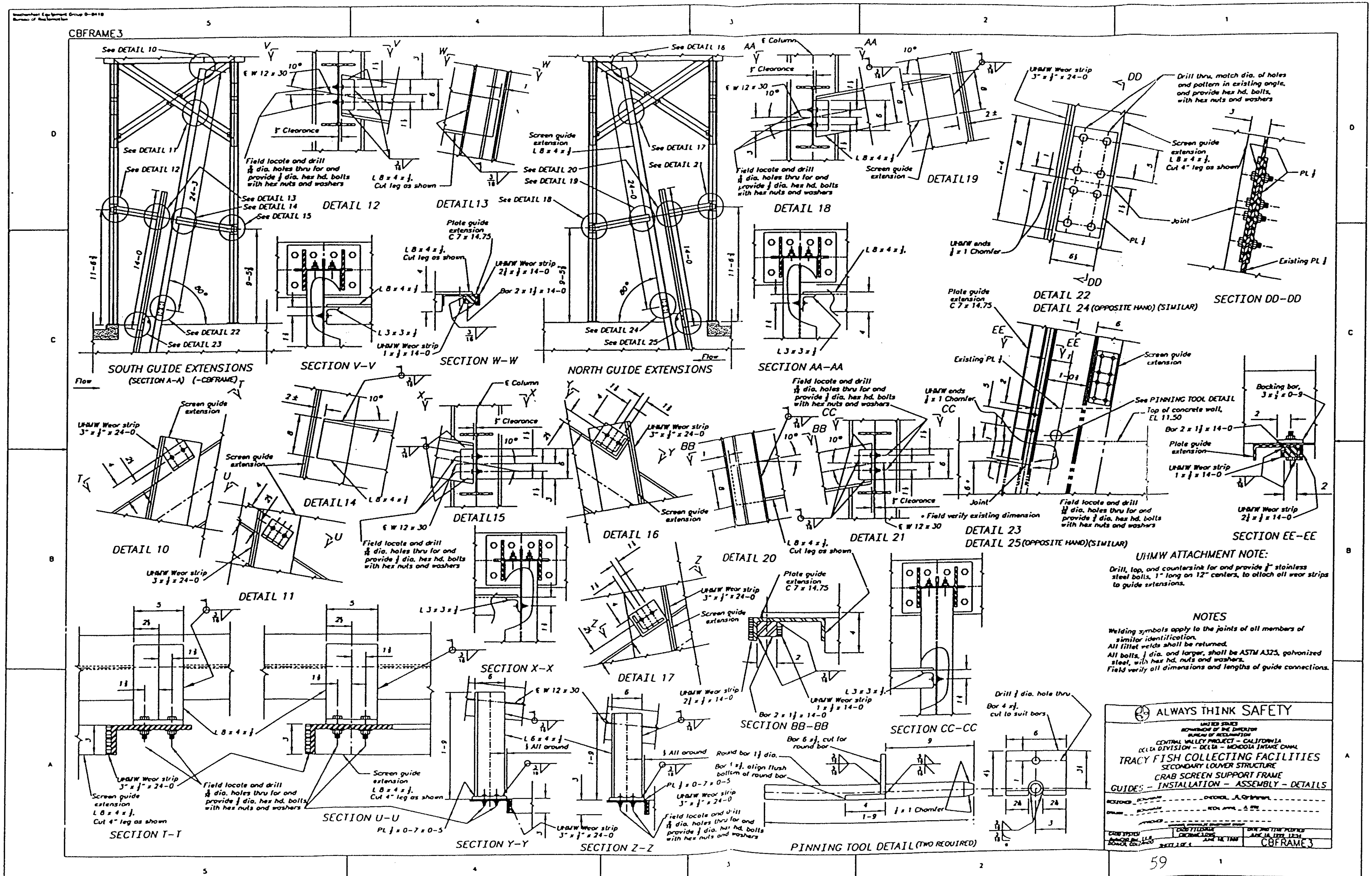
CENTRAL VALLEY PROJECT - CALIFORNIA
DELTA DIVISION - DELTA-MENDOTA INTAKE CANAL
TRACY FISH COLLECTING FACILITIES
SECONDARY LOUVER STRUCTURE
CRAB GUIDE PLATE
SECTIONS AND DETAILS

