Built on Tradition

Highland Tank

Underground Cylindrical Oil/Water Separators

HT-2050

User Manual

Installation, Operation & Maintenance

Carefully read and follow the instructions in this manual.

HT, HTC, UL-SU2215
Single-wall & Double-wall
Series G, J & TF
Models with EZ-Access Option

MADE IN U. S. A.

Warning and Disclaimer

This manual is intended for use only by persons knowledgeable and experienced in underground oil/water separator 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.

Contents

Introduction

Thank you for purchasing a Highland Tank Oil/Water Separator - the leading high-performance separator in the industry.

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/Water Separator.

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

- Highland Tank's HighGuard Tank Installation Instructions, HT-7001.
- Petroleum Equipment Institute Installation of Underground Liquid Storage Systems, PEI/RP100.
- Steel Tank Institute ACT-100-U® Installation Instructions, R971 or STI-P3® Installation Instructions, R821.
- Any and all applicable federal, state and local codes. Always check with Authority Having Jurisdiction.

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

Abbreviations used:
OWS – Oil/Water Separator
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 OWS:

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

- Ensure adequate site space - almost all 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 OWSs.

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

- OWSs that are 10 foot diameter and larger are typically shipped rotated to minimize over-the-road height. They must be lifted from the hauling trailer by the supplied lifting lugs on the heads of the OWS. They must then be rotated before final lifting into the excavation. Spreader bars and/or adequate lifting straps/chains must be available to maintain recommended safe lifting capacity. Please check approval drawing for overall length of the OWS and location of the head lifting lugs.

- DO NOT rotate the OWSs while they are still on the trailer - damage may result. OWSs must be lifted from the trailer, using the lifting lugs supplied on the heads, and lowered onto a flat area, free from anything that may cause damage to the exterior coating. Once the OWS is stable, the lifting device may need to be repositioned and then reattached to the lifting lugs on the top centerline of OWS. At this point, slowly roll the OWS to upright position on the ground before lifting to place in final resting position.

- Barricade the OWS installation area until job is complete.

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

- Confirm inlet and outlet piping elevations. Coordinate with site plan - check/recheck approval drawing and site plan when OWS arrives.

- Make sure OWS hold-down method/system is predetermined and components are at the site prior to OWS installation. Check anchor-bolt locations if applicable.

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

- The OWS must be kept from freezing at all times. The OWS and piping should be installed below local frost levels. If necessary, a thermosatatically controlled steam or electric heating device may be installed.

- Never enter the OWS 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.

Important points to consider continued:

- **IMPORTANT:** DO NOT modify OWS structure in any way. DO NOT weld on OWS.
- 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 after the OWS.
- The OWS will not remove chemical or physical emulsions, dissolved hydrocarbons, solvents or Volatile Organic Compounds. Installation of an appropriately sized Advanced Hydrocarbon Filtration System (brochure HT-2502) 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 OWS. Filling the OWS with waste oils adversely affects OWS performance. Waste oil should be dumped into a waste holding tank for proper disposal.
- The OWS 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 OWS should be in an area with sufficient truck access (top-side clearance) for waste removal.
- An absence of gravity flow to the OWS will necessitate wastewater pumping. Pumping should be restricted to the clean water, effluent end of the OWS. If pumping occurs at the influent end, it will 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 OWS, 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.
- Detergents and solvents must not enter the OWS. The OWS will not remove chemical emulsions or dissolved hydrocarbons, and their presence retards the recovery of oils that would otherwise be separated.
- Complete the OWS Installation Checklist and Start-up Report (Form # HT-9029). A copy of the completed form should be retained by the OWS owner and/or installation contractor.
- Complete the HighGuard, ACT-100-U® or STI-P3® Installer Information Card that was included with the delivery documents. This information is required to activate and maintain the Limited Warranty.
- OWS must be filled with clean water before introducing any wastewater. Filling should only be done after OWS has been leveled and anchored in final installation location.

Standard OWS Description

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

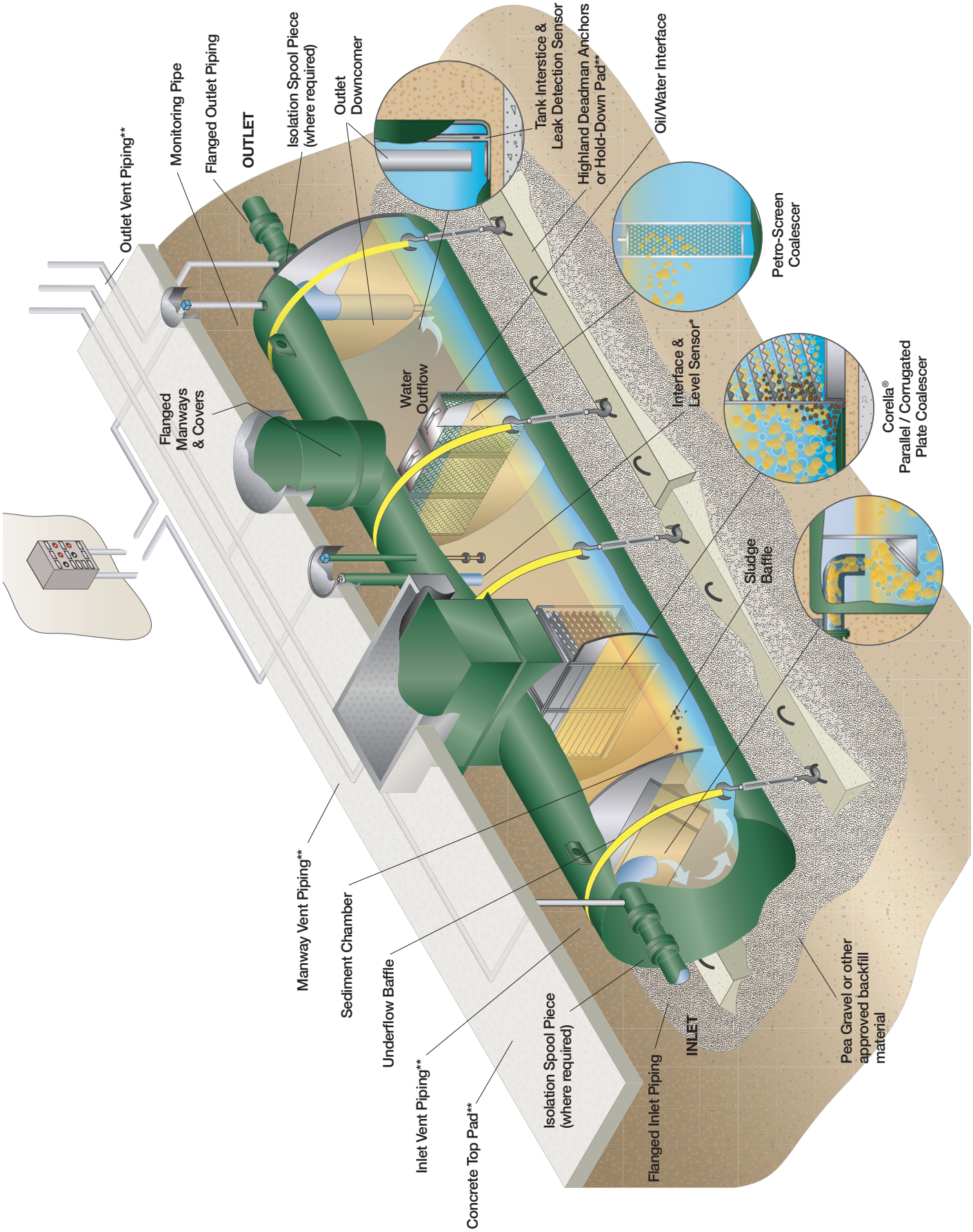
They are typically required in all facilities that conduct washing, servicing, repairing, maintenance or storage of motor vehicles including car washes, commercial vehicle garages, repair facilities, service stations and similar sites where oil or flammable liquids may be introduced into a sewer system.

Designed to accept gravity flow, the OWS's volume, retention time and use of coalescing elements, permit these contaminants to separate from the water due to their differences in specific gravity. The standard OWS contains two chambers where oils separate and float to the surface, while sand and grit settle to the bottom sludge baffle.

These free-floating oils and oily-coated solids accumulate in the OWS until they are pumped out. The clearer water beneath the separated wastes flows downward to the downcomer pipe where it is discharged from the final OWS.

OWS sizing and construction conforms to most plumbing codes and the effluent discharge meets or exceeds many municipal industrial sewer pretreatment regulations. Nonetheless, you must confirm all code and regulatory requirements with your AHJ prior to and during installation of the OWS. To view an animated simulation of the OWS operation, go to www.highlandtank.com

Model HTC Oil/Water Separator with EZ Access option shown.
*Optional equipment available from Highland Tank. **Installer supplied equipment



Installation

Care in Handling OWSs

OWSs must not be dropped, dragged or handled with sharp objects and, except as minimally necessary for inspection and testing, should not be rolled. Lifting equipment must be of adequate size to lift and lower the OWS without dragging, dropping or damaging the OWS or its coating.

