

**LORI OIL RECOVERY SYSTEM
OPERATING AND MAINTENANCE INSTRUCTIONS**

**LORS-3 RECOVERY BARGE
DOP-160 TRANSFER PUMP**

APRIL 2000



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Operating Manual for **DOP-160 Pump**

INSTRUCTIONS FOR LORI OIL RECOVERY SYSTEM

1. General

This document is a general guide for the deployment, operation, and maintenance of the LORI Oil Recovery System, LORS-3 Recovery Barge. The information in this booklet must be adjusted according to the vessel operational requirements and organizational safety procedures. These Instructions should be refined to meet the specific operational needs of your organization and your operating environment.

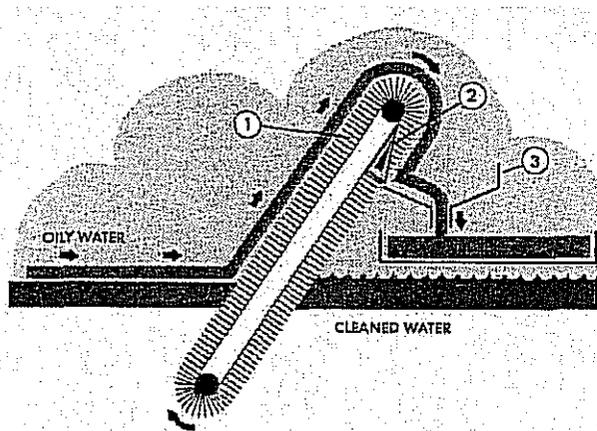
1.1 LORI Technology

The LORI Oil Recovery Systems (LORS), based on the proven LORI stiff brush conveyor technology, offers the highest possible performance and safety for offshore oil spill recovery operations. The LORS operates effectively at vessel speeds of up to 3 knots, which results in much higher oil encounter rates than other types of advancing skimmers.

The unique LORI Recovery Channel design concentrates surface water and oil into the brush conveyor for recovery while water pressure is relieved through exit channels in the sides of the barge. This increases the system's overall efficiency by avoiding the formation of a head wave, which could keep oil from contacting the brushes.

The LORS brush conveyor automatically separates and recovers oils, emulsions and oily debris from sea water and delivers it to deck level. The LORI system has a very high Recovery Efficiency, which takes full advantage of on-board storage volume and eliminates the need for decanting water. Recovered oil normally contains less than 5% free water. The LORI system is unaffected by the type of floating debris normally found in an oil slick.

The LORI system collects oils of all types and viscosities and can operate in adverse weather and sea conditions without losing performance. Performance improves as oil viscosity increases. The LORS can be deployed and operated by a small crew very quickly. Simple and intuitive operation requires very little specialized training.



THE LORI OIL RECOVERY PROCESS

The LORI System separates and recovers oil and oily debris from water as it passed through the Recovery Channel.

- ① LORI Brush Conveyor
- ② Brush Cleaner Unit
- ③ Collection hopper/delivery trough

1.2 Description of Operation

Deployment of the LORI Oil Recovery System changes makes entire barge an "oil slick processing system". The patented LORS uses the vessels' forward motion to process surface water and oil from the collection area, formed by Deflection Boom, through the recovery channel. The flow of water carries oil into the LORI Brush Conveyor, where the oil is efficiently separated and removed from the flow. The LORI system "filters" and lifts oil and debris from the water, which passes through clean.

Recovered oil and debris ride up the conveyor, are combed and squeezed from the bristles, and fall into the delivery trough. Recovered oil and debris flow by gravity into holding tanks or into an offloading pump, such as a DESMI DOP-160.

1.3 LORI Brush Conveyor

The LORI brush Conveyor consists of three parallel brush chains, carried on an hydraulically driven sprocket system (similar to a motorcycle). The "brush conveyor" is supported and protected within an aluminum frame. The brush cleaning mechanism is a comb-like device mounted at the upper end of the brush conveyor. During operation, the cleaner is positioned below the top axle of the conveyor, allowing recovered oil and debris to drop directly into the discharge trough.

The LORI Brush Conveyor is designed and constructed to function in the marine environment. The frame and hardware on the brush conveyor are of marine grade aluminum or stainless steel. The brush drive chain, sprockets, and axles are stainless steel. The brush elements are made of abrasion resistant nylon core with polypropylene bristles. The brush cleaner is fabricated from steel and stainless steel and powder coated for corrosion protection.

Hydraulic requirement to operate each brush conveyor is 0 to +5 GPM @ 1500 to 2500 psi. Normal brush conveyor speed is 1 ft. per second, which requires approximately 2 gpm hydraulic flow.

NOTE

It is recommended that the Brush Conveyor be removed from the recovery channel and stored on deck when not in service. Storing the Brush Conveyor in the skimmer bay may result in accelerated corrosion damage and problematic marine growth.

