Built on Tradition

Highland Tank

Aboveground Rectangular Manual Oil Interceptors

HT-2054

User Manual

Installation, Operation & Maintenance

Carefully read and follow the instructions in this manual.

MOI & MOI-SO
Flush with Floor
Single-wall & Double-wall





MADE IN U. S. A.

Warning and Disclaimer

This manual is intended for use only by persons knowledgeable and experienced in oil interceptor installation, operation and maintenance. This manual provides general guidance, and conditions at your site may render inapplicable some or all of the guidance. If you are uncertain, or require clarification or further instruction, please contact Highland Tank prior to commencing any installation, operation or maintenance procedure. You are solely responsible for compliance with all federal, state and local laws, regulations and ordinances applicable to your installation and operation. Highland Tank disclaims all liability related to any misuse of the oil/water separator or failure to follow all guidance and instruction provided by Highland Tank.

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Introduction

Thank you for purchasing a Highland Tank Oil Interceptor - from the industry leader in oil water separation.

The purpose of this manual is to provide detailed information on the installation, venting, startup, operation, maintenance and trouble-shooting of Highland Tank's Oil Interceptor.

These instructions should be used in conjunction with any and all other applicable installation instructions, e.g.:

- Petroleum Equipment Institute's Installation of Liquid Storage Systems.
- Any and all applicable federal, state and local codes. Always check with Authority Having Jurisdiction.

Note: This manual is based on standard MOI configurations. Other custom configurations are available. Verify the supplied configuration prior to installation and testing.

Abbreviations used:
MOI – Manual Oil Interceptor
MOI-SO – Manual Oil Interceptor with Side Oil Compartment
AHJ – Authority Having Jurisdiction
PSIG – Pounds per square inch, gauge
OSHA – Occupational Safety and Health Administration

Important points to consider prior to installation, operation and maintenance of the MOI:

Carefully read and follow instructions in this manual. Local codes and ordinances may apply. Check with local AHJ prior to installation of MOI.

- Ensure adequate site space - many of our products are delivered on a 75 foot long tractor-trailer. Allow space for unloading, positioning and temporary storage if applicable. Contact Highland Tank if special delivery considerations are needed.

- Ensure the crane has adequate lifting capacity and clearance - have operator check site for clearances (overhead, turning, etc.). Spreader bars may be required for larger MOIs.

- Ensure that installation staff have proper knowledge of proper procedures and inherent dangers associated with MOI installation for the storage of flammable and combustible liquids. Reliance on skilled, professional installation staff, can help avoid system failures and accidents.

- Special permits may be required for weight, size, etc. by local code or ordinance.

- Barricade the MOI installation area until job is complete.

- Confirm inlet and outlet piping elevations - coordinate with site plan, check/recheck approval drawing and site plan when MOI arrives.

- If an MOI hold-down system is required, make sure predetermined system components are at the site prior to MOI installation. Check anchor bolt locations if applicable.

- The amount of debris, such as sand, gravel, dirt, leaves, wood, rags, etc., permitted to enter the MOI must be minimized for maximum effectiveness. Installation of an appropriately sized Collection Catch Basin or other similar device upstream of the MOI is recommended.

- Detergents and solvents must not enter the MOI. The MOI will not remove chemical emulsions or dissolved hydrocarbons, and their presence retards the recovery of oils that would otherwise be separated.

- Never enter the MOI or any of its enclosed spaces without proper confined space entry training and approved equipment. See OSHA, Regulations for Permit-Required Confined Spaces 29 C.F.R. § 1910.146.

- The MOI must be kept from freezing at all times. If necessary, a thermostatically controlled steam or electric heating device may be installed.

Important points to consider continued:

- IMPORTANT: DO NOT modify MOI structure in any way. DO NOT weld on MOI.
- This is a stationary MOI. DO NOT use for transport of any product over roads and highways.
- Wastewater containing high concentrations of dissolved solids (such as untreated sanitary sewage) must be excluded due to its emulsifying tendency. Wastewater, which exhibits high Biological Oxygen Demand, Chemical Oxygen Demand, and Total Suspended Solids may require additional treatment beyond that of the MOI.
- The MOI WILL NOT remove chemical or physical emulsions, dissolved hydrocarbons, solvents or Volatile Organic Compounds. Installation of an appropriately sized Highland Tank Oil/Water Separator (brochure HT-2040) and/or Advanced Hydrocarbon Filtration System (brochure HT-2503) is recommended for treatment of wastewater contaminated with these pollutants.
- Waste oils, such as automobile and truck crank case oil, should not be intentionally drained into the MOI. Filling the MOI with waste oils adversely affects MOI performance. Waste oil should be dumped into a waste holding tank for proper disposal.
- The MOI needs to be maintained to remain as free of accumulated oil and sediment as possible. Suction removal of waste, as needed, is the best and recommended method of maintenance.
- The location of your MOI should be in an area with sufficient truck access for waste removal.
- An absence of gravity flow to the MOI will necessitate wastewater pumping. Pumping should be restricted to the clean water, effluent end of the MOI where possible. If pumping cannot be avoided at the influent end, it may mix the oil and water, increasing the emulsified and dissolved oil content and may cause separation failure. If a pump is installed upstream of the MOI, it must be a positive displacement pump (e.g. progressive cavity, diaphragm, sliding shoe), set at minimum flow rate/RPM and installed as far upstream as possible to minimize oil/water mixing.
- Piping should be designed to minimize turbulence and promote laminar flow.
- Complete the MOI Installation Checklist and Start-up Report (Form # HT-9065). A copy of the completed form should be retained by the MOI owner and/or installation contractor.
- MOI must be filled with clean water before introducing any wastewater. Filling should only be done after MOI has been leveled and anchored in final installation location.

Standard MOI Description

Highland Tank's MOI is a wastewater treatment tank used to intercept and collect free-oil, raw petroleum hydrocarbons, grease and oily-coated solids from a wastewater stream.

They are typically installed in all facilities that conduct washing, servicing, repairing, maintenance or storage of motor vehicles, car washes, commercial vehicle garages, repair facilities, service stations and similar sites where oil or flammable liquids may be introduced into a sewer system.

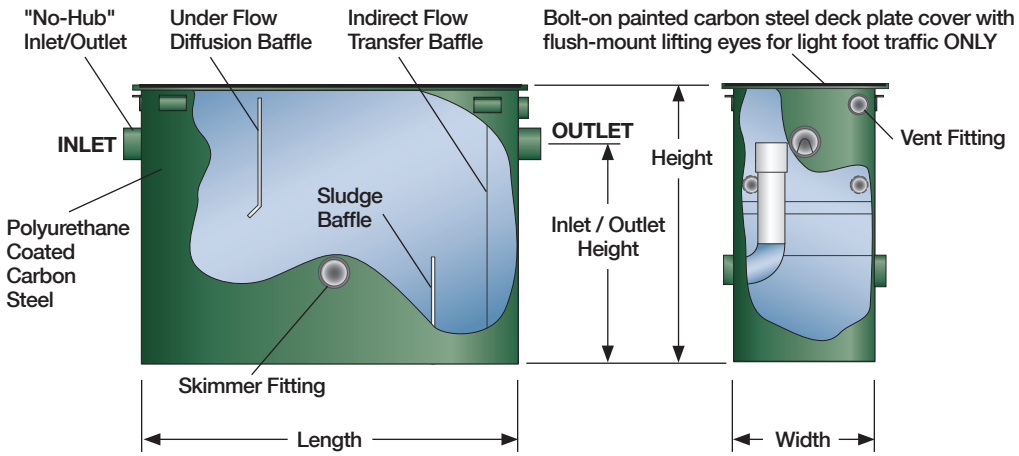
Designed to accept gravity flow, the MOI volume and retention time permit these contaminants to separate from the water due to their differences in specific gravity. The MOI contains an adequately sized chamber where oils separate and float to the surface, while sand and grit settle to the bottom.

Free-floating oils and floatable oily-coated solids accumulate in the MOI until they are pumped out. The clearer water beneath the separated wastes flows downward and exits the MOI via the outlet baffle where it is discharged from the MOI.