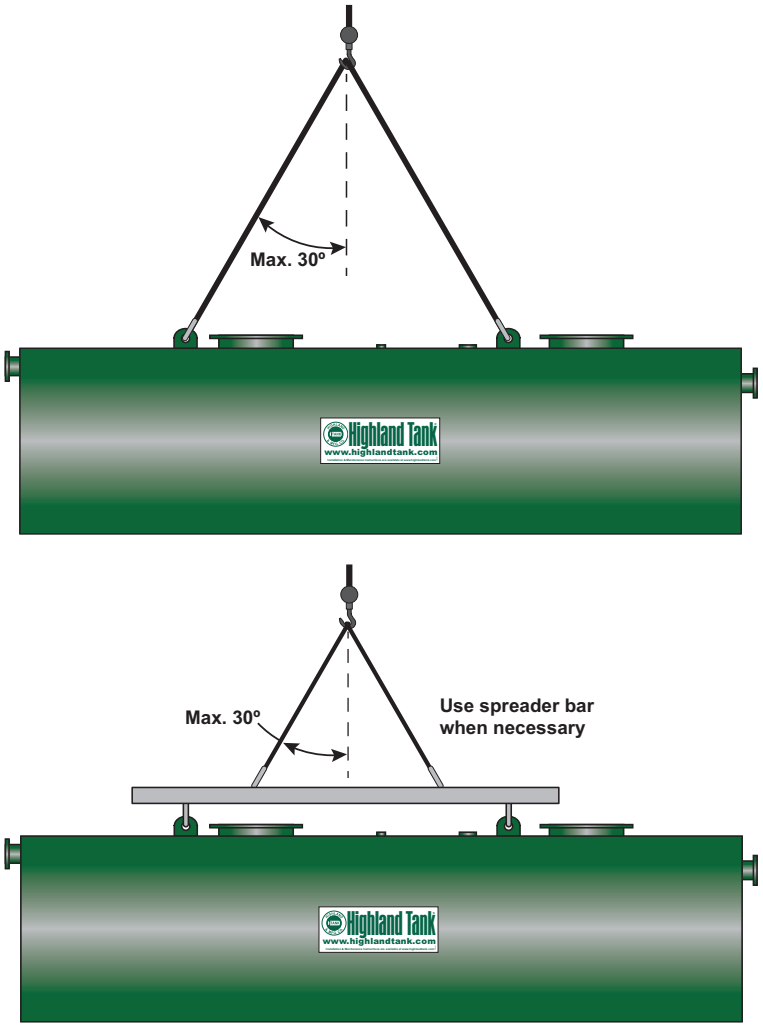
OWS Unloading

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

Lifting and Moving

DO NOT MOVE OWS UNLESS EMPTY. Lifting and moving the OWS must only be done using the lifting lugs welded to the OWS. OWSs should be carefully lifted, moved and lowered using cables, chains or straps of adequate size. When two lifting lugs are used, 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 OWSs with guidelines attached to each end of the OWS. If OWSs must be relocated on a job site during installation, they must be lifted and not rolled.

Fig. 1



WARNING:

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

Always use two lifting lugs to lift OWS.

Pre-Installation Inspection & Testing

Upon delivery, visually inspect the OWS 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. If an OWS is not buried within 90 days, the OWS should be covered to protect the exterior coating from the effects of ultraviolet light damage.

If the OWS is of double-wall construction and has shipped with a vacuum drawn on the interstice, inspect the vacuum gauge. If the gauge indicates less than 5 inches of mercury, reinstitute the vacuum to 7 inches of mercury. Maintain 5 inches of mercury vacuum for 2 hours before installing the OWS. Do not relieve pressure until OWS is secured in its final resting position.

Internal Piping Inspection

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

WARNING:

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

Coating Repair

Before placing the OWS in the excavation, all dirt clods and foreign matter shall be cleaned from the surface of the OWS. Damage to surface must be repaired using the supplied coating touch-up kit.

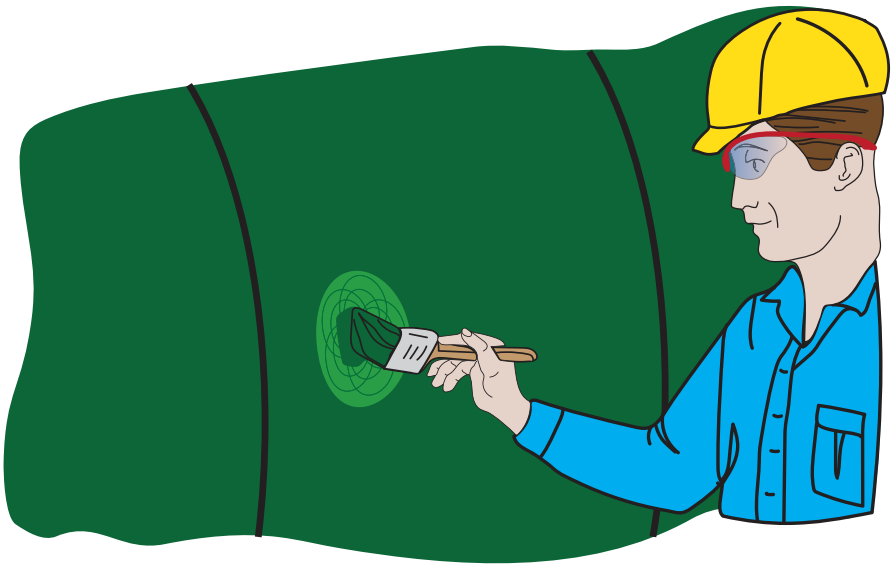
Visually inspect the OWS for damage. Pay particular attention to areas where coating may have been gouged or abraded. Mark all areas which appear damaged for repair. Clean damaged OWS coating areas of rust, contaminants or disbonded coating prior to application of touch-up coating.

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 OWS. Additional coating touch-up is available from Highland Tank.

Coating Repair continued

Fig. 2



As part of Highland Tank's quality control program, all HighGuard, and ACT-100-U® coated OWS receive a holiday detection test at the factory to ensure coatings are uniform and without holidays.

After repairs have been completed, all repaired areas of the HighGuard and ACT-100-U® protection system coatings shall be re-tested with a holiday detector set at 15,000 volts.

Anode Integrity (STI-P3® only)

DO NOT perform a 15,000 volt holiday test on STI-P3® protected OWSs. Refer to Steel Tank Institute STI-P3® Installation Instructions, R821 for more information.

OWS may be equipped with zinc, magnesium or a combination of both anodes. Consult STI-P3® Corrosion Control System (R821) and Petroleum Equipment Institute PEI/RP100 for further instructions for checking operation, repairing connection and activating.

Pre-installation Tightness Testing Procedures

An appropriate pneumatic or hydrostatic test may need to be performed prior to placing OWS into service, as outlined below. Factory-applied vacuum test may be substituted for on-site testing. Check with AHJ for approval. Take all necessary safety precautions during air tests.

IMPORTANT:

DO NOT leave OWS unattended.

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

DO NOT connect the air pressure line from the compressor to the interstitial monitoring port of a double-wall OWS.

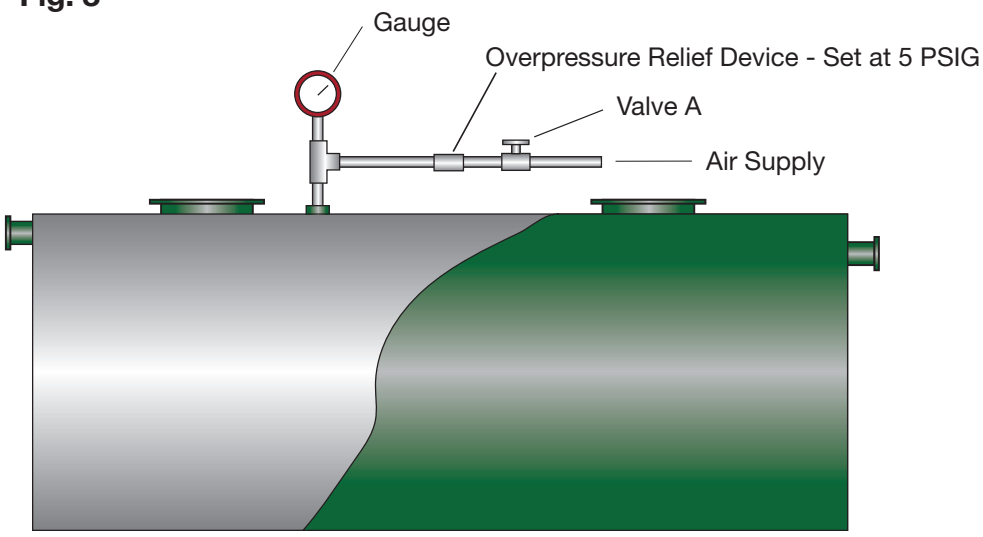
After pneumatic or hydrostatic testing, release air pressure from the OWS before dismantling testing equipment. For factory applied vacuum, do not relieve vacuum until OWS is secured in its final resting position.

Single-Wall OWS Air Test

Remove factory installed temporary plugs & thread protectors. Apply compatible, non-hardening pipe sealant to threads and install/reinstall liquid-tight steel or cast-iron plugs at all unused openings taking care not to cross-thread or over-tighten plugs. Manway gaskets, lids and blind-flanges must be in place prior to performing air test. (Refer to Steel Tank Institute ACT-100-U® Installation Instructions, R971 or STI-P3® Installation Instructions, R821 if nylon dielectric bushings are present.)

Perform air test for a single-wall OWS as illustrated in Fig. 3 below. Temporarily plug, cap or seal off remaining OWS openings to hold pressure. Open valve A and pressurize the OWS to a maximum of 5 PSIG. Seal the OWS by closing valve A and disconnect the external air supply. Apply a soap solution to all welded seams and fittings. Inspect to assure that no leaks exist.

Fig. 3



Pre-installation Tightness Testing Procedures continued

Double-Wall OWS Air Test

Double-wall OWSs require different air pressure testing procedures.

DO NOT connect a high-pressure air supply line directly to the interstitial monitoring port.