When not in use, the brush conveyor should always be kept under cover to protect the plastic brushes from being damaged by UV radiation.

1.4 Deflection Boom

Deflection Boom with air inflated or foam filled buoyancy chambers should be used to concentrate oil from a large sweep area into the LORI Recovery Channel. We recommend boom which presents a smooth profile (no square floats) to assist in deflection of liquid without creating turbulence. The boom should have a very high tensile strength if the barge will be towed by the boom. The boom should have a large freeboard and draft at the inboard end to compensate for vessel pitching and rolling.

NOTE

When not in use, the boom should always be kept under cover to protect the boom fabric from being damaged by UV radiation.

2.0 Preparing equipment for deployment

Prior to departure, check that the equipment is in good condition and that it has not been damaged during storage. Make sure that all equipment is functional and that there are no missing parts, such as hydraulic hoses. Replace any worn or defective parts before deployment.

Due to the high transit speed expected during the voyage to the spill site, we do not recommend positioning the brush conveyor in the recovery channel until arrival at site. Observe all organizational safety guidelines.

WARNING

Towing the barge at speeds greater than 5 knots with the brush conveyor deployed in the recovery channel may result in damage to the brush conveyor. It is recommended that the equipment remain secured in transit position until arrival at the spill site.

2.1 The LORI Brush Conveyor

Check that the chains holding the brushes are adjusted to the proper tightness. Too much slack in the chains can result in the chain contacting the aluminum cross members of the frame resulting in damage to the chain and aluminum frame.

Each brush chain can be loosened or tightened by adjusting the screws on the lower end of the brush conveyor. These screws adjust the position of each lower chain sprocket.

Note that new brush chains will stretch with use and will require occasional tightening. If the chain adjustment screws do not allow adequate tightening, remove one or two chain links as required.

NOTE

Check chain tension before each deployment. The chain is correctly adjusted when maximum sag is $\frac{1}{2}$ to 1 inch (12 to 25 mm) in the middle of the chain.

Check the condition of brushes and replace individual segments if necessary. Spare brush segments are provided with each LORI system and are available from the Manufacturer. Individual brush segments can be removed by knocking out the two stainless steel pins which hold it on the the brush chain.

If necessary, the whole brush chain can be removed for inspection, cleaning or repair by separating the chain at any link. The original assembly point link may be marked by a brush segment which is missing the center row of bristles. If this original link can not be located, the chain can be separated at any convenient point. When the chain is reassembled, mark the position of the reassembled link to assist in locating it the next time.

Spare link plates and a link-plate crimping tool are provided with each LORI system and are available from Hyde:

WARNING

Be sure that the chain tension is relaxed before opening a brush chain master link.

WARNING

To avoid damage to the brushes, never run the brush conveyor in the reverse direction for more than a few seconds. If the cleaner for some reason has been blocked, the brush conveyor can be run in the reverse direction for only a short distance (1 to 2 feet) to clear the blockage. The brush conveyor should then be operated in the forward direction to ensure proper operation.

WARNING

Do not exert forces, leave heavy objects on the brushes or place the brush conveyor in such a position that the brushes are bent or squeezed, as they can be permanently bent or flattened. This will adversely effect the recovery capacity and effectiveness of the brush cleaners.

Lower the Brush Conveyor into the skimmer bay. The Brush Conveyor should extend to the bottom of the recovery channel at an angle of 35 to 50 degrees from horizontal, with the Brush Cleaning Mechanism overhanging the oil collection hopper.

Check the hydraulic hoses and connections for leaks by test running the Brush Conveyor. If necessary the brush conveyor can be lifted out of the recovery channel for inspection and maintenance.

2.2 Transfer pump and storage facilities

Check that the receiving sump and storage tank are in the ready condition to receive oil and debris.

If a transfer pump is installed, check that it is ready for operation and that all the connections and hoses are in proper condition.

Operating Manuals for the DOP-160 Pump supplied by Hyde can be found in the APPENDIX to this Manual.

2.3 Oil Deflection Boom

Make sure that the work area is illuminated properly and cleared of all unnecessary equipment.

All personnel are to be instructed in the proper operation of the equipment and safety procedures. All personnel should be provided with the proper protective clothing for oil recovery work.

Check that the boom wall is in good condition. Repair or patch if necessary.

Check that the tension members/ballast chain are correctly installed and securely fastened to the end connectors and towing bridles.

Check the boom connectors for signs of fatigue or damage.

Attach trimming lines or cross bridles as required.

Move the oil deflection boom to a position on deck where it can be deployed safely and quickly.

3.0 Upon arrival to the oil spill site

3.1 Deployment of the equipment

Using the lifting davit, lift the Brush Conveyor over the recovery channel and lower it into position, with side angles resting securely on the diagonal guide rails. Carefully lower the brush pack along the rails until the lower end is captured in position and the brush cleaner overhangs the discharge trough at the top. The brush pack frame can be pinned, bolted or strapped in place for added security.