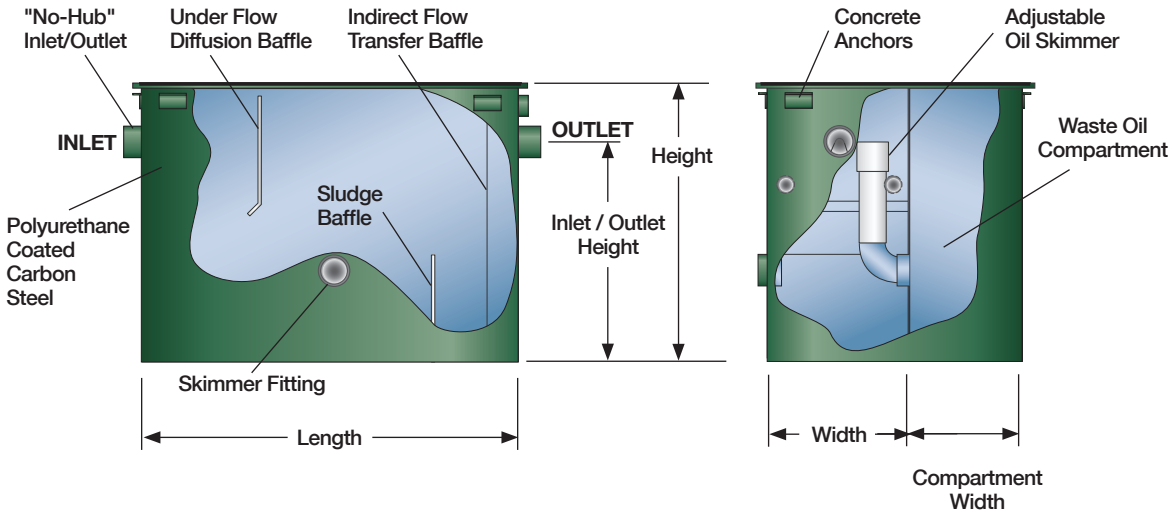
MOI sizing and construction conforms to most plumbing codes. Nonetheless, you must confirm all code and regulatory requirements with your AHJ prior to and during installation of the MOI.

Model MOI - Manual Oil Interceptor &
MOI-SO - Manual Oil Interceptor with Side Oil Compartment

MOI



MOI-SO - with Side Oil Compartment



Installation

MOI Care in Handling

MOIs must not be dropped, dragged or handled with sharp objects. Lifting equipment must be of adequate size to lift and lower the MOI without dragging, dropping or damaging the MOI or its coating.

MOI Unloading

The MOI must be mechanically unloaded. Use extreme care when unloading as weight distribution of MOI may be uneven.

Lifting & Moving

DO NOT MOVE MOI UNLESS EMPTY

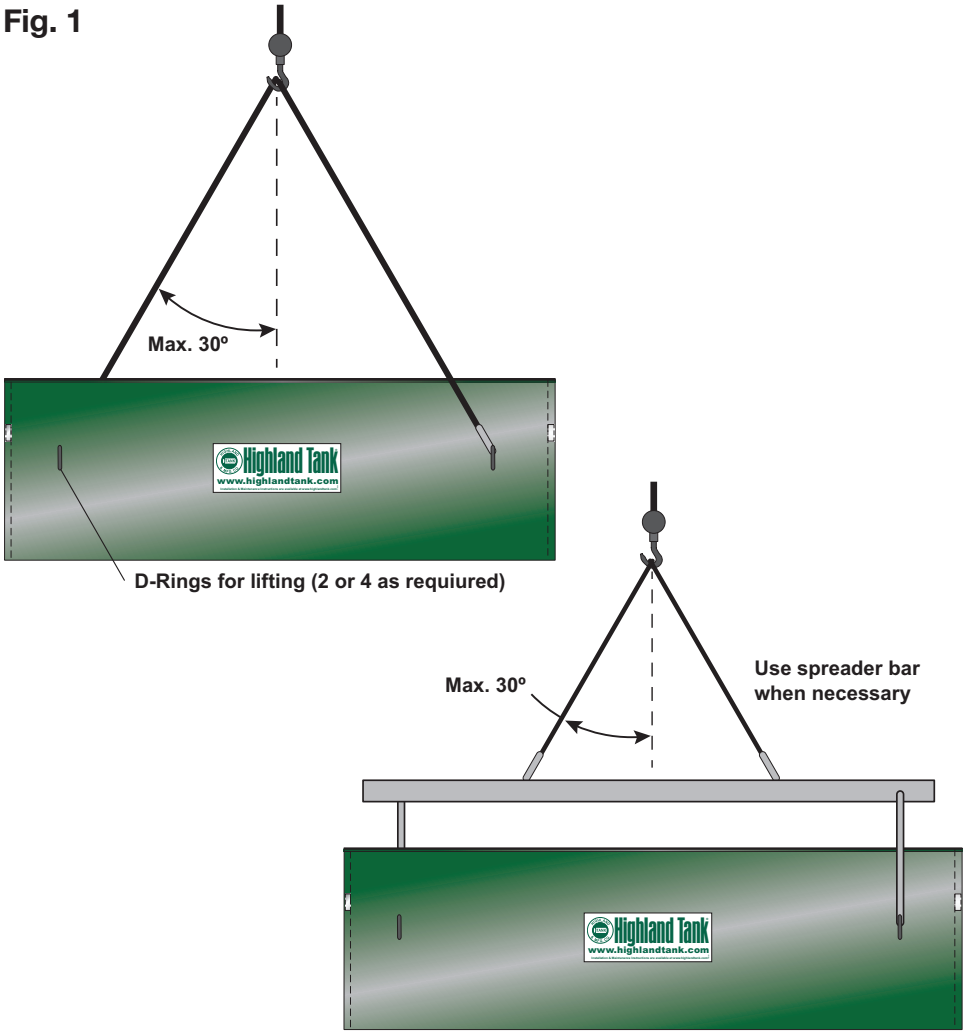
WARNING:

Under no circumstance should chains or slings be used around the MOI shell.

Always use lifting lugs to lift MOI.

Lifting and moving the MOI must only to be done using the lifting lugs welded to the MOI. MOI should be carefully lifted, moved and lowered using cables, chains or straps of adequate size. The angle between the lifting cable and vertical shall be no more than 30 degrees. See Fig.1. Use a spreader bar where necessary. Maneuver MOI with guidelines attached to each end of the MOI. If MOI must be relocated on a job site during installation, they must be lifted using provided lifting lugs.

Fig. 1



Pre-Installation Inspection & Testing

Upon delivery, visually inspect the MOI for exterior damage that may have occurred during shipping or job site handling. Any damage that could result in leakage or corrosion must be repaired in a manner approved by Highland Tank. Please refer to coating repair instructions below.

Internal Inspection

Carefully remove access covers so as not to damage the gaskets. Inspect the interior of the MOI from above (without entry) to ensure that any baffles, internal components and piping are secure and have not been damaged during transport. Do not allow anyone to enter the MOI unless it has been properly prepared for entry and the person entering the MOI has been properly trained for confined-space entry, if required, per OSHA, Regulations for Permit Required Confined Spaces 29 C.F.R. § 1910.146.

WARNING:

DO NOT ENTER the MOI without following proper confined space entry procedures.

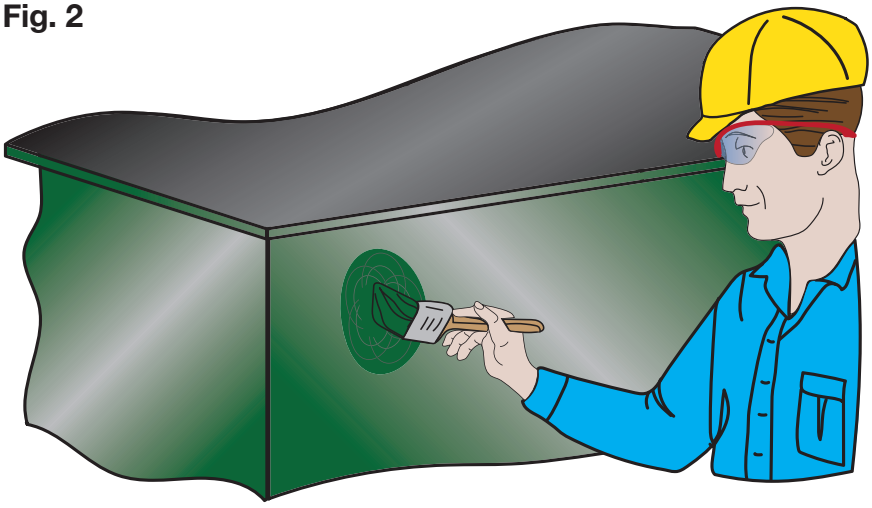
Coating Repair

Visually inspect the MOI for damage. Pay particular attention to areas where coating may have been gouged or abraded. Mark all areas which appear damaged for repair. Clean damaged MOI coating areas of rust, contaminants or disbonded coating prior to application of touch-up coating.

Areas of coating damage shall be roughened up with coarse grit sandpaper or grinder (see Society of Protective Coatings (SSPC) SP-2 “Hand Tool Cleaning” or SP-3 “Power Tool Cleaning” for additional guidance) to remove all glossiness from the surface surrounding the repair area approximately 6 inches around the damaged area. Re-coat the area with touch-up coating provided. See Fig. 2. Allow repaired coating areas to cure completely.