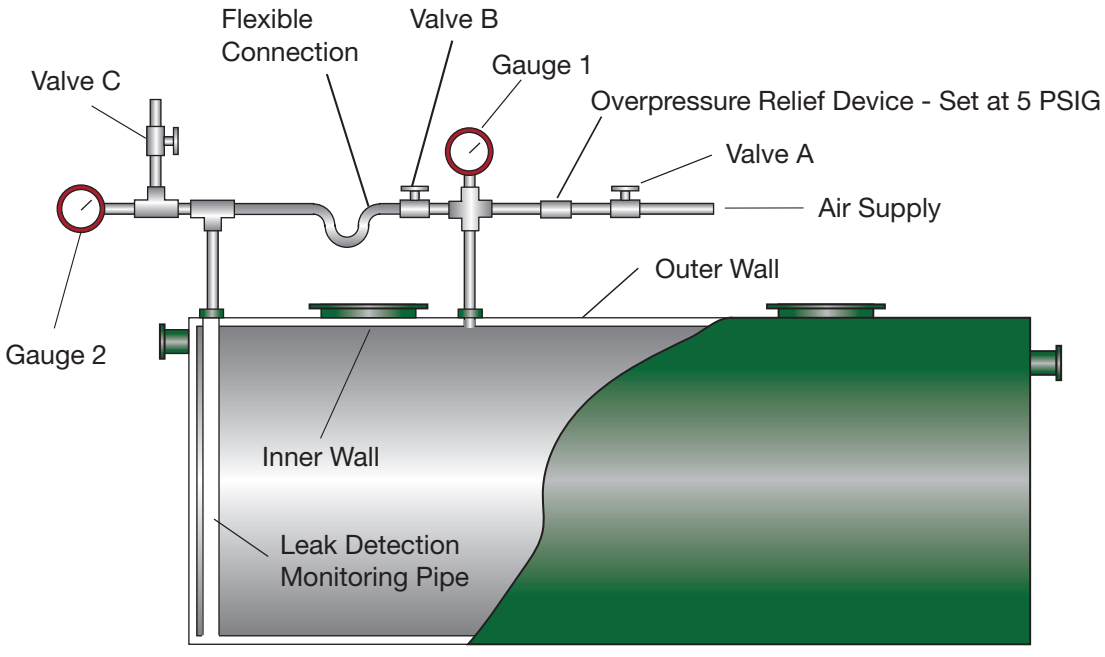
A double-wall OWS shipped with a vacuum on the interstice need not be subjected to an air/soap test, if approved by AHJ and provided the OWS arrives at the installation site with the vacuum level within designated limits. If the vacuum level has changed significantly, reinstitute the vacuum to 7 inches of mercury. Maintain 5 inches of mercury vacuum for 2 hours. Consult Highland Tank if OWS does not hold vacuum.

If the OWS did not ship with a vacuum on the interstice or AHJ requires testing, proceed with the air test as follows and as illustrated in Fig. 4 below.

Temporarily plug, cap or seal off remaining OWS openings to hold pressure. Close valve B and pressurize the OWS inner tank to a maximum of 5 PSIG. Seal the inner tank by closing valve A and disconnect the external air supply. Monitor the pressure for a period of 1 hour.

While air tests are generally inconclusive without soaping and the careful inspection for bubbles, this step is recommended to detect a very large leak in the inner tank and prepare for the next step.

Fig. 4



Pressurize the interstice with air from the inner tank by closing valve C, then opening valve B. Allow pressure to equalize.

Soap the exterior of the OWS and inspect for bubbles while continuing to monitor the gauges to detect any pressure drop. Release the pressure from the interstice first by opening valve C, then open valve B to release all test pressure and vent both spaces.

Refer to PEI/RP100 and labels on the OWS for testing guidelines.

Optional Hydrostatic Test for Single-Wall OWS if Required by AHJ

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

After the separator has been leveled, secured to foundation, and the OWS is fully supported with backfill around the bottom quadrant, fill the OWS with clean, fresh water (See Filling the OWS on page 21.) until water is discharged from the outlet. Allow the OWS to stabilize to a no-flow, static condition. If required by AHJ, attach blind flanges to inlet/outlet and fill completely.

Accurately measure and record the fluid level from the top of the manway 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 G and J OWSs, 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 in any chamber is detected.

Optional Hydrostatic Test for Double-Wall OWS if Required by AHJ

For double-wall OWS, 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.

Optional Double-Wall OWS Vacuum Test if Required by AHJ

A double-wall OWS shipped with a vacuum on the interstice need not be retested, provided the OWS arrives at the installation site with the vacuum level within limits designated by Highland Tank. If the OWS 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 OWS does not hold vacuum.

Double-wall OWS Vacuum Test

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

If the AHJ requires on-site testing of the OWS, proceed with the vacuum test as follows and as illustrated in Fig. 5 below.

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 OWS as illustrated in Fig. 5.

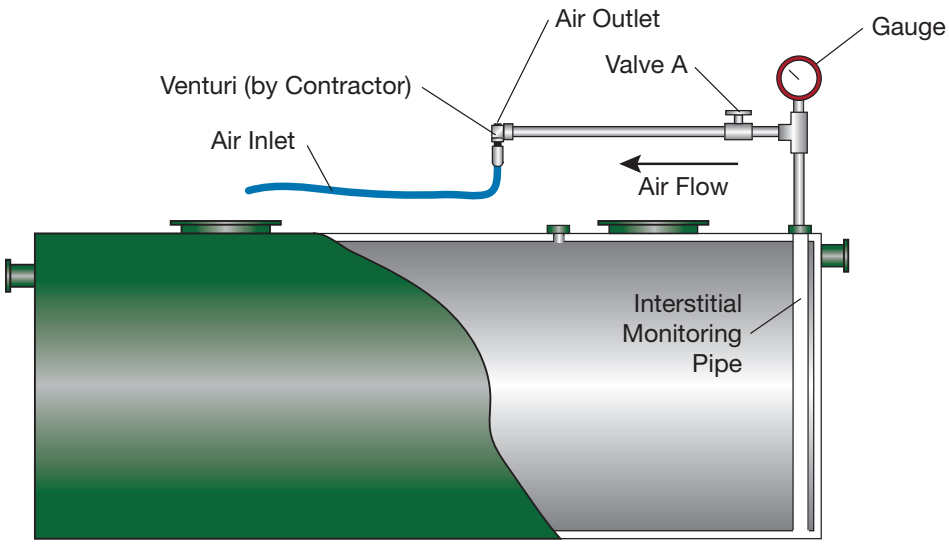
1 - Open valve A and for maximum air flow.
2 - Connect air supply line. (17 cfm's @ 100 psi recommended)
3 - Wait for gauge to read 12-15 in. Hg.
4 -Close Valve A completely.
5 - Remove air supply line

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.

Fig. 5



Excavation and Bedding

The excavation should provide adequate space for the OWS(s) piping and associated equipment. It must also be free of any hard or sharp material that could cause damage to OWS coating.

Be certain that foreign matter is not introduced into the excavation or backfill.

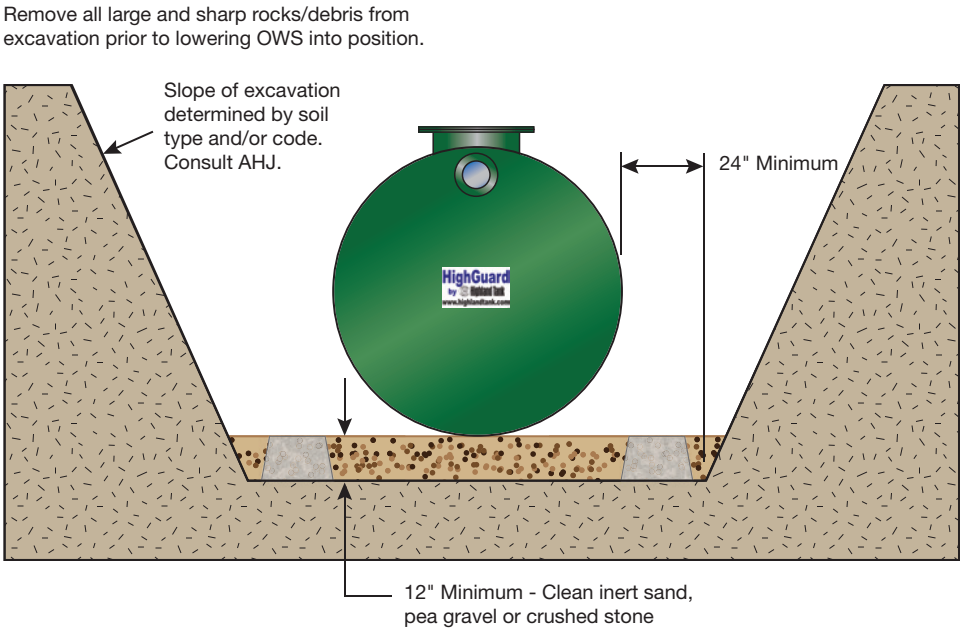
The total depth of the excavation is determined by the OWSs diameter, bedding thickness, hold-down pad (if required) depth of cover (including any effects of vehicular traffic) and slope and length of piping. Consult AHJ for additional requirements related to existing structures.

CAUTION:

DO NOT exceed maximum burial depth predetermined by manufacturer. Check approval drawing for burial depth notes.

Bedding and backfill must be a homogeneous material consisting of compacted clean sand, pea gravel, No. 8 crushed stone (American Society of Testing and Materials - ASTM-448) or equivalent. (100% through a 1/2 inch (13 mm) sieve and no more than 12% by dry weight through a #200 sieve (0.0029 Inch (0.0754 mm)). Pea gravel shall be no larger than 3/4-inch (19 mm). See Fig. 6.