Connect the Brush Conveyor motor to the Skimming System Control Panel with the hydraulic hoses provided.

Deployment of the deflection booms will vary depending on the type of boom, arrangement details, and available lifting devices.

NOTE

A deployment procedure, optimized for the particular vessel and deflection boom, should be developed and refined during exercises with the LORI system prior to an oil spill emergency. Training should be conducted to ensure that the equipment can be deployed efficiently and safely.

The vessel should be turned into a position to minimize the adverse effects of wind and waves. We recommend a speed of zero to 0.5 knot in the downwind direction. Deploy one side at a time if crew is limited.

Deploy the Deflection Boom into the water, section by section, proceeding quickly and carefully. With a safety line attached to the lifting handle on the boom connector, lift the inboard end of the boom above the water and insert the boom end connector into the "C" boom slot adjacent to the recovery channel opening. Lower the boom until it is floating at the waterline.

In some cases, the boom should be raised above its normal floating position by several inches and secured there with the safety line. The water level on the forward side of the boom will increase as the vessel moves forward. The safety line should remain loosely attached to the rail or can be used to adjust and secure the vertical height of the boom.

NOTE

The boom should not be allowed to sit too deep in the water during operation. The boom is designed to deflect the surface water and oil into the recovery channel. Deploying the boom too deep in the water only increases the total drag on the vessel and reduces the available freeboard of the boom.

Deploy the deflection boom on the other side of the vessel if two sides are supplied.

3.2 Adjustment and Trimming the Deflection Boom

It is important to note that the Deflection Boom is an integral part of the recovery system. Proper adjustment of the boom will allow a LORS equipped vessel to operate at speeds of 1.5 knots depending on vessel sizes and operating conditions. Speeds up to 3.0 knots may be possible by using cross bridles to keep the boom in a straight "V" shape.

Once the system is deployed, adjustment is necessary to keep the Deflection Boom in the optimum deflection shape. Boom adjustments will be required as follows:

- a) Adjust the vertical height of the inboard Deflection Boom to maintain freeboard.

Vessel forward motion can raise the height of the water in front of the sweeping boom significantly above the normal waterline. This, combined with motion of the vessel and choppy waves, may result in some surface fluid topping over the boom.

In these cases, the inboard end of the boom can be pulled up several inches and secured with the safety line to the rail in order to maintain sufficient freeboard during operation. The towing vessel will need to ease tension on the boom before making this adjustment.

- b) Maintain tension in the forward towing line and position of the towing skiffs to create the proper overall shape the deflecting boom.

If the boom forms a deep "J" or "U" shape at operating speed, surface oil may not be deflected into the recovery channel for recovery. Instead, oil will be entrained and lost under the boom. The goal is to maintain the smoothest possible deflecting shape at operating speed. Operators should see surface fluid flowing along the boom wall.

NOTE

In NO CASE should the boom be allowed to drag in a "U" behind the inlet of the skimmer bay. If it does, slow the towing skiff speed and adjust the position relative to the other skiff and LORI barge.

A sea anchor, deployed from the trailing end of the barge, may be required to increase drag of the vessel and keep the boom in a more efficient deflection shape.

As a check of proper adjustment during operation, a strong current of surface water and oil should be seen flowing along the boom wall into the opening of the Collection Channel.

WARNING

GREAT CARE must be used when towing the LORI barge and deflection boom. Observe all organizational safety procedures at all times. Use these procedures and good seamanship as a guideline for determining the best deployment, operating and retrieval techniques.

c) Install and use cross bridles or trimming line(s) or cross bridles if necessary to maintain shape the middle of the boom.

Exercising with the LORI skimming vessel and boom will determine if these trimming lines are necessary for a particular operating condition. Install the minimum number of bridles necessary to "fine tune" the boom shape.

d) Some operating conditions, may require that shorter sections of deflection boom or narrower overall sweep width (distance between skiffs) be used in front of the Recovery Barge. Exercise with the system in various conditions to determine the optimum configuration for various conditions.

4 Operation of the LORI equipment

4.1 General

When using the LORS always consider safety and comply with good seamanship. Sea and weather conditions must be taken into account at all times.

If possible, always operate the vessel in the direction of the waves.

Avoid large floating obstacles, such as tree trunks, which may damage the recovery system.

Observe the water flow pattern along the deflecting boom and into the recovery channel. If the boom sags into a "J" shape and the flow slows or stops, oil may begin to escape underneath the boom due to entrainment. If this happens, slow and reposition and towing skiff(s).

Check regularly that the Deflection Boom is standing upright and is remaining in an efficient deflecting shape along its entire length. Adjust the speed and position of the towing skiffs as needed.