CPLATE


CBFRAME
PLAN (GUIDE EXTENSIONS NOT SHOWN)
TOP BEAM PLAN (HOISTS NOT SHOWN)
COLUMN BASE PLAN (EL 12.00)
VIEW D-D
(PLATE HOIST NOT SHOWN)
SECTION A-A (EXISTING HANDRAIL AND LADDER NOT SHOWN)
SECTION B-B (ROTATED)
(EXISTING UPSTREAM DECK NOT SHOWN)
SECTION C-C
(PLATE HOIST NOT SHOWN)
COLUMN BASE PLATE DETAIL (TYPICAL)
SCREEN HOIST PLATE DETAIL
Note: All beams shown in this plan are W 10 x 45
Note: Field verify lengths
Anchor Note:
Concrete anchor assemblies shall be furnished and installed in accordance with commercial item description CIA-A-A-1923A.
Drill 2" dia. hole thru existing 1/2" plate to allow pinning of crab screen above the water surface. Option to the circular hole would be a 2" square hole. Position hole bottom flush with concrete curb.
INSTALLATION NOTES:
1. Install crab screen support frame to position the working point (W.P.) of the screen hoist at the ℄ of the secondary channel and with the desired rope position as shown in SECTION A-A.
2. Install the sheave top support beam to position the sheave at at the ℄ of the channel and to position the plate hoist rope as shown in SECTION A-A.
NOTES
Welding symbols apply to the joints of all members of similar identification.
All fillet welds shall be returned.
Coat all steel surfaces with epoxy paint.
All structural steel shall be ASTM A36 unless otherwise noted.
Field verify concrete curbing for placement of structure column base.
Estimated weight _ _ _ _ _ _ _ _ _ 17,000 pounds.
(excluding the weight of the hoists)
LIST OF DRAWINGS
CRAB SCREEN SUPPORT FRAME
INSTALLATION - PLANS - SECTIONS - DETAILS _ CBFRAME
BEAMS - ASSEMBLY - DETAILS _ _ _ _ _ _ _ _ _ CBFRAME2
GUIDES - ASSEMBLY - DETAILS _ _ _ _ _ _ _ _ CBFRAME3
BEAMS - COLUMNS - DETAILS _ _ _ _ _ _ _ _ _ CBFRAME4
ALWAYS THINK SAFETY
CENTRAL VALLEY PROJECT - CALIFORNIA
DELTA DIVISION - DELTA - MENDOTA INTAKE CANAL
TRACY FISH COLLECTING FACILITIES
SECONDARY LOUVER STRUCTURE
CRAB SCREEN SUPPORT FRAME
INSTALLATION - PLANS - SECTIONS - DETAILS
CBFRAME


CBFRAME2
SECTION G-G
SECTION H-H
DETAIL 2 (-CBFRAME)
SECTION I-I
DETAIL 3 (-CBFRAME)
(TYPICAL WELDED CONNECTION FOR ALL W 10 x 45 BEAMS IN TOP BEAM PLAN EXCEPT FOR SHEAVE TOP SUPPORT BEAM)
SECTION J-J
SECTION F-F (-CBFRAME)
VIEW L-L
DETAIL 1 (-CBFRAME)
SECTION E-E (-CBFRAME)
(ROTATED) (BRACES NOT SHOWN)
SECTION K-K
(BRACES NOT SHOWN)
DETAIL 4 (-CBFRAME)
(TYPICAL CONNECTION BETWEEN W 12 x 30 BRACE TO COLUMN WEB)
SECTION R-R
BRACE DETAIL 1 (SOUTH SIDE BRACE TOPS)
SECTION O-O
DETAIL 8 (-CBFRAME)
SECTION S-S
DETAIL 7 (-CBFRAME) (SHOWN)
DETAIL 9 (-CBFRAME) (SIMILAR)
BRACE DETAIL 2
(UPSTREAM AND DOWNSTREAM BRACE TOPS)
SECTION N-N
SECTION P-P
SECTION Q-Q
ASSEMBLY
SECTION FF-FF (ROTATED) (-CBFRAME)
SECTION M-M (ROTATED)
DETAIL 5 (-CBFRAME) (SHOWN)
DETAIL 6 (-CBFRAME) (SIMILAR)
BRACKET DETAIL
40 REQUIRED
NOTES
Welding symbols apply to the joints of all members of similar identification.
All fillet welds shall be returned.
Cope W 10 x 45 beam connections as shown.
All hex hd bolts shall be ASTM A325, galvanized steel, with hex nuts and washers. Provide bolt lengths to extend at least ¼" beyond the nuts. Tighten ½ dia. bolts to a minimum tension of 12 kips, ¾ dia. bolts to a minimum tension of 28 kips, and 1" dia. bolts to a minimum tension of 51 kips.
Center all brackets on W 10 x 45 and W 12 x 30 beams and guides as required.
Each shoulder type, machine eye bolt shall have a working load limit of at least 5200 pounds.
ALWAYS THINK SAFETY
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
CENTRAL VALLEY PROJECT - CALIFORNIA
DELTA DIVISION - DELTA - MENDOTA INTAKE CANAL
TRACY FISH COLLECTING FACILITIES
SECONDARY LOUVER STRUCTURE
CRAB SCREEN SUPPORT FRAME
BEAMS - ASSEMBLY - DETAILS
CBFRAME2