Fig. 6

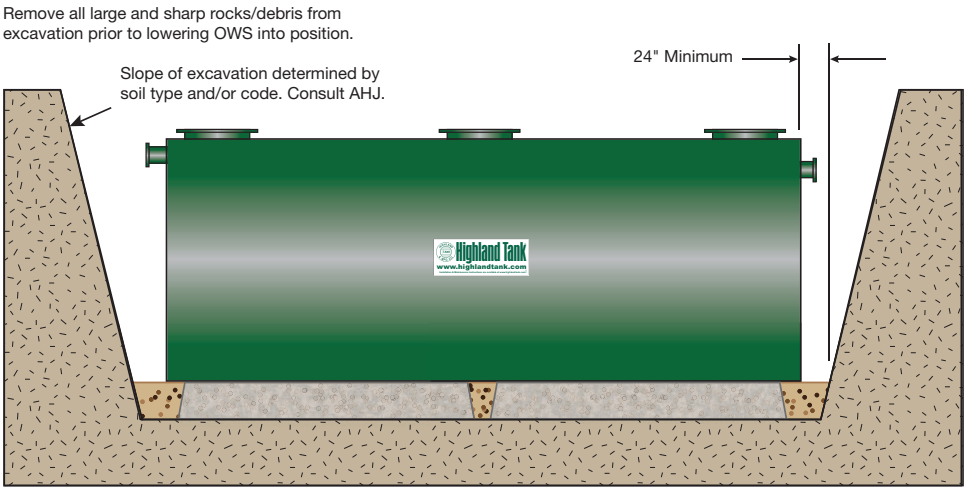


Note: When OWS is to be installed on a concrete pad, a minimum of 6 inches of bedding material must cover the entire pad. Grade and level bedding to extend at least two feet around the perimeter of the OWS for backfill operations.

Excavation and Bedding continued

The bottom of the excavation must be covered with bedding material to a minimum depth of one foot, suitably graded and leveled and extend at least two feet around the perimeter of the OWS for backfill operations. Place at least 24 inches of backfill between any adjacent OWSs, tanks and excavation walls. See Fig. 7.

Fig. 7



Placement of the OWS

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

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

Anchoring

High water tables or partially flooded excavation sites exert significant buoyant forces on OWS. Buoyant forces are partially resisted by the weight of the OWS, the backfill and any pavement atop the OWS. Additional buoyant restraint, when required, is obtained by using properly designed hold-down straps in conjunction with concrete hold-down pads or deadman anchors.

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

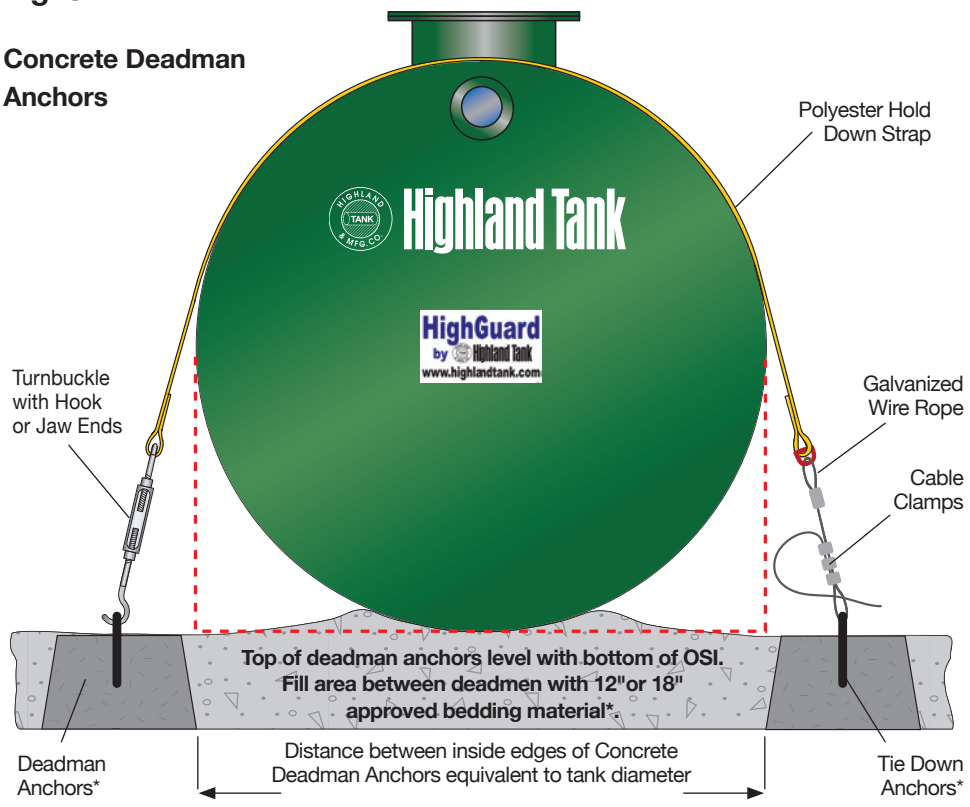
Steel hold-down straps must always be kept from contacting the OWS shell by an oversized separating pad made of inert insulating dielectric material.

Several hold-down methods are available for anchoring the OWS in the excavation. Consult AHJ and choose the method that completely satisfies all requirements for the installation location. Highland Tank's Deadman Anchoring System employs concrete deadman anchors and polyester hold-down straps.

When using deadman anchors, the bottom of the excavation (native earth) shall be covered with a minimum of 12 inches of bedding material suitably graded and leveled. Bedding and backfill shall surround the OWS to a width and depth of 24 inches minimum all around the OWS. Position deadman anchors as shown in Fig. 8, filling the space between them with approved backfill material.

Fig. 8

Concrete Deadman Anchors



*Contractor supplied items.

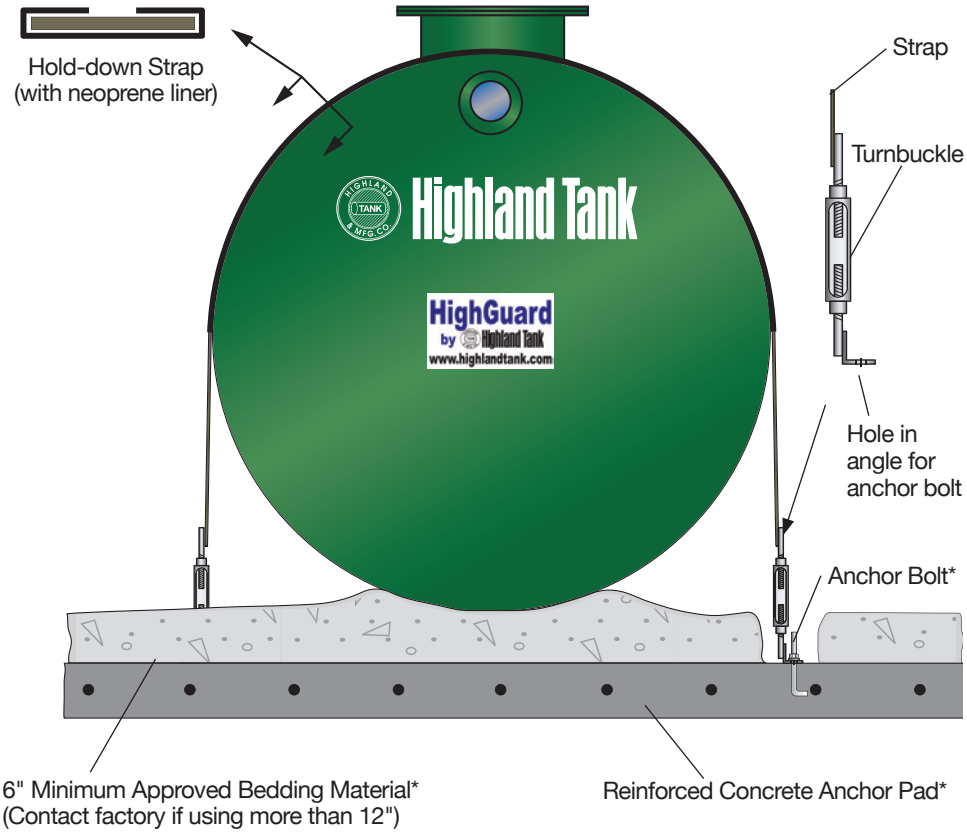
Anchoring continued

When anchoring by means of a concrete pad is required, the OWS must not be placed directly on the pad. See Fig. 9.

A layer of bedding material, 6 inches deep must be spread evenly over the dimensions of pad to separate the OWS from the pad. Bedding deeper than 12 inches require specially designed hold-down straps. Contact Highland Tank if 12 inch or deeper bedding is to be used. The OWS must not be placed on any other hard or sharp material, which might cause deformation of the OWS or damage to the coating.

Fig. 9

Standard Steel Hold-down Straps with Concrete Hold-down Pad



In tidal areas, backfill or bedding materials composed of small particles, such as sand, can migrate into native soils where larger aggregate, such as pea gravel or crushed stone, exists. Resultant voids can create an uneven support for the OWS. The use of filter fabric in tidal areas is recommended to prevent bedding migration.

Backfilling

Approved backfill similar to bedding material must be placed around the entire OWS to create a uniform homogeneous environment. Be certain that foreign matter is not introduced into the excavation or backfill. Special care shall be taken when backfilling to ensure that the OWS is fully and evenly supported around the bottom quadrant and that no damage to the coating occurs. See Fig. 10 and 11.