Check regularly that the Deflection Boom is adjusted to the correct height at the Recovery channel end. To avoid splash over, the boom should have a freeboard of 40 to 50% of its inboard height during operation. Adjust the inboard height by

pulling the boom up and securing with the safety line. It will be necessary to stop the towing skiffs and ease the boom tension in order to adjust the inboard height.

NOTE

The nominal operating speed of the brush conveyor is 1 ft/sec (0.3 m/s).

Operate the brush conveyor as slow as possible to match to incoming flow of oil and oily debris. Observe the quality of oil being recovered and adjust vessel speed and brush speed accordingly. If very little oil is being recovered, slow the brush speed to reduce the volume of water recovered.

Operating the brush conveyor at high brush speeds creates a backward current within the recovery channel that can actually push the oil away and reduce the recovery rate. Operating the brush conveyor at too high a speed also increases the water content of the recovered oil, reducing the overall recovery efficiency.

The LORI system recovers small debris such as sticks, sea weed, and trash together with oil. Check the oil discharge hopper regularly to be sure that debris does not block narrow passages or debris grating.

If a large floating solid object such as a log enters the recovery channel, shut off hydraulic flow to the motor IMMEDIATELY. Large debris should be removed from the channel before it impacts the brush conveyor to avoid damage.

If a brush chain breaks, shut off hydraulic flow to the motor IMMEDIATELY. The chain can be repaired using a new chain link or the chain can be removed until an opportunity arises to affect repairs. The brush conveyor can be operated with one less brush chain as long as necessary but some oil will escape through the void space.

A length of floating sorbent boom may be secured inside of the water discharge trunk to adsorb any small amount of sheen that may pass the recovery brushes.

4.2 Vessel speed versus brush speed

The recovery speed of the barge should be adjusted in accordance with the environmental conditions and the oil to be recovered:

- In optimum conditions of flat water and highly buoyant viscous oil, vessel speeds of 1.5 knots can be used. The range of operating speed is 0.5 to 3.0 knots, depending on the ability to control of the deflection boom.

- With high oil concentrations and high vessel speeds the brushes can be run at the speed of one foot per second.
- If the oil has a high specific gravity and is easily mixed into the water by turbulence, then lower speeds must be used.
- Too high brush conveyor speeds (>1 ft/sec) in connection with low vessel speed (0 to 2 knots) may cause a counter current within the recovery channel which can reduce the recovery rate.
- High brush speeds in areas of low oil concentration tend to increase the amount of free water taken up with the oil. In this case lower brush speeds are recommended.
- High vessel speeds combined with low-viscosity (light) oil may cause some oil to escape through the brush conveyor and mix with the water column. In this case lower vessel speed and lower brush speeds are recommended.

4.3 Operational modes

Stationary

The LORI system is primarily an advancing system. It requires some relative movement of water through the skimmer bays. However the LORI system can be used in stationary mode to support shoreline cleanup operations where oil can be washed toward the recovery device. It can also be used to harvest oil from within a contained area by slowly reducing the boom length, decreasing the contained area, and therefore concentrating the oil to the brushes.

In the presence of a current, the LORI vessel can hold station and await the oil to flow into the recovery system. In a river, containment boom can be anchored upstream of the LORI vessel to deflect and concentrate oil toward the skimming system. In deep water, enhanced booming techniques using boats can be used (see below). In both cases, careful consideration must be given to the boom's ability to handle the speed of the current.