Damaged coatings must be repaired with the repair kit that was delivered with the MOI. Additional coating touch-up is available from Highland Tank.

Fig. 2



Pre-installation Tightness Testing Procedures

An appropriate pneumatic or hydrostatic test may need to be performed prior to placing MOI into service, as outlined below. Check with AHJ to determine appropriate test and approval. Take all necessary safety precautions during all testing.

IMPORTANT:

DO NOT leave MOI unattended.

DO NOT apply a vacuum to a single-wall MOI or to the primary tank of a double-wall MOI.

DO NOT connect an air pressure line to the interstitial monitoring port of a double-wall MOI.

After pneumatic or hydrostatic testing, release air pressure from the MOI before dismantling testing equipment. For factory applied vacuum, DO NOT relieve vacuum until MOI is secured in its final resting position.

Optional On-Site Hydrostatic Test for Single-wall MOI if required by AHJ

An on-site hydrostatic test of the MOI may be required by the AHJ before installation to ensure no damage has occurred during shipping and handling.

After the interceptor has been leveled and secured to foundation, fill the MOI with clean, fresh water (See Filling the MOI on page **22**.) until water is discharged from the outlet. Allow the MOI to stabilize to a no-flow, static condition. If required by AHJ, attach blind flanges or plugs to inlet/outlet, then fill MOI completely with clean fresh water.

Accurately measure and record the fluid level from the top of the MOI to the static fluid level. After one hour, verify that the fluid level has not dropped. A fluid level change would indicate that there may be a leak in the primary tank. If a leak is detected, contact Highland Tank before proceeding.

IMPORTANT:

For Series SO, it is recommended that the hydrostatic test be performed on each separate chamber to ensure there are no leaks between chambers. Contact Highland Tank if a leak is detected.

Optional On-Site Hydrostatic Test for Single-wall MOI if required by AHJ

For double-wall MOI, vacuum testing of the interstitial space can be used instead of a hydrostatic test on the primary tank only. If a hydrostatic test is required, follow the procedure as described above.

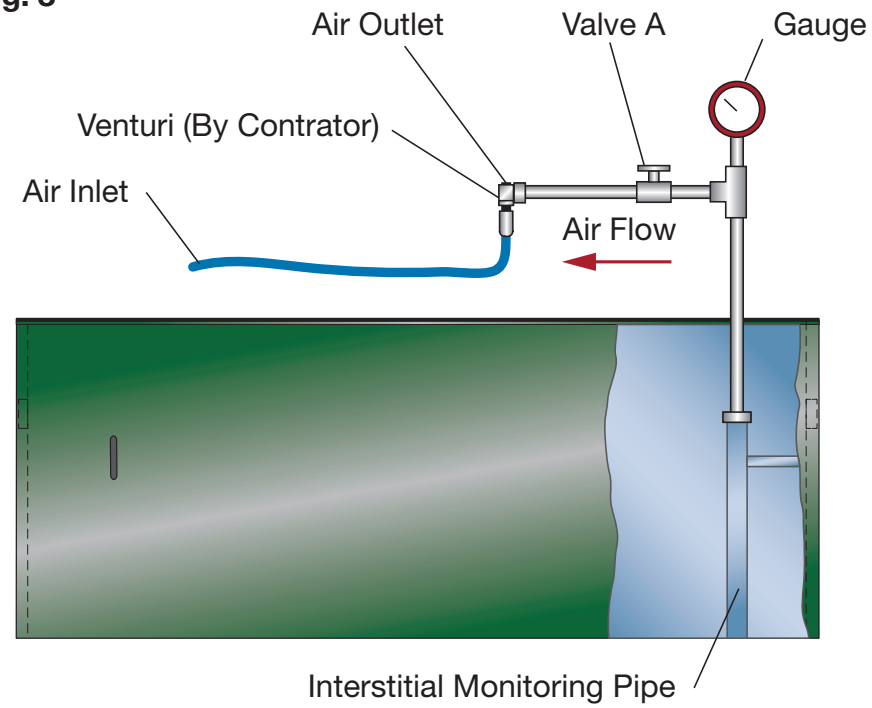
A double-wall MOI shipped with a vacuum on the interstice need not be retested, provided the MOI arrives at the installation site with the vacuum level within limits designated by Highland Tank. If the MOI did not ship with a vacuum on the interstice or vacuum has decayed, proceed with the vacuum test as described for Consult Highland Tank if MOI does not hold vacuum.

Double-Wall MOI Vacuum Test

Double-wall MOIs may require vacuum pressure testing of the interstice on site.

If the AHJ requires on-site testing of the MOI, proceed with the vacuum test as follows and as illustrated in Fig. 3 below.

Fig. 3



Remove factory installed temporary plug or thread protector from interstitial access point. Apply compatible, non-hardening pipe sealant to threads and install test apparatus.

Perform vacuum test for a double-wall MOI as illustrated in Fig. 3.

1 - Open valve A and for maximum air flow.
2 - Connect air supply line. (17 cfm's @ 100 psi recommended)
3 - Wait for gauge to read 12-15 in. Hg.
4 -Close Valve A completely.
5 - Remove air supply line

Monitor gauge for one hour or as prescribed by AHJ. Gauge MUST NOT fluctuate more than 2 in. Hg for the duration of the vacuum test.

If leak is detected, contact Highland Tank. After successful vacuum test, open Valve A to release vacuum. Remove test apparatus and proceed with installation.

Refer to PEI/RP200 for additional testing guidelines.

Foundation Preparation

The foundation to support the MOI must be designed by a licensed professional engineer, familiar with the site conditions and regulations. The foundation must consist of a well-drained, stable, concrete or asphalt surface and suitable bedding material to prevent movement or uneven settling of the MOI.

MOI installations must be in accordance with local applicable electrical and fire code standards which may include but not be limited to: National Fire Protection Association publication NFPA 30, and any local adopted fire codes. Contact the local AHJ for details on all applicable codes and restrictions such as spacing from existing or new buildings, property lines, public ways, etc.

Placement of the MOI

The MOI must be installed in a level and plumb position.

CAUTION:

Check elevations at each end of the MOI with a transit and adjust as necessary to 1/2 inch in 20 feet. Check elevations across the width of the separator tank and adjust to 1/4 inch in 10 feet.

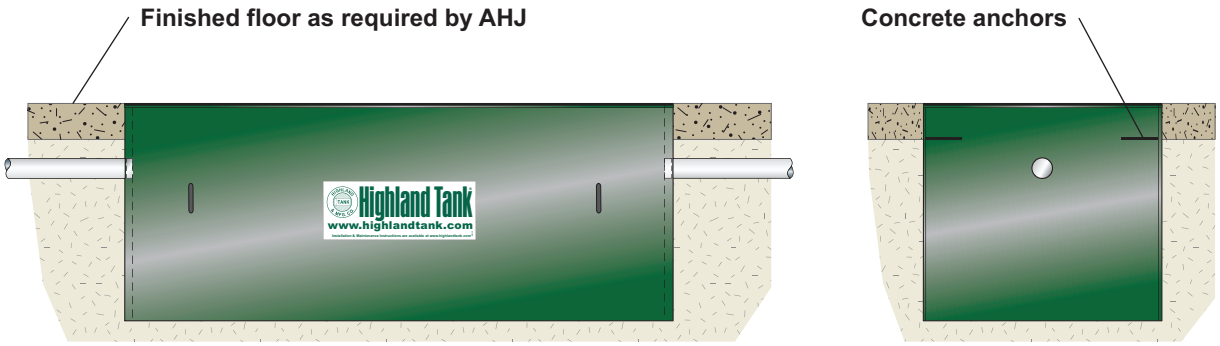
Anchoring

High water tables, partially flooded installation sites or other environmental concerns may exert significant forces on the MOI. MOI movement may interfere with operations. The MOI must be anchored to the foundation to prevent movement. Anchoring method must be determined by the engineer of record and approved by Highland Tank.

The use of steel cable and/or round bar as buoyant restraints is prohibited.

Fig. 4 illustrates a flush with floor MOI installation with the MOI fitted with anchors embedded in the finished floor concrete pad. Other hold-down methods are available. Contact Highland Tank for assistance.

Fig. 4



Ballasting

Ballasting may be necessary for additional downward force on the MOI during the final stages of installation. Consult AHJ. If required, fill MOI with clean water. After ballasting is complete, check elevations for proper tolerances.

Piping & Venting

Inlet piping installation should be straight and true with as few turns as possible to limit turbulence.

Attach inlet/outlet piping (contractor supplied) to inlet/outlet pipes on the MOI. Inlet and outlet inverts were established during manufacturing. Do not modify without first consulting Highland Tank.