Fig. 10

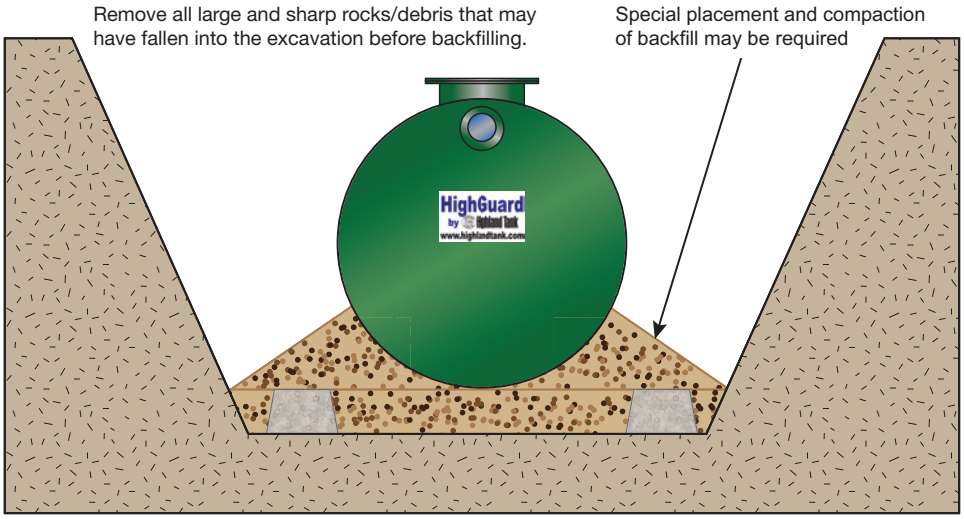
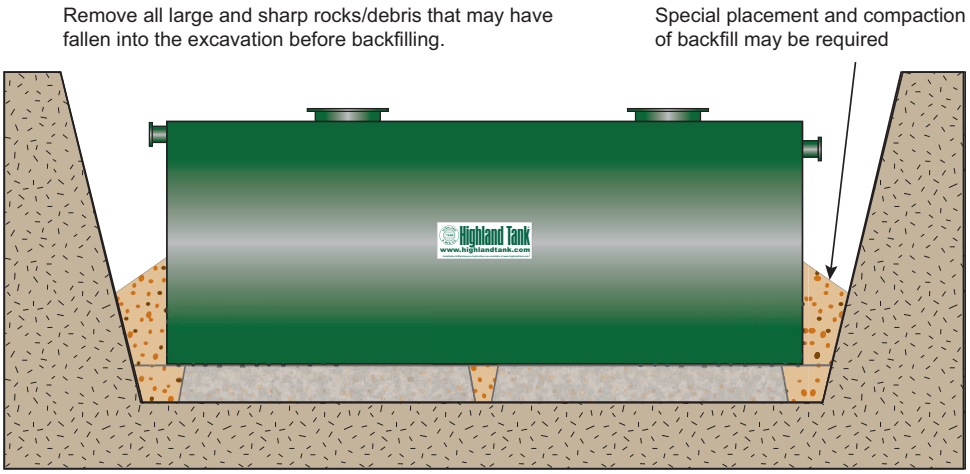


Fig. 11



The backfill should be placed carefully around the OWS to the top of the OWS.

Ballasting

In areas where there is the presence of ground water or a high water table, ballasting may be necessary for additional downward force on the OWS. If required, fill OWS with clean water. After ballasting is complete, check elevations for proper tolerances.

Note: Highland Tank recommends maintaining the excavation dewatering process until installation is complete.

Piping & Venting

Inlet piping installation should be straight and true with as few turns as possible to limit turbulence. (When dielectric isolation is required, consult Steel Tank Institute ACT-100-U® Installation Instructions, R971 or STI-P3® Installation Instructions, R821 and Petroleum Equipment Institute PEI/RP100 for further instructions.)

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

The OWS inlet and outlet piping 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 in the OWS will cause turbulence, which adversely affects OWS performance. Piping must also be designed to limit flow into the OWS to the flow rate specified. Use of a flow control device may be required.

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

IMPORTANT:

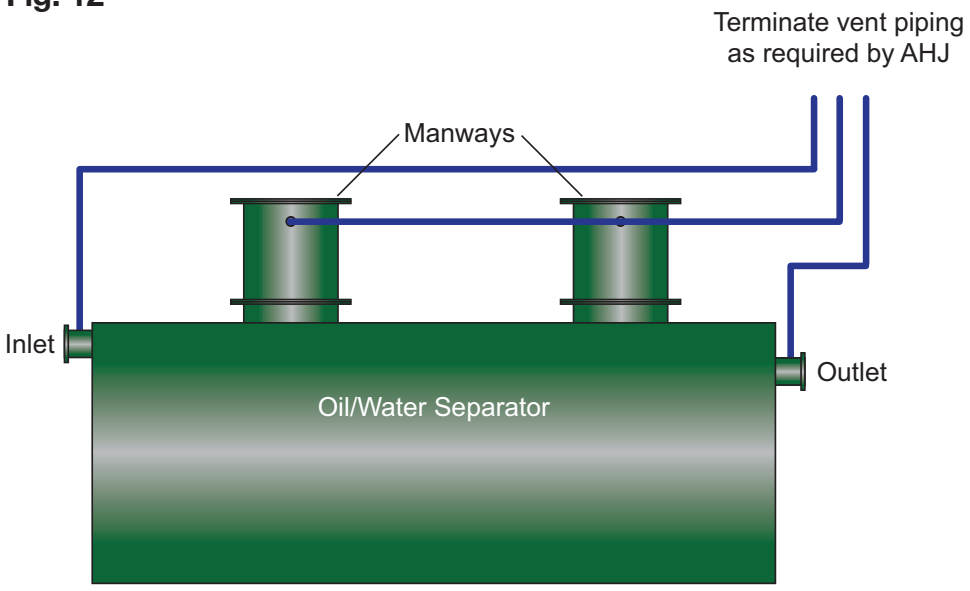
The OWS should be fitted with properly sized inlet and outlet shut-off valves (contractor supplied) for emergency shut-down and service purposes.

Attach manway extensions, riser and sensor pipes and any other contractor supplied piping to the OWS. Take special care to prevent damage to any gaskets or pipe threads.

OWS Venting Guidelines

OWS is designed for operation at atmospheric pressure ONLY. OWS inlet, outlet and manways MUST be vented to atmosphere to assure proper operation. See Fig. 12.

Fig. 12



OWS Venting Guidelines continued

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

As shown, the manway vents can be manifolded together to one common vent line. **The inlet and outlet vents must each have their own separate, dedicated vent line for the following reasons:**

- OWS 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).
- OWS outlet is vented to prevent siphoning during full flow into a flooded storm sewer or flooded pit.
- OWS manways are vented to prevent hazardous gases from building up in manway risers.

Venting the inlet, manways and outlet independently prevents raw oil or oily wastewater from bypassing and exiting the OWS 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: OWS owners may need to provide flame arrestors where required by governing codes for safety. Check with AHJ.

OWS with Gravity Oil Skimmers and/or Monitoring Equipment

If an oil skimmer is to be installed, piping between the OWS and the waste oil tank must be sloped between 1/8 inch to 1/4 inch per foot to maintain gravity flow.

For OWS with oil level sensors, pump-out pipes and leak detection sensors, install riser pipes 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 OWS is secured and backfilled to the top of the OWS. Air pressure for air testing after installation must not exceed 5 PSIG and must be measured at the top of the OWS. Refer to appropriate air tests procedure on pages 12 and 13.

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 OWS. 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 OWS 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.

After all coating touch-up applications, the installer must verify that all of the coating has cured (adequate material hardness and solidification) prior to final backfill that will completely cover the OWS.

IMPORTANT

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

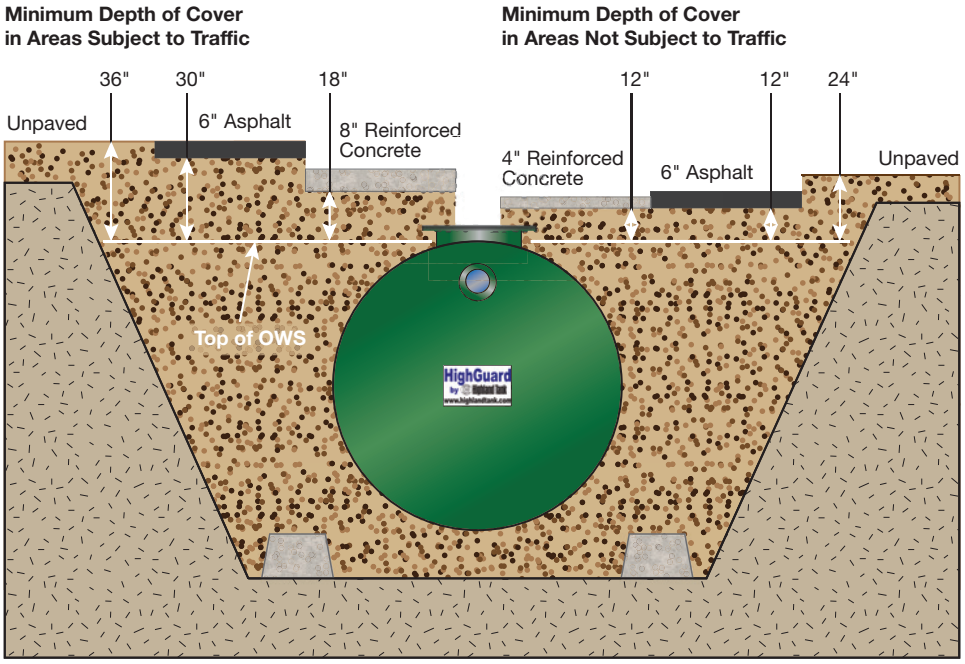
Final Backfilling

Deposit homogeneous backfill carefully around OWS to a depth of at least one foot over OWS to avoid damage to coating especially where tamping is required. Refer to the National Fire Protection Association's Regulation NFPA 30 and state or local codes for minimum depth of cover required.

Finally, carefully deposit backfill over the OWS up to the elevation needed to complete grade level finishing. See Fig. 13 for minimum burial depth. Consult approval drawing for maximum burial depth.

Use grade level covers and street boxes to access the manways, sensors, or pump-out pipes. The grade level covers above the access manways must be of a greater diameter (i.e. 36 inch grade level cover over a 24 inch access manway).

Fig. 13



Optional OWS Electronics

Optional OWS Electronics may have been provided for your project. These electronics may include:

- Oil/water Interface level sensor
- High Fluid Level Sensor
- Leak sensor (for interstitial monitoring of double-wall OWS)
- Alarm/Control panel

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

Oil Level /Leak Alarms (Optional)

For easy, efficient operation and maintenance, the OWS 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 OWS until a predetermined level is reached, at which time the oil level sensor activates an alarm signaling that the OWS 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 OWS 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 OWS. 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.