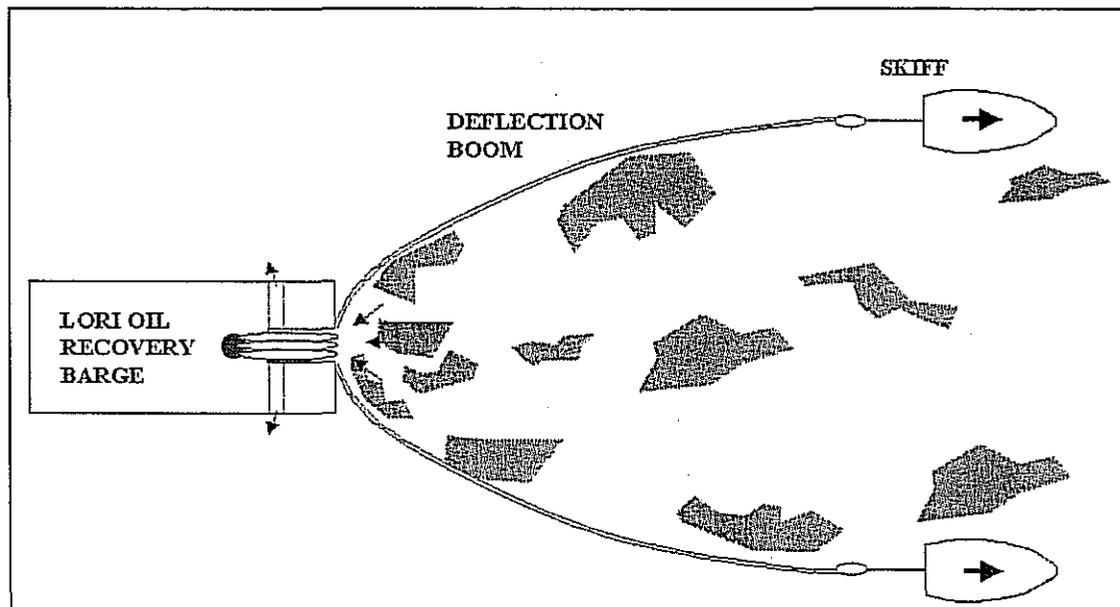
Advancing

The LORI Barge is a powerful self-contained oil recovery system. When possible, operate the vessel in the same direction as the spreading oil slick. The LORI is ideal for skimming along "windrows" and in tidal "rips".

If oil is to be recovered in congested areas, such as in a crowded harbor or in shallow water near shorelines, it is recommended that the vessel operates at relatively slow speeds, scooping and filling the sweeping boom full of oil. It can then

proceed into open water and increase speed until the oil is forced into the LORI skimmer bay.

The normal operating configuration is for the LORI barge to be towed behind two boom towing skiffs to continuously funnel oil from a large area into the LORI system.



Enhanced booming techniques can be used to increase oil encounter rate (feed more oil into the brushes) and increase the effectiveness of a single LORI vessel:

- One or more “teams” of booming boats can operate independent of the LORI vessel to sweep through a large area of widely spread oil. When a sufficient volume of oil has been captured within the boom area, the LORI vessel can be signaled to recover the concentrated oil. Several techniques are effective:
 - The LORI vessel can enter the towed sweep and skim the oil within the boom area
 - As one tow vessel casts off her tow line and the second vessel tows the boom ahead, the LORI vessel can follow behind the trailing edge of the boom and recover the oil as it is released
 - The LORI vessel can position itself behind the apex of a the concentration boom and collect oil released from the apex of the sweep. The sweep can be fitted with an oil discharge “window” which is opened to release the oil into the

LORI or the tow boats can release the oil by increasing speed and purposely entraining oil beneath the boom skirt at the apex.

Transit

Upon arriving in areas of lower oil concentration, the vessel speed may be increased until a thicker patch of oil is encountered.

For short transits between areas of high oil concentration, the Brush Conveyor can be left in the recovery channel. The deflection boom should be detached from the recovery Barge and towed by the skiffs separate from the barge. It is possible that for short distances and at slow speed, the skimming barge can be towed with the deflection booms streaming behind the barge.

For longer transits or rough conditions, the Deflection Boom and Brush Conveyor should be lifted onto the deck and secured.

5. Procedure following recovery operations

5.1. Dismantling the equipment

Stop the towing operation or slow to a speed of less than 1 knot.

Detach the after end of the Deflection Booms from the sides of the recovery channel and lift onto the deck. Retrieve the boom onto the deck as towing line is eased or the skiff is allowed to drift back.

Lift the LORI brush conveyor out of the Recovery Channel and secure it in transit position.

Position and secure the equipment in a suitable place for returning to port and cleaning. Avoid spreading oil and debris beyond the work areas if possible. In some designs, the boom can be placed in a contained area on top of the barge. This keeps all of the oily equipment together and off the deck. It also facilitates cleaning.

Clean the equipment according to the instructions below. Dispose of all oily cleaning water in an appropriate way.

5.2. Cleaning the equipment

Follow all safety procedures if the Brush Conveyor and offloading pump could be "live" during cleaning operations.

All equipment should be rinsed thoroughly with fresh water after any contact with salt water or salt spray.

Always use common sense when it comes to what cleaning chemicals and techniques are used and how the equipment is preserved after cleaning (ie, wipe the outside of motors and bearings with rust preventative and grease all bearings immediately after cleaning.).

5.2.1 LORI System

Aluminum Frames

Use diesel oil to remove sticky black oil from the recovery equipment. Do not use caustic alkaline cleaners (high pH) on aluminum parts. Use only mild detergent. Steam or pressure sprayers can be used on the metal surface.

Brush Conveyor

We recommend that diesel oil should be used for an initial decontamination to remove sticky black oil from the recovery brush conveyor.

Do NOT use steam or high temperature pressure nozzle directly on the plastic brushes. Maximum cleaning water temperature is 120 deg. F (50 deg. C).

It is recommended that a PETROLEUM BASED cleaning agent is used on the brush conveyor in order to prevent damage or unnecessary wear to the brush bristles.