The MOI inlet piping typically must be sloped from 1/8 inch to 1/4 inch per foot to maintain gravity flow. A greater slope, or a free fall of wastewater into the MOI will cause turbulence, which adversely affects MOI performance. Piping must also be designed to limit flow into the MOI to the flow rate specified. Use of a flow control device may be required.

MOI outlet piping must be designed to flow at a rate equal to or greater than the inlet piping to avoid any potential backup.

IMPORTANT:

The MOI should be fitted with properly sized inlet and outlet shut-off valves (contractor supplied) for emergency shut-down and service purposes.

Attach any other contractor supplied piping to the MOI. Take special care to prevent damage to any gaskets or pipe threads.

MOI Venting Guidelines

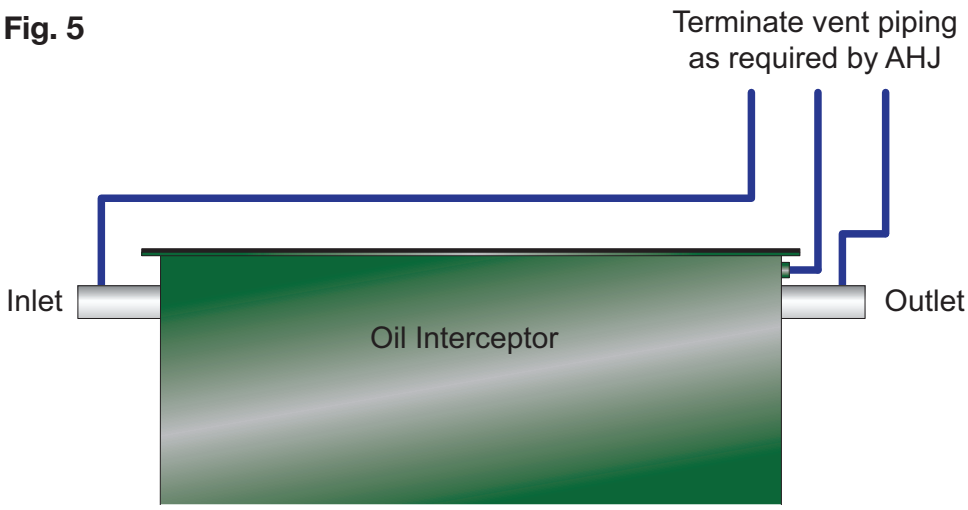
MOI is designed for operation at atmospheric pressure ONLY. MOI inlet and outlet MUST be vented to atmosphere separately from the oil interception chamber to assure proper operation. See Fig. 5.

Note: Inlet pipe does NOT need to be vented when influent is being pumped into the interceptor. Likewise if the effluent is being pumped, the outlet pipe does not need to be vented.

The inlet and outlet vents must each have their own separate, dedicated vent line for the following reasons:

- MOI inlet is vented to prevent hazardous gases from building up in inlet pipe draining the catch basin or trench drain (which may be in a building).
- MOI outlet is vented to prevent siphoning during full flow into a flooded storm sewer or flooded pit.
- MOI primary chamber is vented to prevent hazardous gases from building up inside.

Fig. 5



Venting the inlet, MOI and outlet independently prevents raw oil or oily wastewater from bypassing and exiting the MOI in the event of a surge or vapor condensation.

Vent piping requirements may vary by code. Check with AHJ. Terminate all vent piping per local code and AHJ.

Note: MOI owners may need to provide flame arrestors where required by governing codes for safety. Check with AHJ.

MOI with Gravity Oil Skimmers and/or Monitoring Equipment

If an oil skimmer is to be installed, piping between the MOI and the waste oil tank should be sloped between 1/8 inch and 1/4 inch per foot to maintain gravity flow in most conditions.

For MOI with oil level sensors, pump-out pipes and leak detection sensors, install using compatible non-hardening sealant, taking care not to cross thread or damage the nonmetallic bushings.
For electrical wiring details, please refer to the sensor and control panel installation instructions.

Final Tightness Test

An additional tightness test may be required after MOI is secured. If required, refer to appropriate test procedures on page 12.

Sealing of Lifting Lugs and Pipe Connections

During the installation process, steel can become exposed at the lifting lug due to the handling of the MOI. These areas, along with all other exposed steel surfaces, must be covered using the coating kit supplied by the manufacturer.

Apply supplied coating touch-up to all exposed steel surfaces of the MOI and allow to cure completely.

After testing has established tightness, apply coating to the OWS fittings and allow to cure prior to backfill. Coating must include the entire plug on unused fittings.

Cure time will vary depending on temperature and conditions. Contact Highland Tank if additional touch-up coating is needed.

Optional MOI Electronics

Recommended Optional MOI electronics may have been provided for your project.

Recommended MOI Electronics may include:
- Oil/water interface level sensor
- High Fluid Level Sensor
- Leak sensor (for interstitial monitoring of double-wall MOI)
- Alarm control panel

Optional MOI electronics must be installed after MOI has been installed and before start-up procedures are initiated. For MOI electronics installation details, please refer to the specific device's installation instructions.

Oil Level /Leak Alarms (Optional)

For easy, efficient operation and maintenance, the MOI may be equipped with an Oil/Water Interface and Level Sensor and/or Leak Detection Sensor to activate warning alarms at high oil levels or in the event of a leak.

Oil accumulates in the MOI until a predetermined level is reached, at which time the oil level sensor activates an alarm signaling that the MOI is full of oil. The level sensor is a magnetic float switch type for oil/water interface detection.

The interstitial space of a double-wall MOI can be monitored for a leak of either water or hydrocarbons by liquid-only or product specific sensors.

Highland Tank offers a wide range of control panels and sensors to monitor the operation of your MOI. All panels include audible/visual signals to alert the operator of system changes and system test buttons.

Highland Tank's typical standard panels are listed here for quick reference.

HTAP-1 Single-channel panel. Performs High-Oil Level sensing OR for Liquid Only Leak Detection with non-specific alarm.

HTAP-2 Two-channel panel. Performs High-Oil Level AND High-High-Oil Level sensing OR High-Oil Level sensing AND for Liquid Only Leak Detection with non-specific alarms.

HT-A2 Two-channel panel. Performs High-Oil Level AND High-High-Oil Level sensing with specific alarms.

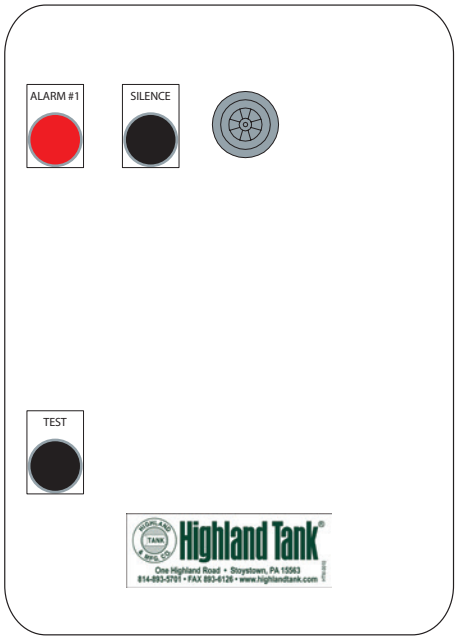
HT-A2-LD Three-channel panel. Performs High-Oil Level, High-High Oil Level sensing AND Liquid Only Leak Detection with specific alarms for oil levels only.

HT-A2-LDFW Four-channel panel. Performs High-Oil Level, High-High Oil Level sensing AND Leak Detection for Fuel or Water with specific alarms for each.

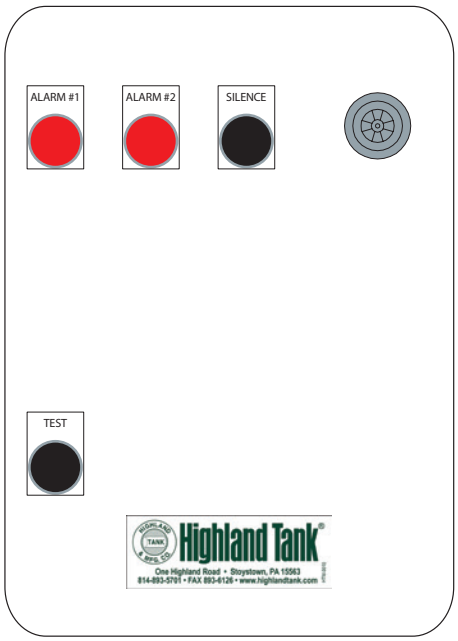
Oil Level Controls (Optional) continued

If your MOI has a control panel and sensors installed, locate the diagram for your panel from the four selections and then refer to the button/light function listing for operation and required action. Please consult the job specific project information should you need detailed information regarding a specific alarm/control panel. Contact Highland Tank if you still need assistance.