CBFRAME3
SOUTH GUIDE EXTENSIONS (SECTION A-A) (-CBFRAME)
NORTH GUIDE EXTENSIONS
DETAIL 10
DETAIL 11
DETAIL 12
DETAIL 13
DETAIL 14
DETAIL 15
DETAIL 16
DETAIL 17
DETAIL 18
DETAIL 19
DETAIL 20
DETAIL 21
DETAIL 22
DETAIL 24 (OPPOSITE HAND) (SIMILAR)
DETAIL 23
DETAIL 25 (OPPOSITE HAND) (SIMILAR)
SECTION V-V
SECTION W-W
SECTION AA-AA
SECTION DD-DD
SECTION EE-EE
SECTION X-X
SECTION BB-BB
SECTION CC-CC
SECTION T-T
SECTION U-U
SECTION Y-Y
SECTION Z-Z
PINNING TOOL DETAIL (TWO REQUIRED)
Field locate and drill 13/16 dia. holes thru for and provide 3/4 dia. hex hd. bolts with hex nuts and washers
UHMW ATTACHMENT NOTE:
Drill, tap, and countersink for and provide 3/8" stainless steel bolts, 1" long on 12" centers, to attach all wear strips to guide extensions.
NOTES
Welding symbols apply to the joints of all members of similar identification.
All fillet welds shall be returned.
All bolts, 3/4 dia. and larger, shall be ASTM A325, galvanized steel, with hex hd. nuts and washers.
Field verify all dimensions and lengths of guide connections.
ALWAYS THINK SAFETY
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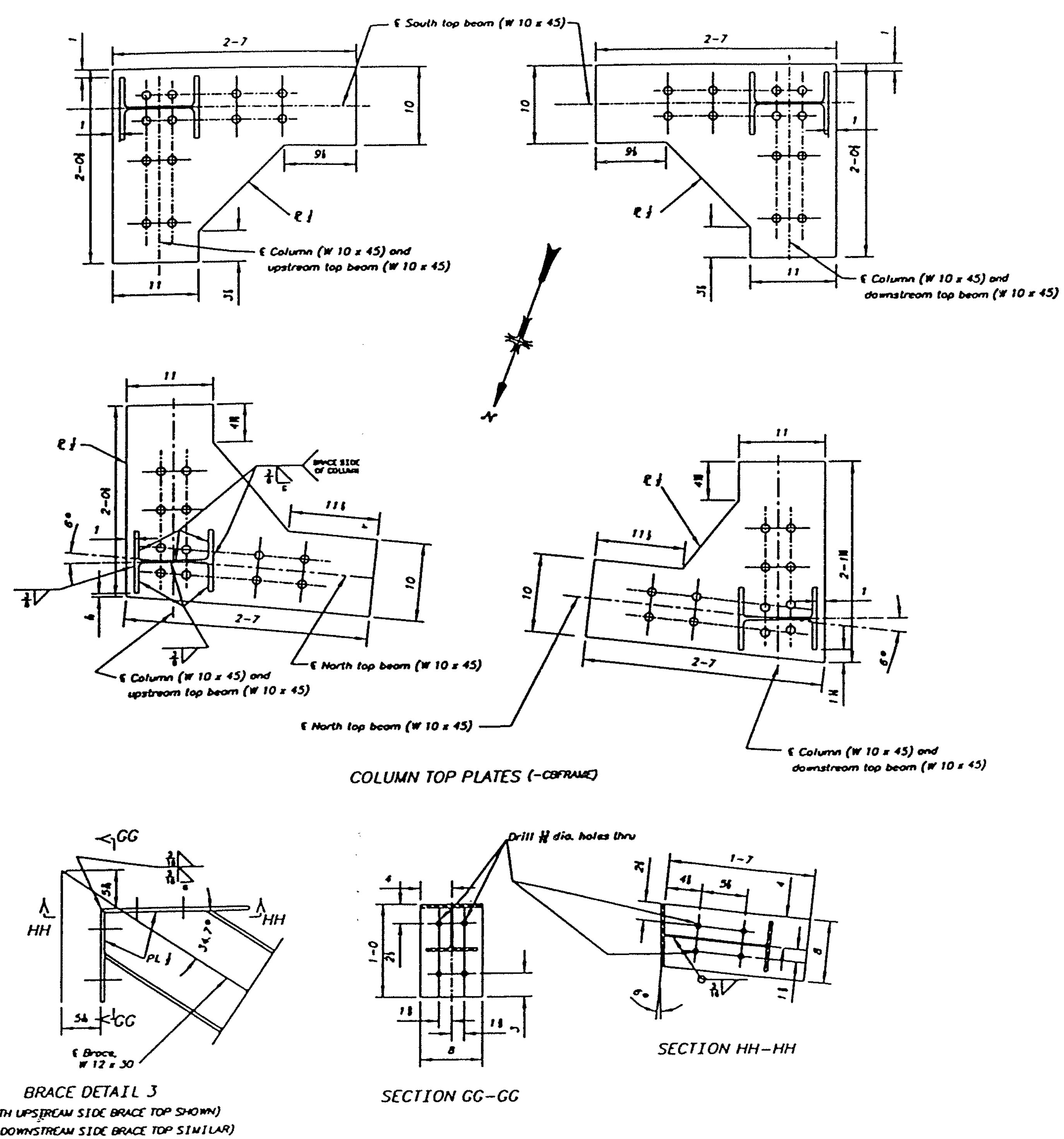
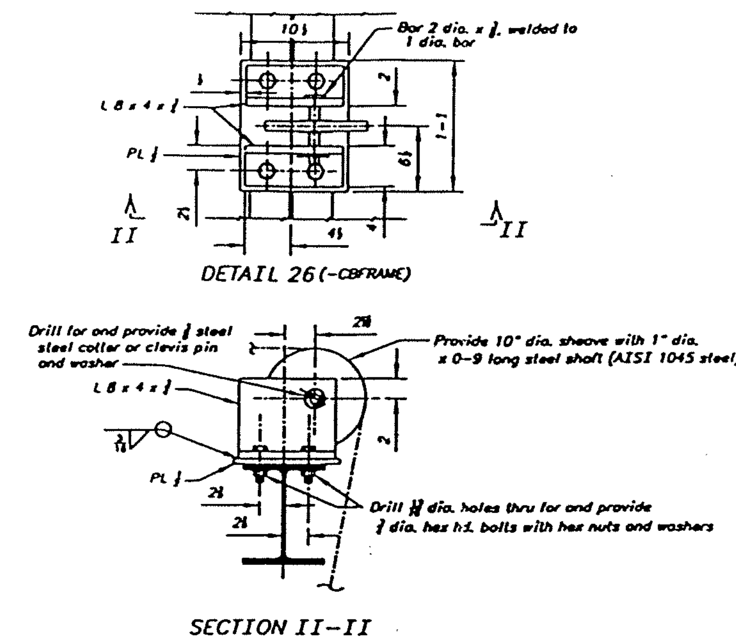
CRAB SCREEN SUPPORT FRAME
GUIDES - INSTALLATION - ASSEMBLY - DETAILS
CBFRAME3