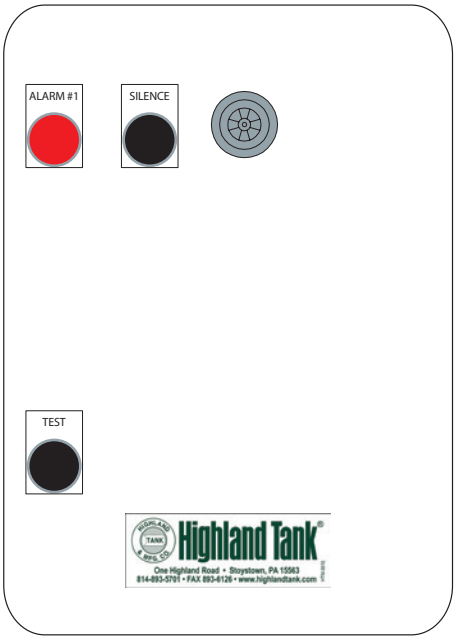
HT-A2-LD Three-channel panel. Performs High-Oil Level, High-High Oil Level sensing AND Liquid Only Leak Detection with specific alarms for oil levels only.

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.

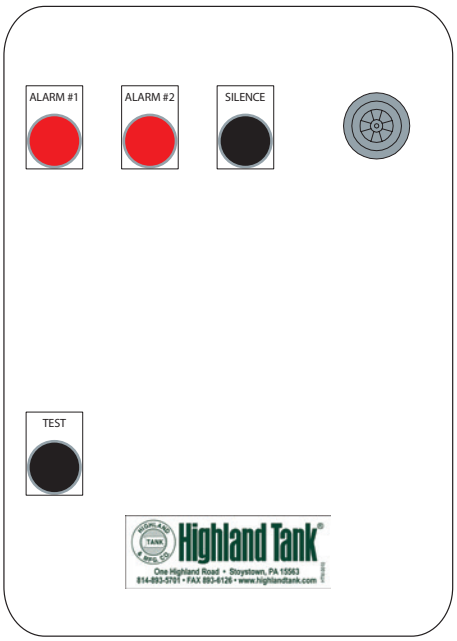
Oil Level Controls (Optional) continued

If your OWS has a control panel and sensors installed, locate the diagram for your panel from the five 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.

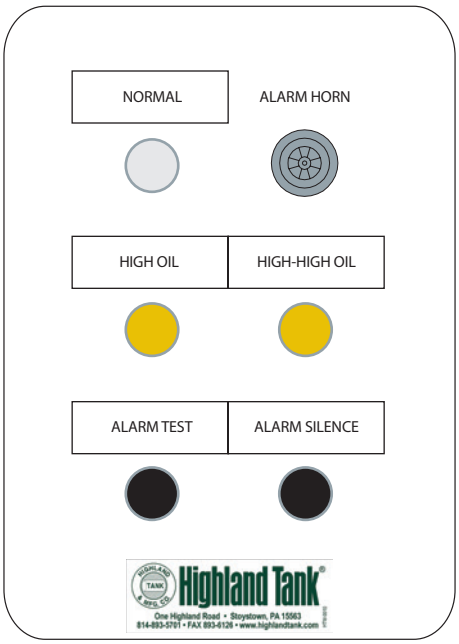
HTAP-1 - 1-Channel
High-Oil or Leak Detection



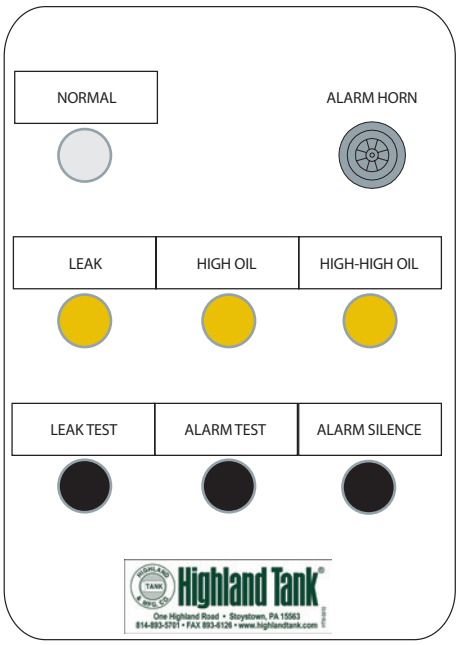
HTAP-2 - 2-Channel
High-Oil and Leak Detection
or High-Oil and High-High-Oil



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

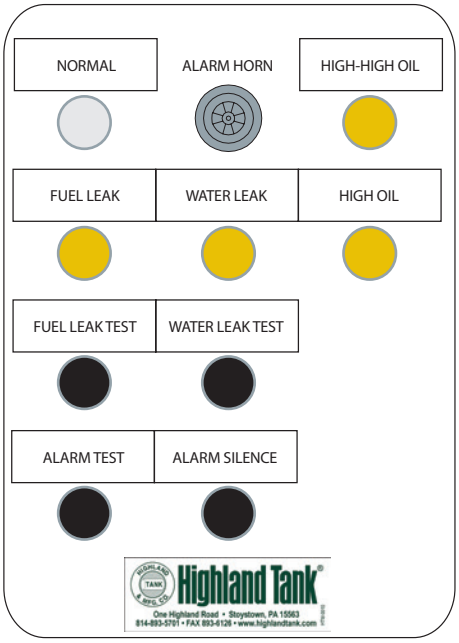


HT-A2-LD - 3-Channel
High-Oil, High-High-Oil
and Leak Detection Specific
Non-discriminating



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)	Alerts operator of High-Oil Level, High-High-Oil Level or Leak Detection depending on the connected sensor. See Alerts and Responses below:

Oil Level Controls (Optional) continued

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 OWS operation. Pump out oil. Refill OWS with water to reset sensors. Resume OWS 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 OWS operation. Pump out oil. Refill OWS with water to reset sensors. Resume OWS operation.

LEAK Alerts operator of a leak in either primary or secondary wall of OWS. Does not discriminate if leak is fuel or water.
RESPONSE: See Leak Detection System procedure page 30.

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 OWS Only

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

For easy and efficient monitoring of the interstitial space, the OWS 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 OWS operation. After flow has stopped, remove leak detection sensor from monitoring pipe being careful not to damage 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 fuel 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 ground/surface 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 will lower with each pump-out.

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

OWS Start-Up

IMPORTANT: **The OWS must be full of water as described[1] below to operate.**

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

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.

Open the OWS inlet and outlet pipe valves.

Filling the OWS

If the OWS has not yet been filled with water, as may have been required for ballasting, (see page 19) fill with clean, fresh water at this time. [1]The OWS must be full of water before any wastewater can be treated. The OWS can be filled through the facility's drain leading to the OWS inlet or through a manway.

If filling by manway, place the hose through the 4 inch diameter Gauge Port in the inlet-side Manway Cover or in the 24 inch diameter Manway so that hose outlet rests inside the OWS.

The OWS 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 OWS bottom.

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

Prior to Oil Level Sensor Installation

Oil Level Controls (optional)

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

And/Or

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

Switch on 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 OWS 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 OWS 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 @ 814-893-5701 should you need additional assistance.

OWS Start-Up continued

Skimmer Adjustment

Ensure that OWS 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 OWS for reference. Stop flow to OWS.

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:

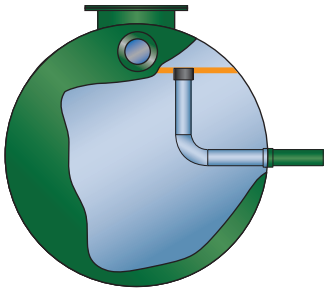
If necessary, the Effluent Transfer Up-Comer Pipe(s) rubber fittings can be adjusted to raise or lower the OWS chamber fluid level. This is typically utilized to make large adjustments. The Skimmer Pipe rubber fitting should only be utilized to make small adjustments to skimming level.

After adjustment, initiate maximum flow rate to the OWS 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.

Bucket Style



Sawtooth Style

Operation

The OWS is a stationary, wastewater treatment tank, filled with water. Internal baffles and chambers enhance the oil/water separation process. Waste accumulates within the OWS while effluent is discharged by gravity.

Highland Tank OWSs will not remove oils with a specific gravity greater than designed for, 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 OWS through the inlet pipe and is directed over the Velocity Head Diffusion Baffle, a reinforced steel plate inclined at a 45 degree angle.

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

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

The oily water then passes through the Corella® coalescer - an arrangement of parallel corrugated/flat plates. Oil rises and coalesces into sheets on the undersides of the plates. The oil migrates up the plate surface, breaking free at the top to form large globules of oil that rise quickly to the surface. At the same time, floating solids are stopped on the flat top surface of the angled plates and slide back off into the sludge collection area.

During periods of operation and wastewater flow, oils and solids continue to accumulate in the OWS. As this separation process continues, the clearer, heavier water migrates toward the bottom of the OWS. When wastewater enters the OWS, the cleanest water from the bottom of the OWS is discharged via gravity flow. Treated water is only discharged from the bottom of the OWS via the down-comer pipe during periods when wastewater flows into the OWS.