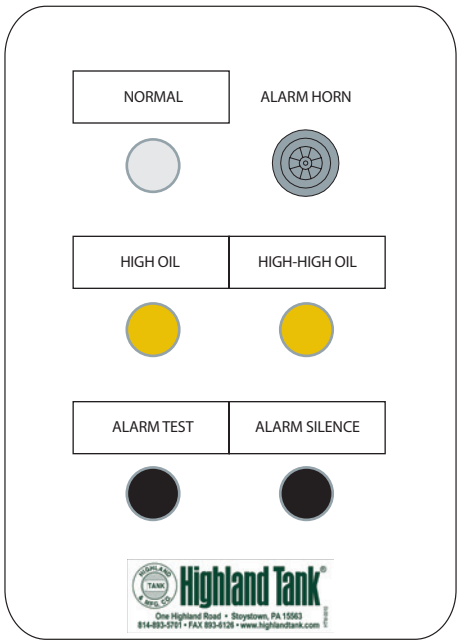
HTAP-1 - 1-Channel
High-Oil or Leak Detection



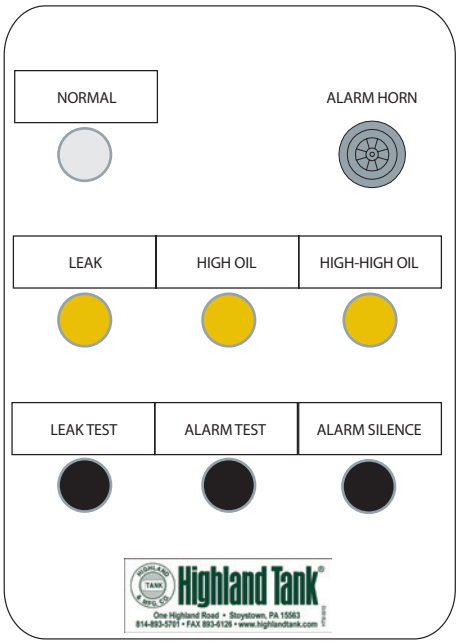
HTAP-2 - 2-Channel
High-Oil and Leak Detection
or High-Oil and High-High-Oil



HT-A2 - 2-Channel
High-Oil and High-High-Oil Specific

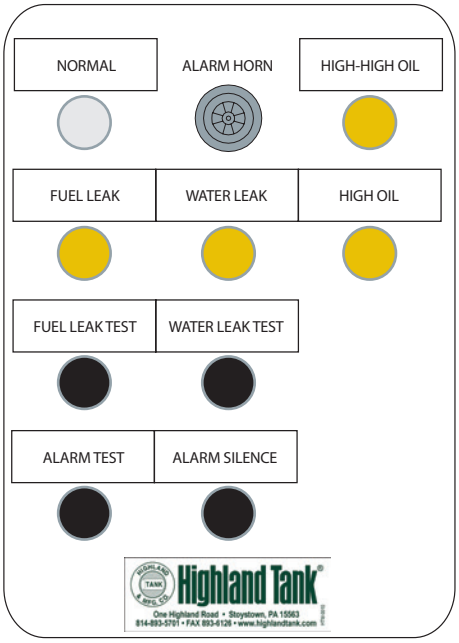


HT-A2-LD - 3-Channel
High-Oil, High-High-Oil
and Leak Detection Specific
Non-discriminating



Oil Level Controls (Optional) continued

HT-A2-LDFW - 4-Channel
High-Oil, High-High-Oil
and discriminating
Fuel/WaterLeak Detection



Below is a listing of Highland Tank's control panel features. Refer to the previous diagrams to help understand the function of your particular panel.

Panel Light or Button	Description / Function
NORMAL LIGHT (White)	Indicates that system is active in normal operating (non-alarm) mode.
ALARM TEST / TEST	Temporarily closes the control panel circuits to provide a system test.
ALARM HORN	Works in conjunction with yellow alarm lights. Emits audible (90-95 decibel) sound alerting operator that system has entered an alarm mode.
ALARM SILENCE / SILENCE	Silences the audible alarm temporarily for operator to perform service. (Does not cancel alarm mode.)
ALARMS (#1 & #2)	Alert operator of High-Oil level, High-High-Oil Level or Leak Detection depending on the connected sensor.. See Alerts and Responses below.
HIGH-OIL	Alerts operator of High-Oil level. Oil has reached a predetermined level and must be pumped out as soon as possible. **RESPONSE:** Stop MOI operation. Pump out oil. Refill MOI with water to reset sensors. Resume MOI operation.

HIGH-HIGH-OIL Alerts operator of High-High-Oil level. Oil has reached a critical predetermined level and must be pumped out immediately. **RESPONSE:** Stop MOI operation. Pump out oil. Refill MOI with water to reset sensors. Resume MOI operation.

LEAK Alerts operator of a leak in either primary or secondary wall of MOI. Does not discriminate if leak is fuel or water.

Fuel/Water Leak Sensor

LEAK TEST Temporarily closes the control panel's leak detection circuit to provide a system test.

FUEL LEAK Alerts operator of a leak from primary wall of OWS into interstice. **RESPONSE:** Contact Highland Tank for procedure. Fuel leak will cause only fuel leak alarm.

WATER LEAK Alerts operator of a water leak from primary or secondary wall of OWS into interstice. **RESPONSE:** Contact Highland Tank for procedure. Water leak will cause both fuel and water leak alarm.

FUEL LEAK TEST Temporarily closes the control panel's fuel leak detection circuit to provide a system test.

WATER LEAK TEST Temporarily closes the control panel's water leak detection circuit to provide a system test.

Leak Detection System Procedure (Optional) Double-wall MOI ONLY

Leak Detection Procedure for fuel or water in the MOI interstice.

For easy and efficient monitoring of the interstitial space (the space between the inner and outer walls), the MOI may be equipped with a Liquid Leak Detection Sensor to activate warning alarms if the interstitial space becomes filled with hydrocarbons or water during operation.

If the audible alarm is activated during operation, it can be silenced by momentarily depressing the SILENCE push-button.

The interstitial space can be checked by:

Stopping MOI operation. After flow has stopped, remove leak detection sensor from monitoring pipe correctly to avoid damaging sensor or communication wiring. Place sensor in a dry, safe place during water removal procedure.

Use a gauge stick to inspect the monitoring pipe for the presence of oil or water.

IMPORTANT:

If a suspicion of a leak exists, contact a tank testing professional to remove liquid and test tank for tightness.

If water is found, note level. Pump-out interstice. Water in the interstice can sometimes be caused by condensation or other water infiltration.

It may be necessary to pump out several times with a waiting period between pump-outs, to remove all of the accumulated water. Starting level should lower with each pump-out.

After water has been removed from MOI interstice, reinstall sensor and wiring making sure to seal all threaded connections with approved sealant. Restart MOI operation as described earlier.

MOI Start-Up

The MOI must be full of water, as defined below[1], to operate.

IMPORTANT:

Separated liquid oil and vapors may be flammable and/or combustible.

CAUTION:

Service personnel must comply with all established OSHA regulations governing the facility and services. These include, but are not limited to, the use of approved breathing equipment, protective clothing, safety equipment and other requirements.

The final state of all wiring must comply with all applicable electrical and fire code standards.

This system must be properly vented by installer in accordance with applicable plumbing and safety codes for venting of combustible gases.

All electrical equipment, connections and wiring must be protected from submergence and infiltration of water.

Intrinsically safe sensor wiring must be kept in a separate conduit from non-intrinsically safe power wiring. Run non-intrinsically safe power wiring in conduit grounded at the panel end only and per applicable electrical code.

Filling the MOI

Open the MOI inlet and outlet pipe valves.

If the MOI has not yet been filled with water, as may have been required for ballasting, (see page 14) fill with clean, fresh water at this time. The MOI must be full of water (as defined below) before any wastewater can be treated. The MOI can be filled through the facility's drain leading to the MOI inlet, by removing one of the top covers or through a fitting leading to the oil interception chamber on the inlet side of the MOI.

If filling through top cover or a fitting, place the hose so that the hose outlet rests inside the MOI.

[1]The MOI is full when water drains out of the Outlet. Check the water level using a gauge stick. The level on the gauge stick must equal the invert of the Outlet Pipe as measured from the MOI bottom.

To ensure that no blockage exists, allow water to flow through the facility drain which leads to the MOI Inlet. Check the Outlet Pipe to make sure that water is flowing through the MOI. Check the Inlet Pipe and facility's drain for water backup.

MOI Start-Up continued

Oil Level Controls (optional)

Prior to Oil Level Sensor Installation

Check sensor with a continuity meter. Both switches are normally closed in a low position (dry condition).