CBFRAME4





NOTES

Welding symbols apply to the joints of all members of similar identification.

All fillet welds shall be returned.

All hex hd bolts shall be ASTM A325, galvanized steel, with hex nuts and washers. Provide bolt lengths to extend at least ⅛" beyond the nuts. Tighten ⅝ dia. bolts to a minimum tension of 12 kips, ⅞ dia. bolts to a minimum tension of 28 kips, and 1" dia. bolts to a minimum tension of 51 kips.

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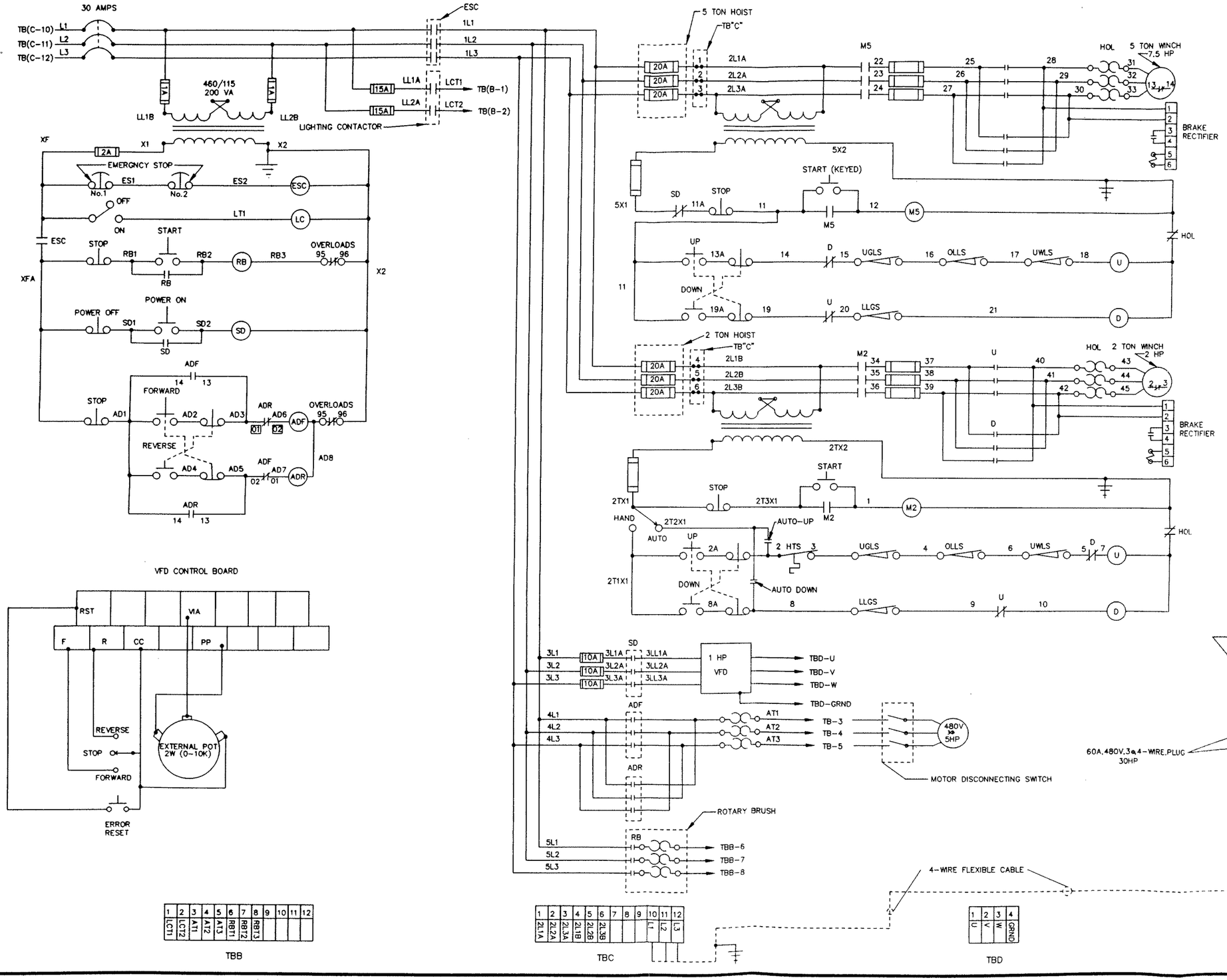
TRACY FISH COLLECTING FACILITIES