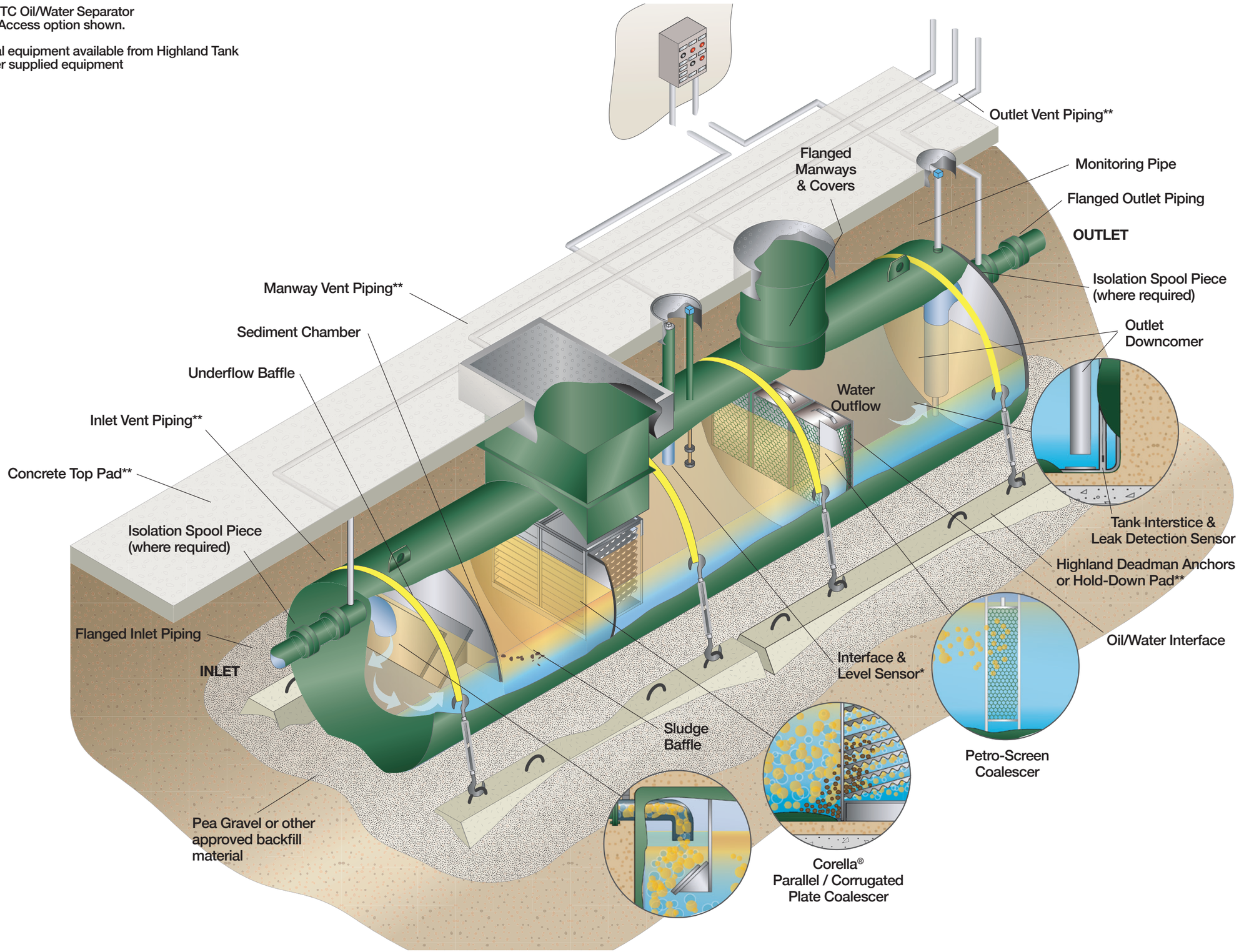
Wastewater flows from the OWS to a sanitary or storm sewer or is pumped to be recycled for reuse. Free-floating oil and greasy solids accumulate in the OWS until they are pumped out. Any and all oil recovered and removed from the OWS must be recycled or disposed of in accordance with federal, state and local regulations.

Petro-Screen Coalescer

The Petro-Screen coalescer intercepts oil droplets too minute to be removed by the Corella Coalescer. This bundle of oil-attracting polypropylene fibers traps oil particles down to 20 microns in size. These small particles coalesce into larger globules that eventually break free and rise to the surface.

Model HTC Oil/Water Separator
with EZ Access option shown.

*Optional equipment available from Highland Tank
**Installer supplied equipment



Maintenance

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

WARNING: **Never enter an OWS 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 OWS 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 manway gaskets as necessary when the OWS is shut down for maintenance.**

The coalescer plates and packs can be mechanically removed through the EZ-Access manways, if present, for cleaning or can be cleaned from above using a high-pressure, hot-water system.

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

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

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

OWSs 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, sand interceptors and traps
- Inside of the OWS 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

Maintenance continued

OWSs with oil level sensors require oil removal when the alarm is activated. Stop OWS operation, remove the oil and then refill OWS with clean water (see Start-Up Instructions, page 29).

OWSs without oil level sensors require level checking by use of a sampling device or a gauge stick with water finding paste. The OWS 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 OWS's working volume, oil should be removed and the OWS refilled with clean water. At the 43% or high-high-oil level OWS performance will decline. Oil must be removed and the OWS 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 OWS.

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 OWS, from Step 1, to obtain the accumulated wastes volume percentage.

If the combined oil and solids layers are equal to or greater than 20%, the separator is considered full. Stop OWS operation, remove accumulated oils and solids. Refill the OWS with clean fresh water and resume operation (see Start-Up Instructions, page 29).

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.

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 OWS is in alarm condition,
- the oil layer and/or the solids layer in the first chamber are 20% or greater than the depth of the OWS diameter,
- the effluent exhibits an oil sheen or contains high contaminant levels.

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

Maintenance continued

If the OWS 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 from the sediment chamber and refill OWS with clean water. (See Start-Up Instructions, page 29.)

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 OWS, 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, connect the oil suction hose to the designated Oil Pump-out Pipe fitting or open and use one of the OWS manways to skim oil.

Using suction, remove the oil. Refill OWS with clean water to deactivate the High Oil Level Alarm (see Start-Up Instructions, page 29).

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 OWS refilled with clean water.

To minimize water contamination of the oil, use the designated Oil Pump-out Pipe fitting or open and use one of the OWS manways to skim oil. Using suction, remove the oil. Refill with clean water (see Start-Up Instructions, page 29).

Mixed Oil and Water Removal Procedures

Place a suction hose inside the OWS through either the Gauge Port in the Sediment Chamber Manway or through the Sediment Chamber Manway.

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

Using suction, remove all contents from the OWS. Refill with clean water (see Start-up Instructions, page 29).

Major Oil Spill Response Procedures

IMPORTANT:

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

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

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

If OWS 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.

Open the Gauge Port or Sediment Chamber Manway.

Place sampling device or gauge stick into the OWS through either the Gauge Port or Manway to determine the oil/water interface location.

Place a suction hose inside the OWS through either the Gauge Port or through the Manway.

Lower 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 29).

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

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

Sludge Removal Procedures

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

Open the Gauge Port or Chamber Manway.

If used, insert gauge stick into the OWS through either the Gauge Port or Manway. Alternately, a sampling device enables taking accurate readings on settled solids to any depth in the OWS.

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 Striker Plate on the OWS bottom. Mark the stick.

The sludge depth is the difference between the two measurements.

Sludge Removal Procedures (for full OWS)

Place a suction hose inside the OWS through either the Gauge Port or through the Manway.

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 Striker Plate on the OWS bottom.

Refill with clean water (see Start-Up Instructions, page 29).

Sludge Removal Procedures (for completely empty OWS)

WARNING:

Never enter an OWS or enclosed space, under any condition without proper training and OSHA approved equipment. 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 can be helpful. Direct the water stream to the OWS wall side and bottom.

Using suction, remove the resultant slurry.

General OWS Cleaning Procedures

If not properly maintained, the OWS may malfunction.

NOTE: Over a period of time sediment, oil and grease will build up on the walls and floors of the OWS. Dirt and heavy oil may also build up on the Corella® coalescer, reducing the unit's efficiency. In addition, the Petro-Screen removes some suspended solids along with the small oil droplets in the wastewater. Periodic cleaning of the Petro-Screen is also required.

IMPORTANT:

It is recommended that the OWS 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 manway covers to expose the sediment chamber, being careful not to damage the gasket.

Pump-out liquid contents of OWS (see Mixed Oil and Water Removal Procedures, page 37).

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 OWS.

Remove the accumulated waste with a suction hose (see Sludge Removal procedures, page 39).

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

NOTE: Use high-temperature, 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 OWS wall sides, top and bottom.

Using suction, remove the resultant slurry.

Cleaning OWS 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.

Cleaning OWS Chambers

Remove manway covers over the manways to expose the OWS chambers. Be careful not to damage the gasket.

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

Never enter an OWS 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.

Remove the accumulated waste with a suction hose (see Sludge Removal Procedures, page 39). Direct a high-pressure hose downward and around to loosen caked oily solids on OWS sides, top and bottom.

Corella® Coalescer

Attach spray nozzle wand extension to the high-pressure hose. Direct spray downward and toward the Corella® coalescer to loosen caked oily solids that may have accumulated on the plates. Flush the Corella® coalescer from the outlet side to direct debris into sediment chamber. The coalescer packs must be cleared of all sludge to operate properly.

Direct the spray to the OWS wall sides, top 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 OWS interior and components for any damage.

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

Petro-Screen Coalescer

IMPORTANT:

Coalescer packs can be removed through the manways for cleaning. Mechanical lifting equipment may be required to remove oil-filled packs and coalescer packs in larger units.

Note: The coalescer packs should be placed in a convenient location upstream of the OWS. Place coalescer packs on oil-absorbent blanket or sheet plastic for cleaning.

Hook a lifting rod or other device to the lifting lug on the coalescer pack directly below the manway and lift straight up to remove it from the OWS. Use lifting rod or other device to slide an adjacent pack into position below the manway for removal. Continue process until all packs have been removed.

Using a standard garden hose at normal pressure (40–70 PSIG) with or without a spray nozzle to loosen any caked solids. Flush the coalescer packs from both sides. Let coalescer packs stand to dry.

Visually inspect the OWS interior and components for any damage.

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

Reinstall the coalescer packs, restoring them to their original locations. Coalescer packs must be installed sitting on top of the bottom steel channel supports.

NOTE: Improper installation may result in separator malfunction.

Reattach the manway cover. Ensure the gasket is damage free.