And/Or

Connect the sensor to panel using proper wiring. Refer to specific panel wiring diagram supplied.

Apply power to the panel.

Move the bottom float up and down on the probe stem. As the bottom float approaches the lower grip ring, the High-High Oil Level Warning Alarm (light and audible alarm) should activate.

Move the top float up and down on the probe stem. As the top float approaches the lower grip ring, the High Oil Level warning alarm (light and audible alarm) should activate.

Note: If one or both alarms do not activate properly, check the panel and sensor wiring for proper connections and continuity.

After Oil Level Sensor Installation

As installed MOI fills with water, both floats will be in low position (dry condition) and both alarms will be activated.

Note: If alarms are not activated, check the wiring connections.

While the MOI is filling with water, the High-High Oil Level Warning Alarm should deactivate, and soon thereafter the High Oil Level Warning Alarm should deactivate.

Note: If the alarms do not deactivate upon filling, remove the sensor and check for float binding or poor electrical connections.

Contact Highland Tank at 814-893-5701 should you need additional assistance.

MOI with Gravity Oil Skimmers and/or Monitoring Equipment

If an oil skimmer is to be installed, piping between the MOI and the waste oil tank should be sloped between 1/8 inch and 1/4 inch per foot to maintain gravity flow in most conditions.

For MOI with oil level sensors, pump-out pipes and leak detection sensors, install using compatible non-hardening sealant, taking care not to cross thread or damage the nonmetallic bushings. For electrical wiring details, please refer to the sensor and control panel installation instructions.

Optional Oil Skimmer Adjustment

The oil skimmer is a device installed in the MOI to remove accumulated waste oils at a prescribed rate. The oils are transported via the oil skimmer to an integral side oil compartment (MOI-SO) or and external collection container.

Periodic adjustment to the oil skimmer may be required based on the flow to the MOI. To adjust skimmer, follow these steps:

CAUTION: **Appropriate hand and eye protection is required to prevent contact with accumulated oils.**

IMPORTANT: **Adjustments must be made during conditions when wastewater is NOT flowing into the MOI.**

Remove MOI lid above skimmer. Observe MOI operation at typical flow rate.

Stop flow to unit by closing inlet valve.

Locate oil skimmer and determine the direction for adjustment. Skimmer should be set even with or just above operating fluid level.

Loosen the band clamp(s) around rubber sleeve enough to allow adjustment without letting the clamp(s) slip off the sleeve.

Reposition sleeve as needed. Tighten band clamp(s) to secure sleeve in position.

Restart flow to MOI and observe operation.

Note: Setting the skimmer too high will prevent waste oils from being removed. Setting the skimmer to low will allow water to be removed. Multiple small adjustments may be required. Repeat adjustment as necessary to achieve desired skimming rate.

Reattach lid(s).

Skimmer Adjustment

Ensure that MOI is completely full of water, and that water level is at the top of or flowing from effluent transfer pipe.

Initiate expected rated flow to oil/water separator. Maximum liquid operating level is established when water surface in separation chamber has stabilized.

Make a permanent, waterproof mark, at water level, on the inside wall of the MOI for reference. Stop flow to MOI.

Bucket Style Skimmer

Adjust the Oil Skimmer's rubber fitting up or down so that top of fitting is approximately 1/8" above the maximum operating level.

Sawtooth Style Skimmer

Adjust the Sawtooth Skimmer by rotating the skimmer pipe so that the skimming level (bottom of V-notch) is approximately 1/8" above the maximum operating level mark.

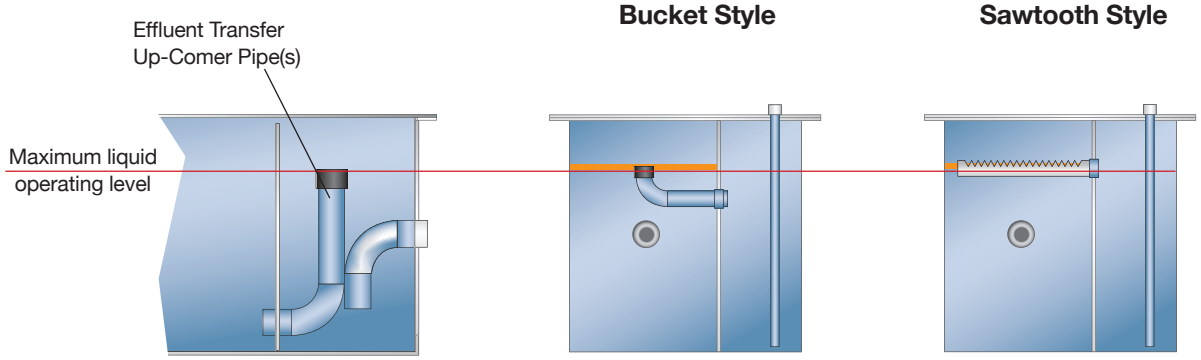
NOTE:

If necessary, the Effluent Transfer Up-Comer Pipe(s) rubber fittings can be adjusted to raise or lower the MOI chamber fluid level. This is typically utilized to make large adjustments. The Skimmer Pipe rubber fitting should only be utilized to make small adjustments to skimming level.

After adjustment, initiate intended flow rate to the MOI to confirm no water transfer to the oil pump-out chamber. If necessary, repeat adjustment until skimmer is set to prevent water entry into the oil pump-out chamber.

NOTE:

An oil skimmer set too low will allow water to enter the oil chamber, while a skimmer set to high will prevent oil from skimming. Some fine tuning may be required to set the skimmer at optimal level.



Operation

The MOI is a stationary, wastewater treatment tank filled with water. Waste accumulates within the MOI while effluent is discharged by gravity.

Highland Tank MOIs will not remove chemical or physical emulsions, dissolved hydrocarbons, solvents, or volatile organic compounds (VOC). Highland Tank has specialty systems that have been designed for treatment of wastewater contaminated with these pollutants.

During operation, the wastewater flows into the MOI through the inlet pipe and is directed over the Underflow Baffle.

The Underflow Baffle
- dissipates the velocity and turbulence of the incoming water,
- redirects the flow downward and toward the MOI head to start serpentine flow process,
- reduces and distributes the flow evenly over the MOI's cross-sectional area,
- isolates the inlet turbulence from the rest of the MOI.

In the sediment collection area, heavy solids settle out and are collected at the Sludge Baffle. Concentrated oil slugs rise immediately to the surface.

During periods of operation and wastewater flow, oils and solids continue to accumulate in the MOI. As this separation process continues, the clearer, heavier water migrates toward the bottom of the MOI.

When wastewater enters the MOI, the cleanest water from the bottom of the MOI is discharged via gravity flow or by pumping. Treated water is only discharged from the bottom of the MOI It is then discharged from the MOI through the outlet baffle during periods when wastewater flows into the MOI.

Wastewater flows from the MOI to a sanitary sewer or is pumped to be recycled for reuse.

Free-floating oil and greasy solids accumulate in the MOI until they are pumped out by the operators. Any and all oil recovered and removed from the MOI must be recycled or disposed of in accordance with federal, state and local regulations.

Maintenance

CAUTION: **Separated liquid oil and vapors may be flammable and/or combustible.**

WARNING: **Never enter an MOI or enclosed space, under any condition, without proper training and OSHA approved equipment. See OSHA, Regulations for Permit-Required Confined Spaces 29 C.F.R. § 1910.146.**

All enclosed spaces must be properly vented prior to entry to avoid ignition of flammable materials or vapors. Atmosphere must be properly tested for combustible vapors and oxygen prior to entry.

Entering the MOI without using an approved breathing apparatus may result in inhalation of hazardous fumes, causing headache, dizziness, nausea, loss of consciousness and death. Required entry equipment includes, but is not limited to:

- Lifelines
- Safety harnesses (safety belts are unacceptable)
- Self-contained breathing apparatus
- Respirators (canister type)
- Rescue harness and ropes
- Horns, whistles, radios, etc. (for communication purposes)
- Explosion-proof lighting

IMPORTANT: **Be sure to inspect and replace gaskets as necessary when the MOI is shut down for maintenance.**

The MOI can be cleaned from above using a high-pressure, hot-water system (within the temperature limits of the interior coating).

Inlet and effluent pipe valves should be closed and locked for safety prior to MOI entry.

All liquid must be removed from the MOI prior to entry. Any and all oil recovered and removed from the MOI should be recycled or disposed of in accordance with federal, state and local codes and regulations.

CAUTION: **Interior surfaces of the MOI will be slippery.**

Maintenance Continued

MOI are designed for long-term, trouble-free operation. The following maintenance should be performed as needed or in accordance with a facility maintenance schedule.