SECONDARY LOUVER STRUCTURE

CRAB SCREEN SUPPORT FRAME

BEAMS – COLUMNS – DETAILS

CBFRAME4



TBE

(IN CONTROL STATION)

1	XF
2	ES1
3	LT1
4	SD1
5	SD2
6	RB2
7	RB1
8	AD1
9	AD3
10	AD5
11	F
12	R
13	RST
14	PP
15	CC
16	VIA
17	2TX1
18	2T2X1
19	2T3X1
20	1
21	2
22	8
23	11A
24	11
25	12
26	13
27	19
28	
29	
30	

NOTES

E	EMERGENCY STOP PUSH BUTTON
ESC	EMERGENCY STOP CONTACTOR
LC	LIGHTING CONTACTOR
RB	ROTARY BRUSH
SD	TRAVELING SCREEN DRIVE LINE CONTACTOR
ADF	AUGER DRIVE FORWARD
ADR	AUGER DRIVE REVERSE
UGLS	UPPER GEARED LIMIT SWITCH
LLGS	LOWER GEARED LIMIT SWITCH
OLLS	OVERLOAD LIMIT SWITCH
UWLS	UPPER WEIGHT ACTUATED LIMIT SWITCH
HTS	HOIST THERMAL SENSOR

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UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
CENTRAL VALLEY PROJECT
SAN LUIS AND DELTA MENDOTA WATER AUTHORITY