Do not use chemicals or solvents which may damage or embrittle the polypropylene bristles or nylon brush cores. When in doubt, test the chemical by soaking a spare brush segment and test the reaction.

To make cleaning easier, the brush conveyor can be operated while it is being sprayed with diesel or with warm cleaning solution. The action of the brushes passing through the combing device will aid in cleaning the bristles. The brush conveyor can also be submerged in a bath of cleaning solution and rotated using an hydraulic power conveyor.

It may be helpful to break each chain at the master link and remove the brush chains for cleaning. This can help in removing oil deposits from the chain links behind the brush cores. Be sure to relax chain tension before breaking the link. The chain assembly link is normally marked by a brush segment which has the center row of bristles clipped off but any chain link can be cut and repaired.

Boom

Use warm fresh water to clean the boom if it is not badly oiled. Over time, detergents can remove plasticizers from the boom fabric making it brittle. Use a mild detergent and warm water to clean the surface of the boom wall if it is badly oiled.

A high pressure spray washer can be used but the spray nozzle must be kept several inches from the nozzle. We do not recommend using a steam cleaner due to possible damage from high temperatures. Rinse thoroughly with fresh water and let stand in a cool dry place to dry completely before storing.

5.2.2 DESMI pumps and hoses

Diesel oil can be used to remove thick concentrations of oil from the external surfaces of the pump and hoses.

To clean the inside of the pump, remove the plate wheel cover, submerge the pump in diesel oil or a mild cleaning solution, and operate the pump slowly.

At the same time, the DOP can be used to clean the inside of discharge hoses by recirculating from the cleaning tank through the pump and discharge hose and back.

NOTE

Follow all of the instructions in the DESMI Operating Manual on the cleaning and preservation of the DOP pump after cleaning.

5.3 Storage

Although the brushes have been treated for protection against ultraviolet radiation, it is recommended that the oil recovery equipment should not be exposed to the sun for extended periods of time

When not in operation, the Brush Conveyor should not remain in sea water for extended periods of time, because of potential corrosion damage and fouling by marine growth.

The DOP-160 pump should be stored under cover and in a relatively dry environment if possible. If this equipment is stored in the presence of salt air and high humidity, it should be regularly exercised and lubricated for storage in accordance with the operating manual to avoid corrosion on the internal parts.

6. Inspection and Maintenance

6.1. LORI Brush Conveyor

A trained mechanic should inspect the brush conveyor after cleaning for signs of worn or broken parts.

Remove the Brush Conveyor from the skimmer bay for inspection and maintenance.

During inspection and maintenance of the LORI Brush Conveyor, the following should be checked:

- Frame welds and dimensions for bending, cracking, and wear.
- Alignment of the brush chains (upper and lower shafts and chain sprockets) with respect to the Brush Conveyor frame and Brush Cleaner.
- Tightness and secureness of the brush chains, chain master links, cleaner bolts, upper shaft sprocket, lower shaft sprockets, Chain Tightness Adjustment bolts, and all other assembly hardware.

Test Operate the Brush Conveyor at a speed of 1 ft/sec (0.3 m/s) and check the following:

- The running of the brush chains
- The functioning of the cleaner
- The drive shaft bearing temperature (should not be too hot to touch)
- The functioning of the hydraulics

The brush segments are attached to the chain by two stainless steel pins. A brush segment can be removed by knocking out these two pins with a thin punch.

To remove a complete brush chain, loosen the Chain Tightness Adjustment Screws on either side of a lower shaft sprocket. When the chain tension has been eased, open the chain at the master link. If the master link can not be found, the chain can be separated by cutting a link at any convenient point.

A new master link is installed by squeezing it with the master link tool provided in the tool kit or by flaring the end of a link pin with a wide punch and hammer.

Grease the bearing on the upper drive shaft. Wipe the outside surfaces with a protective lubricant.

The paint on the brush combing mechanism can peel and crack after extended use. Small areas of exposed metal can be cleaned, prepared and touched up with marine epoxy. For more extensive repair, the Brush Cleaner can be removed from the brush Conveyor for cleaning, blasting and powder coating.

The hydraulic motor is made of steel and should be protected from corrosion by regular application of paint.

The hydraulic quick couplers should be cleaned, inspected and preserved by wiping with a protective lubricant.

6.2 Oil Deflection Boom

Check the oil Deflection Boom material for cracks, cuts or worn areas. Repair this damage as necessary.

Check the condition of the aluminum attachments, end connectors, lifting straps, and tension members. Tighten all assembly hardware.