Periodic inspection of:

- Upstream trench drains, influent pump sumps, sand interceptors and traps
- Inside of the MOI for sand, trash, sludge and oil build-up
- Effluent for oils and other contaminants in accordance with local codes and permits
- Oil level in accordance with local codes and permits

MOI with oil level sensors require oil removal when the alarm is activated. Stop MOI operation, remove the oil and then refill MOI with clean fresh water (see Start-Up Instructions, page 22).

MOI without oil level sensors require level checking by use of a sampling device or a gauge stick with water finding paste. The MOI must be checked at regular intervals to monitor oil levels.

When the oil/water interface level surpasses the high-oil level or 20% of the MOI's working volume, oil should be removed and the MOI refilled with clean fresh water. At the 40% or high-high-oil level MOI performance will decline. Oil must be removed and the MOI refilled with clean water.

Use a gauge stick and water finding paste to check the oil/water interface level.

Step 1 - Measure and record the distance from the fluid surface to the bottom of the MOI.

Step 2 - Measure and record the thicknesses of the oil (top) and solids (bottom) layers.

Step 3 - Add thickness measurements of the oil and solids layers then divide this number by the distance from fluid surface to bottom of MOI, from Step 1, to obtain the accumulated wastes volume percentage.

If the combined oil and solids layers or either individual layers are equal to or greater than 20%, the interceptor is considered full. Stop MOI operation, remove accumulated oils and solids. Refill the MOI with clean fresh water and resume operation
(see Start-Up Instructions, page 22).

If this calculation is less than 20%, reduce pump-out frequency.
If greater than 20%, increase pump-out frequency.

WARNING:

If the oil is not pumped out, the oil concentration in effluent may exceed the desired levels.

Maintenance Continued

If contaminants are found, close the valve on the inlet line, determine what the requirements are for restoring working order and take appropriate action.

For optimum performance, maintenance is required once per year or when:

- the MOI is in alarm condition,
- the oil layer and/or the solids layer in the main oil/water separation chamber are 20% or greater than the operating depth of the MOI,
- the effluent exhibits an oil sheen or contains high contaminant levels.

Inspect MOI after a heavy flow periods to check for signs of malfunction due to an excessive flow rate.

If the MOI has been cleaned within the year and only bottom sludge has built up while the effluent water is contaminant free, it may be sufficient to vacuum the sludge out and refill MOI with clean water. (See Start-Up Instructions, page 22.)

Oil Removal Procedures

IMPORTANT:

Oil should only be removed during non-flow conditions to ensure pure oil draw-off

Note: The procedures outlined here are guidelines. Pure oil, water or sludge draw-off will depend on conditions and operator control.

Oil Removal Procedures (with optional oil level controls)

Confirm that the High-Oil Level Warning Alarm is due to an actual high-oil level in the MOI, otherwise a mixture of oil and water will be removed. Oil levels can be verified using a sampling device or a gauge stick with water-finding paste.

To minimize water contamination of the oil, open and use one of the MOI access covers to skim oil.

Using suction, remove the oil. Refill MOI with clean water to deactivate the High Oil Level Alarm
(see Start-Up Instructions, page 22).

Oil Removal Procedures (without optional oil level controls)

Determine where the oil/water interface by using a sampling device or a gauge stick with water-finding paste.

If oil/water interface level is beyond the maximum allowable level, oil needs to be removed and the MOI refilled with clean water.

To minimize water contamination of the oil, open and use one of the MOI access covers to skim oil. Using suction, remove the oil. Refill with clean water (see Start-Up Instructions, page 22).

Mixed Oil and Water Removal Procedures

Remove one of the MOI access covers and place suction hose inside the MOI.

The suction hose nozzle should be 12 inches or higher above the MOI bottom. If nozzle extends closer to the bottom, sludge may be inadvertently removed.

Using suction, remove oil and water, then lower suction hose to remove all remaining contents from the MOI. Refill with clean water (see Start-up Instructions, page 22).

Major Oil Spill Response Procedures

A major oil spill is a spill that exceeds the normal oil storage capacity of the MOI. In the event of a major spill, notify proper authorities as required by federal, state and local laws.

IMPORTANT:

After a major oil spill, the MOI should always be emptied, cleaned and refilled with clean water.

Oil Spill Removal Procedures (with or without optional oil level controls)

If MOI has optional oil level controls, confirm that the High and High-High Oil Level Alarms are activated due to an actual High-High oil condition.

Determine exactly where the oil/water interface is located using a sampling device or a gauge stick with water finding paste.

Remove one of the MOI access covers.

Place sampling device or gauge stick into the MOI to determine the oil/water interface location.

Lower suction hose to exact oil/water interface location. If the suction hose nozzle extends lower than the oil/water interface, water may be inadvertently removed with the oil.

Using suction, remove the oil.

Refill with clean water (see Start-Up instructions, page 22).

Oil Spill Removal Procedures continued

If oil is still visible on the surface of the MOI or the alarms remain on, suction out the oil and refill with clean water.

Continue this sequence until only a sheen of oil is visible on the surface of the MOI or the alarms deactivate.

Sludge Removal Procedures

Determine exactly where the sludge/water interface is located using a sampling device or a gauge stick.

Remove the Access Cover closest to the inlet end of the MOI.

If used, insert gauge stick directly into chamber. Alternately, a sampling device enables taking accurate readings on settled solids to any depth in the MOI.

Slowly lower the gauge stick until it comes into contact with the sludge blanket. Mark the stick.

Push the stick downward until it comes into contact with the MOI bottom. Mark the stick at this level.

The sludge depth is the difference between the two measurements.

Sludge Removal Procedures (for full MOI)

Lower hose to exact sludge/water interface location.

Using suction, remove the sludge while slowly lowering the suction hose nozzle until it comes into contact with the MOI bottom.

Refill with clean water (see Start-Up Instructions, page 22).

Sludge Removal Procedures for completely empty MOI

WARNING:

Never enter an MOI or enclosed space, under any condition without proper training and OSHA approved equipment. Consult AHJ for requirements. Consult OSHA, Regulations for Permit-Required Confined Spaces 29 C.F.R. § 1910.146.

Using suction, remove the sludge and debris. Use caution to avoid internal coating damage.

Using a standard garden hose at normal pressure (40-70 PSIG), with or without a spray nozzle, loosen any caked oily solids. Use of hot water (within internal coating temperature limits) can be helpful. Direct the water stream to the MOI sides and bottom.

Using suction, remove the resultant slurry.

If not properly maintained, the MOI may malfunction.

General MOI Cleaning Procedures

NOTE: Over a period of time, sediment, oil and grease will build up on the sides and bottom of the MOI. Dirt and heavy oil may also build up, reducing the unit's efficiency.

IMPORTANT:

It is recommended that the MOI be cleaned as needed or at least once a year. Keep inspection and maintenance logs and have them available for ready reference.

Sediment Chamber

Remove top covers to expose the sediment chamber, being careful not to damage the gaskets.

Pump-out liquid contents of MOI (see Mixed Oil and Water Removal Procedures, page 30).

Gauge the level of sand, dirt or debris with a sampling device or gauge stick.

IMPORTANT:

The level of sand, dirt or debris should not be allowed to accumulate higher than 12" from the bottom of the MOI.

Remove the accumulated waste with a suction hose (see Sludge Removal procedures, page 31).

Direct a high-pressure hose downward to loosen any caked oily solids on MOI sides and bottom.

NOTE: Use high-temperature (within internal coating temperature limits), high-pressure washing equipment.

Attach spray nozzle wand extension to the high-pressure hose.

Direct spray downward and toward the velocity head diffusion baffle to loosen any caked oily solids that may have accumulated on inlet head.

Direct the spray to the MOI sides and bottom.

Using suction, remove the resultant slurry.

Cleaning MOI Chambers

Remove top covers to expose the MOI chambers. Be careful not to damage the gasket.

Gauge the level of sand, dirt or debris with a sampling device or gauge stick.

IMPORTANT:

Never enter an MOI or enclosed space, under any condition without proper training and OSHA approved equipment. Consult AHJ for requirements. Consult OSHA, Regulations for Permit-Required Confined Spaces 29 C.F.R. § 1910.146.

Remove the accumulated waste with a suction hose (see Sludge Removal Procedures, page 31). Direct a high-pressure hose downward and around to loosen caked oily solids on MOI sides and bottom.

Direct the spray to the MOI sides and bottom. Rotate the nozzle sufficiently and often so that all areas are reached with the spray.

Using suction, remove the slurry from all chambers.

Visually inspect the MOI interior and components for any damage.

NOTE: If any visual damage exists, contact Highland Tank for further instructions.

NOTE: Improper installation may result in interceptor malfunction.

Reattach the top covers. Ensure the gasket is damage free.

Reinstall the Oil Level Sensor in the Interface and Level Sensor Fitting. Reconnect all non-voltage carrying sensor lines to the Oil Level Sensor.