TRACY FISH FACILITIES
TRAVELING SCREEN FOR MITTEN CRAB REMOVAL
ELECTRICAL CONTROLS

DESIGNED	JFL/TDC	SUBMITTED	
DRAWN	TCC	RECOMMENDED	
CHECKED		APPROVED	

TRACY, CALIFORNIA COMPUTER DRAFTED — AUGUST 8,1999 — 214-227WA-1099

SECTION J

Photographs

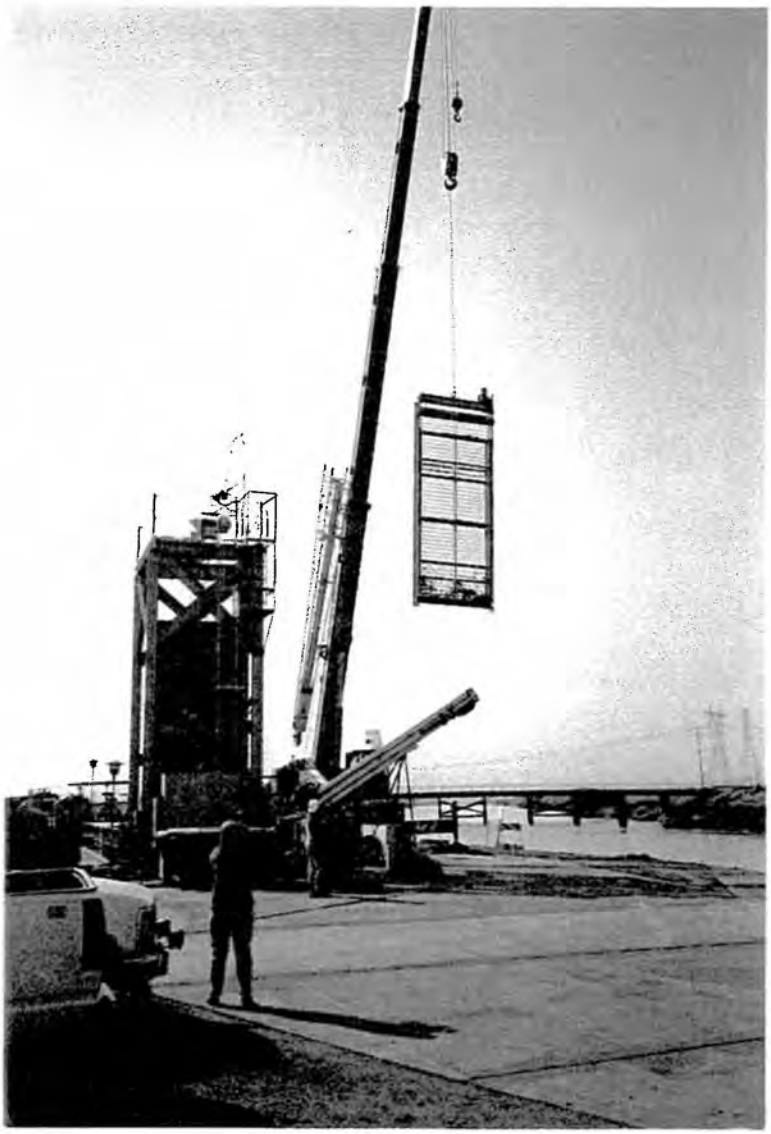

Figure 1: Crab Screen is lifted up and over the top of the superstructure for installation.

Figure 2: Crab screen and superstructure looking upstream.

Figure 3: Close-up of spray wash filter system and control panel.

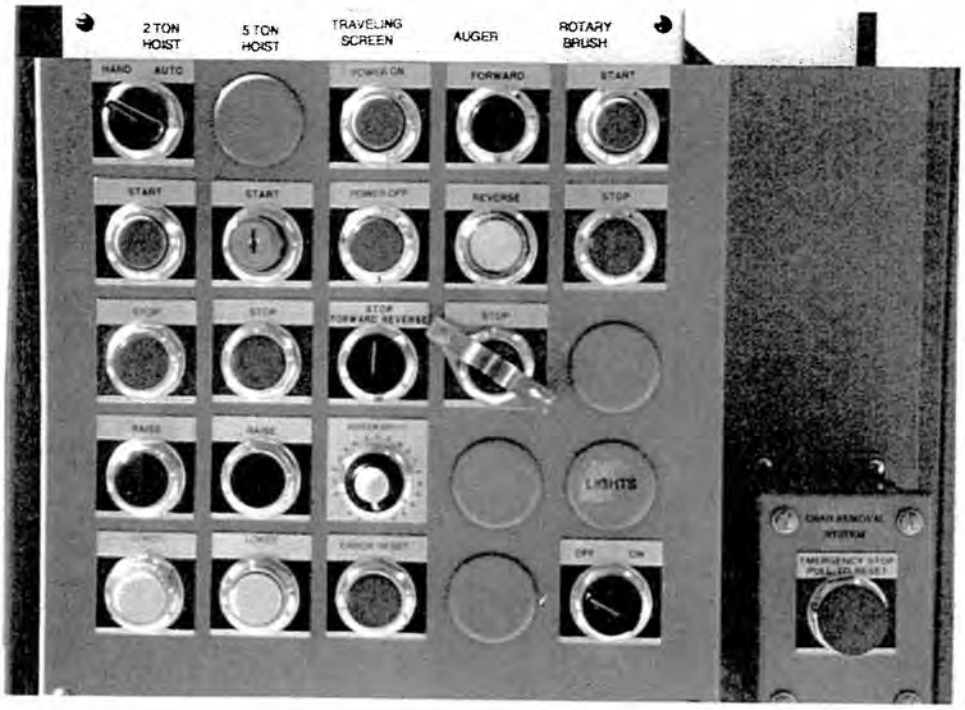

Figure 4: Control panel and screen emergency shut off.