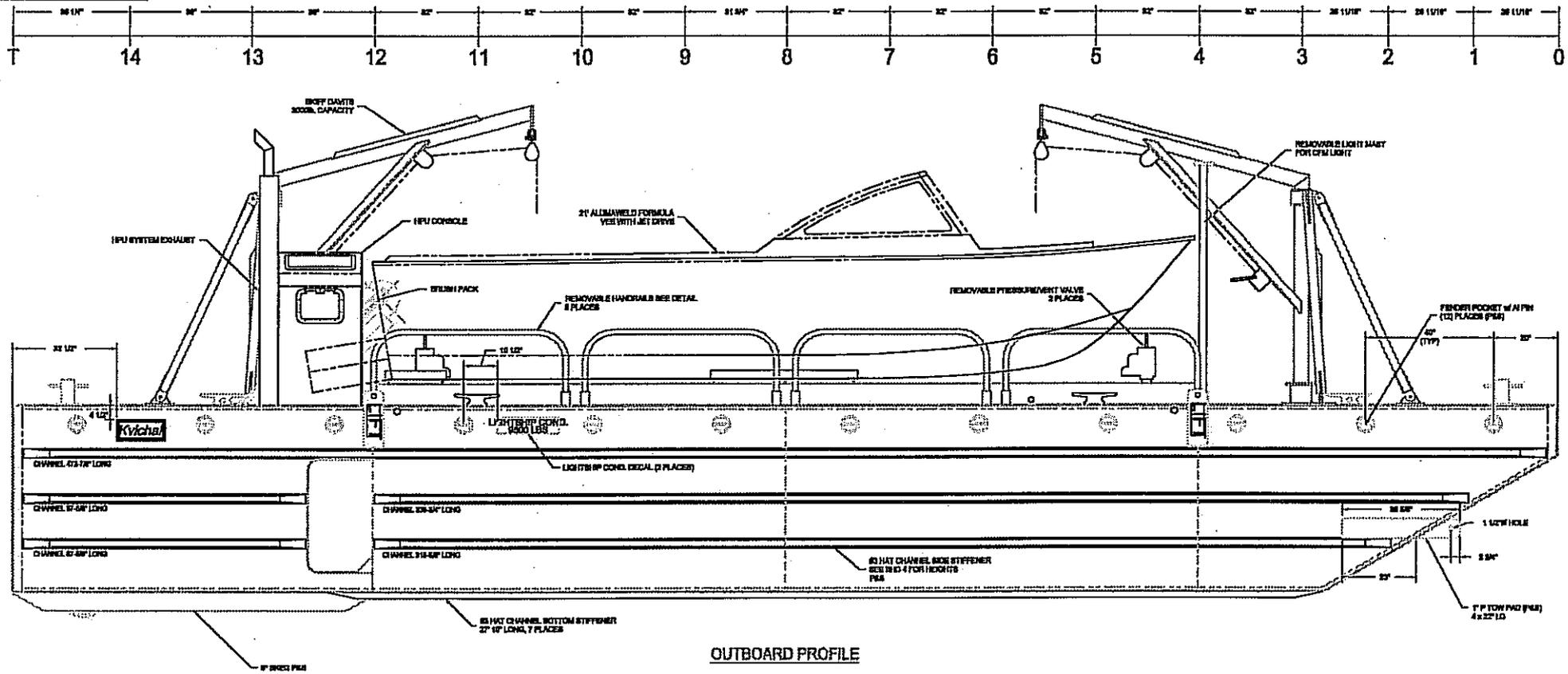
APPENDIX

TECHNICAL SPECIFICATION: SOUTHEAST ALASKA RECOVERY BARGE

LORS-3 PACKAGE FOR KVICHAK BARGE PACKAGE HYDE JOB NO. 3754

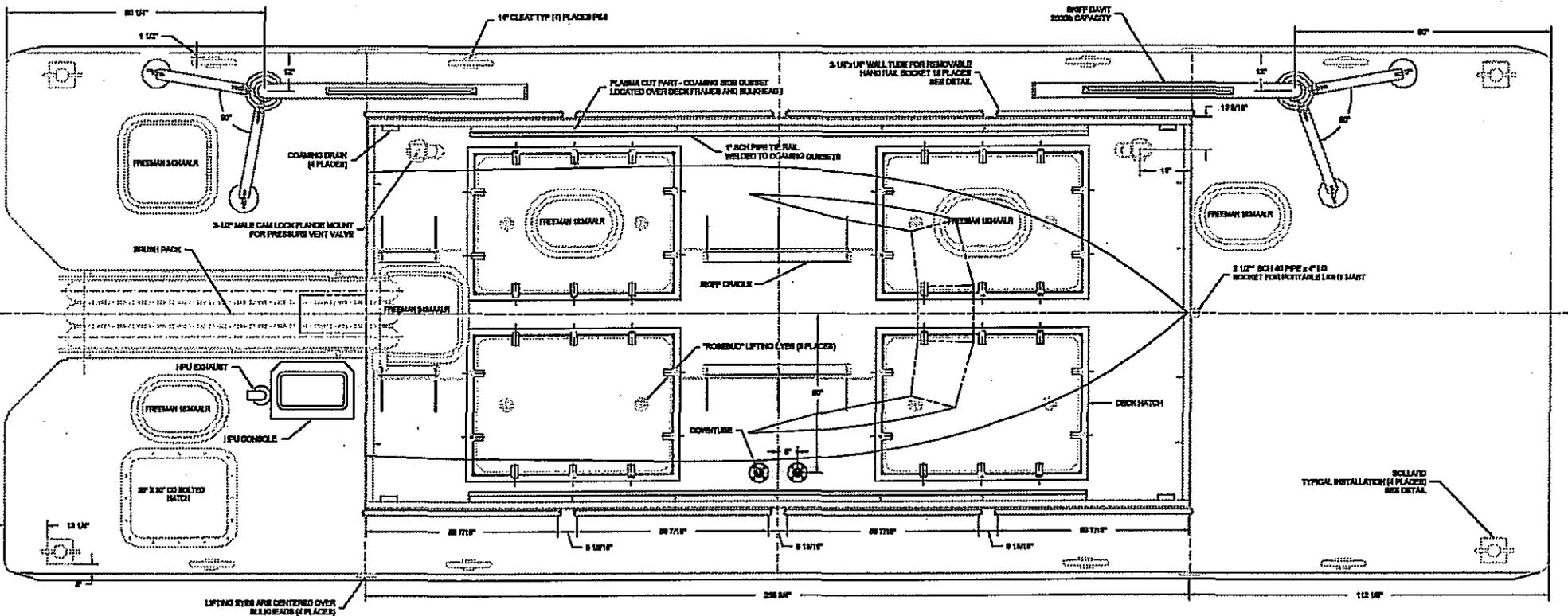
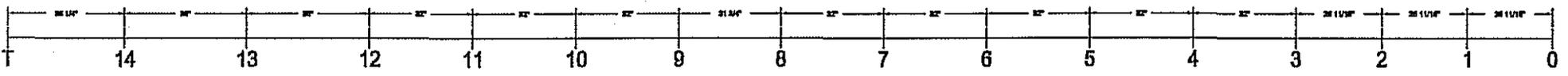
Name Plate Recovery Capacity	774 bbl/hr (123 m ³ /hr)
Skimming Speed:	0.25 to 3 knots
Viscosity Range:	0 to >1,000,000 cst
Debris Handling:	Sticks up to 3 inch dia.x 2 ft. long, plastic garbage, rope, seaweed, etc.
LORI Brush Pack:	Model HK3/3.3
Brush System Configuration:	3 chain Brush Conveyor (linear oil recovery conveyor with stiff brush segments mounted on chains which are driven by an hydraulic motor)
Brush Conveyor Dimensions (L x W x H):	130 in. x 26.75 in. x 16.5 in. x 290 lbs.
Brush Conveyor Materials of Construction:	
Brush Conveyor frame:	Marine Aluminum
Shafts, sprockets, chains:	stainless steel
Brush pins, assembly hardware:	stainless steel
Brush cleaning mechanism:	epoxy coated steel and stainless steel
Brush segments:	Polypropylene bristles and Nylon core