Refer to MOI Start-Up Instructions on page 22 for proper refilling and restarting procedures.

Special Model Maintenance

Depending on the specific model MOI, your MOI may have one or more extra chambers - Series SO - Side Oil Compartment on one side of MOI

Please see special instructions below for regular maintenance of MOI units with any of these extra chambers.

Series SO

Series SO MOIs include an integral side oil compartment for storage of accumulated oils. This model includes an oil skimming device that automatically removes oils from the surface of the effluent and transfers them to the side compartment. Oil levels can be monitored manually or by an electronic level sensor. When oil level reaches predetermined pump-out level, remove oil using methods discussed earlier in the manual.

Cleaning MOI Sensors

Disconnect all Oil Level Sensor wiring. Carefully remove the Oil Level Sensor.

Carefully check the Oil Level Sensor floats. If the floats do not slide easily on the stem or have sludge on them, clean the Oil Level Sensor. Use a parts washer and mineral spirits to remove accumulated oil, grease or sludge.

Check the Oil Level Sensor with a continuity meter to assure proper operation.

Place the Oil Level Sensor in a safe area to prevent damage.

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Troubleshooting Guide

Problems which occur during MOI operation can be the result of many factors. The following list identifies the most common problems, their possible causes, and suggested remedies.

Problem	Possible Cause	Remedy
Excessive oil concentration in MOI effluent water	Wastewater pumped into the MOI causing emulsification of oil droplets in the effluent water.	Adjust pump, change to different pump, change to gravity flow or add additional treatment such as Highland OWS or AHFS system.
	Flow rates exceeding MOI rated capacity, causing oil droplets in the effluent water.	Decrease flow rate.
	Presence of detergents or surfactants causing emulsification of oil droplets in the effluent water.	Detect and remove source of harmful detergents.
	Oil levels higher than rated storage capacity, causing separated oil to carry over into effluent.	Remove oil.
	Excessive flow turbulence into MOI causing mechanical emulsions.	Check inlet piping and valving design. Check for debris in inlet piping. Decrease flow.
	Presence of dissolved hydrocarbons	Remove source of hydrocarbon.
	Presence of excessive dissolved or suspended solids leading to MOI, inside MOI or in effluent (Solids or clay may be coated with oil).	Consider additional treatment.
	Oil is of a higher specific gravity than was specified for MOI.	Remove source of high specific gravity oil, decrease flow rate or add additional treatment such as Highland OWS or AHFS system.

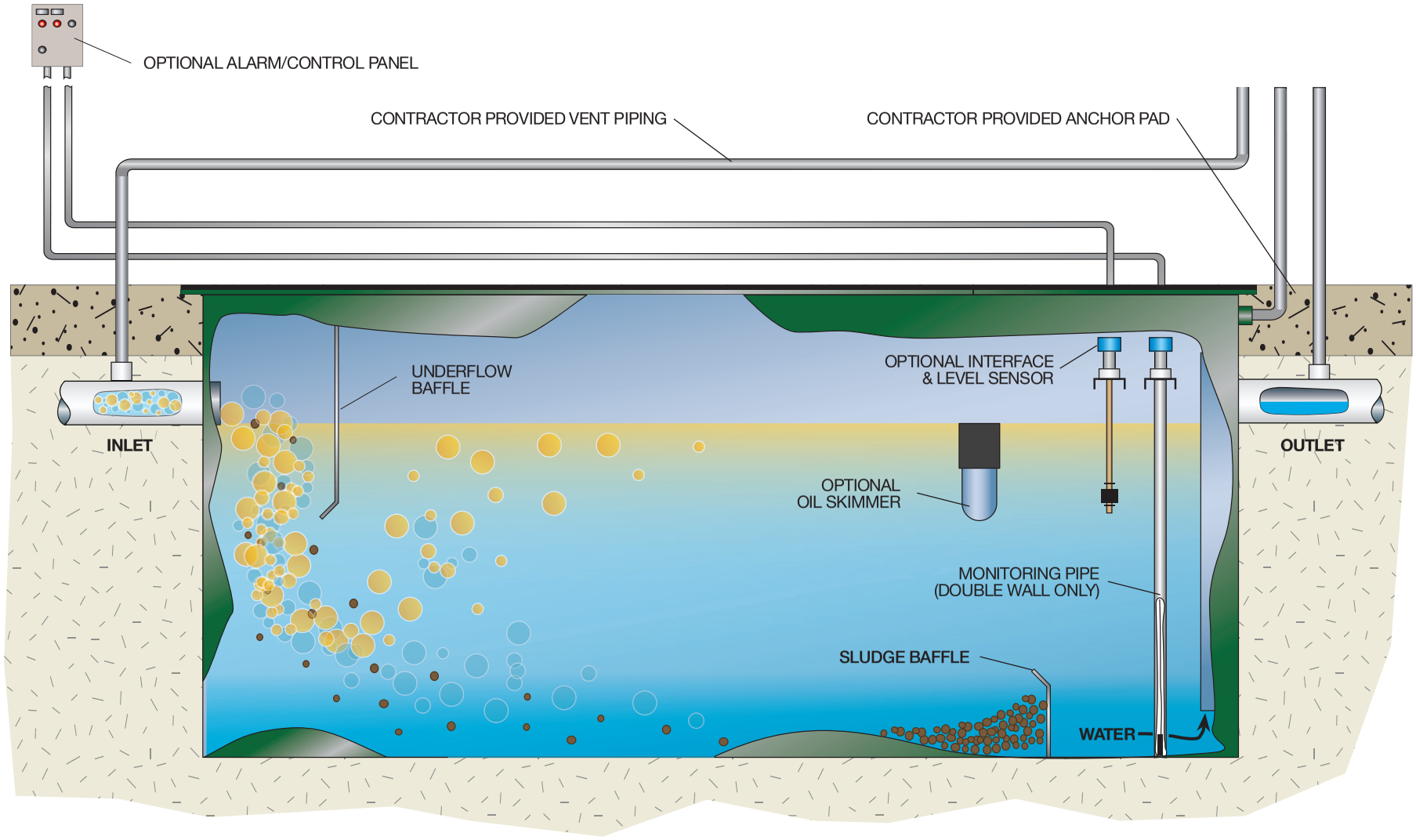
Troubleshooting Guide Continued

Problem	Possible Cause	Remedy
Excessive oil concentration in MOI effluent water continued	Wastewater pH is high, causing chemical emulsification	High pH is usually caused by high alkaline cleaner. Eliminate other source of high pH.
Wastewater back-up in drainage area	Excessive sludge or debris build-up	Clean out MOI.
	Closed inlet or effluent piping valves	Open piping valves completely.
	Inlet piping vapor lock	Check to ensure inlet vent is operating properly.
	Debris	Clean catch basin, trench drains, influent pump sump and/or MOI.
High suspended solids content in clean water effluent	Excessive sludge or debris build-up	Clean out MOI.
	Excessive solids in wastewater drainage area	Install Highland Collection Catch Basin in front of MOI and clean MOI.

If you have any additional questions regarding MOI problems, contact Highland Tank.

Phone: 814-893-5701 or email: wastewater@highlandtank.com

Manual Oil Interceptor Reference Drawing



Highland Tank - Manual Oil Interceptor Inspection and Maintenance Log - Serial # _____

Use a separate log sheet for each unit

Facility Name: _____

Address: _____ City: _____ State: _____ ZIP: _____

Contact Name: (Please print) _____ Phone: ( ) _____-_____

MOI Unit Details

Model No.: MOI - _____ Flow rate: _____ (GPM) Recommended pump-out: _____ (GAL)

Location of manual oil interceptor: _____

(e.g.: Building 1 basement, 1st St. parking garage, etc.)

Service/Maintenance Provider

Company Name: _____ License No.: _____

Address: _____ City: _____ State: _____ ZIP: _____

Contact Name: (Please print) _____ Phone: ( ) _____-_____

The Highland Tank MOI should be inspected on a regular schedule as determined by facility needs.

Appendix - A - Sample Inspection and Maintenance Log

MOI Maintenance Log

WEEK - MONTH - YEAR

Date ____/____/_____ Work performed by: _____

Action taken: _____

_____

Observations/comments: _____

Date ____/____/_____ Work performed by: _____

Action taken: _____

_____

Observations/comments: _____

Date ____/____/_____ Work performed by: _____

Action taken: _____

_____

Observations/comments: _____

Date ____/____/_____ Work performed by: _____

Action taken: _____

_____

Observations/comments: _____

Aboveground Rectangular Manual Oil Interceptors

HT-2054

User Manual

Installation, Operation & Maintenance

www.highlandtank.com
wastewater@highlandtank.com

Highland Tank

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