Troubleshooting:

Problem:	Action:
Guide Plate is too low or too high while in the AUTO mode.	Switch the selector switch on the 2-ton Hoist to HAND and move the plate to the appropriate position. Then contact the Electric Shop (ext. 420) or the Tracy Control Room (ext. 445) for a repair technician.
Water pressure drops below normal (< 75 psi).	Change to Standby Filter and back flush the "dirty" filter. If this doesn't correct the problem, then contact the Machine Shop (ext. 470) or Tracy Control Room (ext. 445).
Auger becomes clogged.	Shut off the auger, and the Traveling Water Screen and contact the Machine Shop (ext. 470) or Tracy Control Room (ext. 445). Lift the screen only under direction of a supervisor or foreman.
Cable(s) on the Traveling Water Screen comes loose or is broken.	Stop the Traveling Water Screen, and contact the Machine Shop (ext. 470) or Tracy Control Room (ext. 445). Lift the screen only under direction of a supervisor or foreman.
Screen will not lift using 5-ton hoist	Depress the TWS "STOP" button, check that pins are removed, and that all Emergency Stop switches are reset
Auger is making unusually loud noise, or vibrating abnormally.	Shut off the auger, and the Traveling Water Screen and contact the Machine Shop (ext. 470) or Tracy Control Room (ext. 445). Lift the screen only under direction of a supervisor or foreman.

APPENDIX 2– Start-Up and Shut-Down Check Lists

Start Up Checklist–Debris Removal System

1. Perform Pre-Start Inspection of the DRS.

    1.1 CONFIRM Retaining Pin Bolts IN.
    1.2 INSPECT Traveling Screen, Hopper, Conveyor for damage.
    1.3 INSPECT plumbing, valves, hoses, and connectors for damage.
    1.4 OPEN DynaQuip and Apollo Valves at blue green Filter.
    1.5 CLOSE valves to Spray Boom and Hopper Sprayer Hoses (4 valves).
    1.6 CLOSE all 4 valves to Orange Filter Cylinders.

2. Turn ON Water Supply Pump at the Pump Control Panel.

3. FLUSH water supply line at the blue green Filter until water is clear of debris.

4. PARK dump truck beneath Conveyor.

5. REMOVE retaining pins.

6. LOWER Traveling Screen with 5-ton Hoist Controls on Traveling Screen Control Panel.

7. LOWER and Position Guide Plate with 2-ton Hoist Controls on Traveling Screen Control Panel.

    7.1 Guide Plate should be 6-12 inches above the water surface.

8. Close Hopper Lid.

9. FLUSH Spray Boom and Hopper Sprayer Lines by OPENING line valves.

    9.1 Flush until water clear of debris,
    9.1 CLOSE all Sprayer and Spray Boom Valves.

10. CONNECT Spray Boom Hoses to Traveling Screen. Connect Hopper Sprayer Hose to Hopper.

11. Start Flow to Spray Booms and Hopper Sprayers.

    11.1 PARTIALLY CLOSE the smaller line Apollo valve and larger line DynaQuip valve.
    11.2 OPEN Spray Boom Hose Valves and Hopper Sprayer Hose Valve
    11.3 ADJUST PRESSURE by opening or closing DynaQuip Valve.
    11.4 ADJUST FLOW using Spray Boom and Hopper Sprayer Valves.

12. START Traveling Screen rotation at Traveling Screen Control Panel.

13. START Conveyor at Conveyor Control Panel.

14. CHECK Conveyor alignment. Call Reclamation Facility Manager if problem.

15. ATTACH sluice and debris basket to stainless steel Hopper tray and walkway.

Shut-Down Check List–Debris Removal System

1. SHUT OFF Water Supply

    1.1 OPEN both DynaQuip and Apollo Valves at the blue green Filter D3.
    1.2 CLOSE valves to Spray Boom Hoses and Hopper Sprayer Hose.
    1.3 Disconnect Spray Booms at Traveling Screen.

3. STOP Traveling Screen rotation at Traveling Screen Control Panel.

4. STOP 2-ton Hoist at Traveling Screen Control Panel.

5. STOP Conveyor at Conveyor Control Panel.

6. OPEN and secure Hopper Lid.

7. RAISE Guide Plate using 2-ton Hoist Controls at Traveling Screen Control Panel.

8. RAISE Traveling Screen using 5-ton Hoist Controls at Traveling Screen Control Panel.

9. SHUT OFF Water Supply Pump at Pump Control Panel.

10. CLEAN UP debris in and below Hopper, and on Conveyor.

11. RE-INSTALL Retaining Pins to secure Traveling Screen.

12. PRESS and activate one or both of Emergency Shut-Off Switches.