Hydraulic motor:	Danfoss OMP-200
Hydraulic Requirement::	0 to 5 GPM @ 1500 to 2500 psi

THIS DESIGN IS PRELIMINARY TO
 ANOTHER DESIGN GROUP, ONLY.
 PLEASE BE AWARE, IT SHOULD NOT BE CONSIDERED
 A FINAL DESIGN OR CONSIDERED FOR CONSTRUCTION
 WITHOUT THE WRITTEN CONSENT OF
 ELLIOTT BAY DESIGN GROUP.



OUTBOARD PROFILE

ELLIOTT BAY DESIGN GROUP, LTD.			
NAVAL ARCHITECTS		SEATTLE, WA	
		MARINE ENGINEERS	
CLIENT			
KVICHAK MARINE INDUSTRIES			
SEATTLE, WASHINGTON			
PROJECT			
OIL SPILL RECOVERY VESSEL			
TITLE			
OUTBOARD PROFILE			
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CRD	KRL	DATE	3/28/00
APVD	KRL	DATE	3/28/00
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SCALE	3/8"=1'-0"	FILE NAME	1041-01_00012_8
REV	-	SHEET	1 OF 1



DECK ARRANGEMENT

ELLIOTT BAY DESIGN GROUP, LTD.			
NAVAL ARCHITECTS		SEATTLE, WA	
MARINE ENGINEERS			
CLIENT	KVICHAK MARINE INDUSTRIES		
	SEATTLE, WASHINGTON		
PROJECT	OIL SPILL RECOVERY VESSEL		
TITLE	DECK ARRANGEMENT		
DWG	ANNV	DATE	3/28/00
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