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

Refer to OWS Start-Up Instructions on page 29 for proper refilling and restarting procedures

Troubleshooting Guide

Problems which occur during OWS 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 concentrated in OWS effluent water	Wastewater pumped into the OWS causing emulsification of oil droplets in the clean water	Adjust pump, change to different pump or change to gravity flow. Add additional treatment
	Flow rates exceeding rated capacity causing emulsification of oil droplets in the clean water	Decrease flow.
	Presence of detergents or surfactants causing emulsification of oil droplets in the clean water	Detect and remove source of harmful detergents.
	Oil levels higher than rated storage capacity, causing separated oil to carry-over	Remove oil.
	Excessive flow turbulence into OWS causing more mechanical emulsions	Check inlet pipe and valve 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 OWS, inside OWS or in effluent (Solids or clay may be coated with oil).	Install Highland Oil/Sand Interceptor in front of OWS and clean OWS.
	Oil is of a higher specific gravity than was specified for OWS	Remove source of high specific gravity oil, or decrease flow rate. Add additional treatment
	Wastewater pH is high, causing chemical emulsification	High pH is usually caused by high alkaline cleaner. Eliminate source of high pH

Troubleshooting Guide continued

Problem	Possible Cause	Remedy
Storm water back-up in drainage area	Excessive sludge or debris build-up	Clean out OWS.
	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 and/or OWS.
High suspended solids content in clean water effluent	Excessive sludge or debris build-up	Clean out OWS.
	Excessive solids in storm water drainage area	Install Highland Collection Catch Basin in front of OWS and clean OWS.

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

Email: wastewater@highlandtank.com

Phone: 814-893-5701

Special Model Maintenance Series G, J, S & TF

Depending on your specific model R-OWS, your OWS may have one or more extra chambers for:

Series G - Sand and grit collection on inlet end of OWS
Series J - Effluent Pump-out on outlet end of OWS
Series S - Side Oil Compartment on one side of OWS
Series TF - Trickle Filtration on outlet end of OWS

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

Series G

Series G OWSs incorporate an integral sand/grit chamber ahead of the main OWS chamber to capture and retain heavier solids, preventing them from entering the OWS. Some oils will separate from the influent and accumulate at the top of this chamber. Individual site conditions vary. It is important to monitor the levels in this chamber to prevent deterioration in OWS performance. If depth of solids reaches 12 inches of the operating depth of the OWS, follow procedures for oil and sludge removal discussed earlier in this manual.

Series J

Series J OWSs have a separate effluent pump-out chamber with level controls. The pumped effluent can be routed through a Highland Advanced Hydrocarbon Filtration System to further reduce the oil content. Effluent can also be pumped to a holding tank for additional processing at a later time and/or remote location. It is important to monitor the electrical and mechanical components for signs of wear or malfunction. Faulty equipment may cause OWS performance to deteriorate. Replace components as needed for optimal performance. Perform cleaning/maintenance as discussed earlier in this manual.

Series S

Series S OWSs 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.

Series TF

Series TF oil water separators have modifications to the standard OWS clear well, or a separate, additional chamber for installation of this oil removal media. The Trickle Filter media consist of small pieces of absorbent filter media that are chemically treated to cause molecular cohesion of hydrocarbons. This media is contained in mesh bags and can be incorporated into any of Highland Tank's HTC or R-HTC designs.

Special Model Maintenance continued Series TF

Media Replacement Cycle - The Trickle Filter media does require monitoring to determine the need for media bag change-out. Media replacement should be carried out as needed, but at a maximum recommended period of every 18 months.

Monitoring

Possible scenarios that will require attention to the media.

Oil Breakthrough – The primary purpose of the TF media is for removal of mechanically emulsified oils or high specific gravity oils that were able to make it past the primary coalescers of the HTC / R-HTC separator and / or to remove additional free oils to reduce oil discharge levels from the OWS. Once the TF media reaches its capacity for oil removal, oil discharge levels from the OWS will begin to increase. Grab sampling of the effluent and lab evaluation of oil & grease levels can be used to track discharge levels and indicate when the media must be changed to maintain acceptable discharge levels.

General guideline for determining media bag condition.
A dry media bag weighs approximately 3 lbs.
A water-soaked media bag weighs approximately 9 lbs.
An oil-saturated media bag will weigh between15-20 lbs.

Solids Buildup – While media saturation with oil does not typically create backpressure through the media, solids buildup on the media bags can cause an increase in water level during operation. Excessive backup will be indicated by a high water level alarm, if equipped. In applications with low levels of solids, the oil capacity of the media will often be reached before solids buildup becomes a factor. However, the type and volume of solids can vary widely from one application to the next, so maintenance due to solids buildup may be required. Once solids plugging is acknowledged, we recommend either replacing the bags or spraying them off to remove solids in a location where the solids that are washed off will not be discharged from the OWS. Sometimes rearranging of the bags is enough to alleviate the backup, but since the solids are often coated with oil, this can lead to a high level of oil discharge.

If solids discharge level is a concern, we recommend replacing or attempting to wash off and contain solids from the top layer of the media bags.

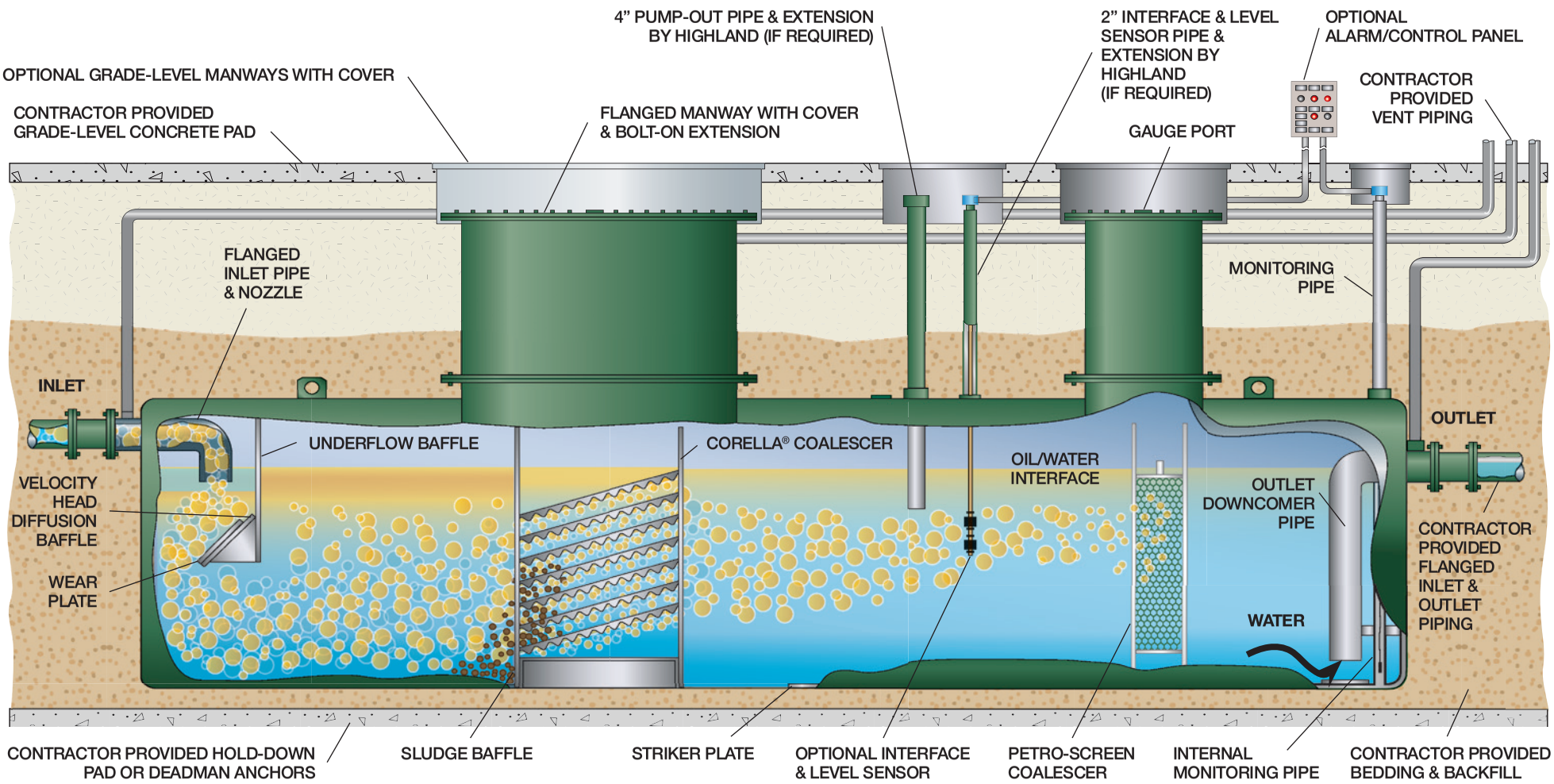
Bag Replacement

The Trickle Filter media is typically installed at the factory. To install new media, a portion of the top grating must be removed as needed by unbolting it. After flow to the OWS has been suspended, remove top grating. Remove and properly dispose of the used media bags. Continue with the removal of any residual oils or water that may have drained from the media. Place new media bags on top of the lower grate. Arrange the bags evenly to reduce the possibility of bypass. After all new media bags are in place, position and bolt the top grate back into its original position to prevent possible media flotation.

IMPORTANT
Bag Disposal Note

Media bag disposal is based on the contaminants that have been removed and should be in accordance with site-specific hazardous waste requirements and all applicable local, state and federal guidelines. This determination will need to be made by the appropriate site environmental personnel and carried out by operations personnel properly to avoid the possibility of environmental contamination and/or fines.

HTC Double-Wall Oil/Water Separator Reference Drawing



Appendix - A - Sample Inspection and Maintenance Log

Highland Tank - Oil/Water Separator Inspection and Maintenance Log - Serial # _____

Use a separate log sheet for each unit

Facility Name: _____

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

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

OWS Unit Details

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

Location of oil/water separator: _____

(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 OWS should be inspected on a regular schedule as determined by facility needs.

OWS 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: _____

Underground Cylindrical Oil/Water Separators

HT-2050

User Manual

Installation, Operation & Maintenance

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