



Installation and Operating Manual
Vault Type Separator System

Typical

Purchase Order No:

MSR Job:

Manufactured 2005



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Installation and Operating Manual Separator System

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1. Safety:

The following safety precautions supplement the other warnings provided within the text of this manual. They are recommended precautions that must be applied during operations and maintenance. It is not possible to determine in advance all of the possible situations that may arise, so the operator should exercise caution and use good operation procedures in the use of the unit. In addition to the procedures contained herein, observe all other required safety procedures. Always wear correct safety clothing and equipment and respect all safety rules. ***Safety is the sole responsibility of the owner and operating and maintenance personnel.***

- 1) All personnel performing installation or service on the separator system must be familiar with normal safety precautions and this manual before doing any work.
- 2) Do not install or service the equipment alone. Do not perform any work on the unit without another person present to render aid in the event of problems.
- 3) Do not perform any service on the equipment with the electrical power connected. Prior to any service, disconnect the power and use a voltmeter to ensure that there is no power to the system. Use approved lock-out and tag-out procedures.

2. Introduction:

The MSR Oil-Water Separator is a passive gravity-flow system for the separation of oil from oil-water mixtures. The design utilizes the difference in specific gravities between oil and water (buoyancy force) enhanced by the use of MSR “arc” coalescing plates. The separator is designed to receive oily water by gravity flow and to process it on a once-through basis. The separator vessel is constructed of concrete (by others). The coalescing plates are manufactured of an oleophilic (oil-loving) polypropylene. Please refer to the drawings at the end of this manual for the following descriptions.

The separator consists of a pre-separation chamber baffle; a plate inlet chamber directly upstream of the plates; a coalescing plate module section; and an outlet underflow/overflow exit chamber. Modules are installed with a double plate seal mechanism to ensure that all of the oily water influent is treated.

Also included is a belt-type oil removal skimmer (instructions for this skimmer are provided separately).

The oil in this mixture is usually in the form of droplets of various sizes. The oily water flows through the spaces between the plates, following a sinusoidal path, flowing alternately upward and downward. The oil droplets rise due to their buoyancy, impinge on the undersides of the plates and are captured. (Their rise rate is governed by Stokes' Law.) As more and more droplets are captured, they coalesce into larger droplets and eventually form an oil film. Because the coalescing plates slope upward from every angle, this film then migrates upward along the surface of the plates to the oil ports, eventually collecting on the surface of the water.

The plates are securely held in the separator by a series of plate hold-down brackets, one for each row of plates. These brackets may be seen in the assembly drawing,

Caution: The coalescing plate modules are constructed of polypropylene plastic which is very strong and compatible with both water and oil. They do, however, become brittle at low temperatures and must be handled at or close to room temperatures. Once installed, these temperature limitations do not apply.

3. Installation:

Please refer to the vault assembly drawing for purposes of these instructions and to the belt skimmer manual for skimmer installation and operating. The vault should be cast in place generally according to the dimensions shown in the drawings, Sheet 1.

a. Coalescing Plate Installation

Installation of the coalescing plate modules is a simple procedure consisting of installing the vertical aluminum angles at the back of the row of modules, the modules and seals, the top hold-downs and the front vertical angles. This installation is shown on the Drawings, Sheet 2.

Install the two back vertical angles (item 2 on the drawing) against the two sides of the vault 24 inches upstream of the oil dam as shown. These are provided with mounting holes and must be installed using appropriate concrete anchors and bolts. These act as locating pieces and also retain the seal mechanisms in place.

Install the back row of 18 coalescing plate modules (1) against the angles (2) leaving approximately even spaces against each side of the vault for the installation of the seals. The modules should be flush against each other and in an even row. This back row consists of six stacks of three modules each. Be careful to stack the modules so that the space between the modules is the same as the space between the plates within the modules. The plates can be turned 180 degrees to make the space either a nominal $\frac{1}{4}$ " or a nominal $\frac{1}{2}$ ", and the modules are designed in the nominal $\frac{1}{2}$ " spacing. The space on between the plates and the vault wall on each side should be approximately $\frac{3}{4}$ ".

Install the flat seal plates (6) on each side of the stacks of plate modules, between the plate modules and the vault walls. At this point there should still be a small space of $\frac{1}{4}$ to $\frac{1}{2}$ " between the flat plates and the vault walls.

Install the corrugated seal plates (5) between the flat plates and the vault wall. It is important that the seals extend all of the way to the bottom of the vault. If necessary, it may be possible to use a piece of wood on top of the corrugated plates to help move them into place. The corrugated plates are somewhat wider than the flat plates and become wider still when compressed into the space between the flat plates and the wall. This allows for overlap of the back and front corrugated plates.

Note: It is only important to ensure that all of the water/oil flow goes through the plate modules and not around along the walls. If the vault is somewhat narrower than designed as sometimes happens in a poured vault, it is acceptable to leave out one or more of the corrugated or flat plates so long as the entire module system is firmly in place and the flow must go through the modules. If the vault is somewhat wider than designed, it may be necessary to add additional sealing mechanisms to ensure all of the flow goes through the modules. If this occurs, please consult MSR for suggestions.

Install the wall clip (4) for the hold down bracket as shown on the detail, using appropriate wall anchors. Bolt the hold down bracket (3) to the wall clip. Install the opposite wall clip and match drill the hold down bracket to the appropriate length. Bolt the hold down to the other wall clip. The hold down bracket should be placed so that it holds the modules firmly in place with the bottom corner of the hold-down in one of the valleys of the tops of the modules. If possible a slight compression of the modules – approximately $\frac{1}{8}$ " – is good because it allows for future settling of the plates within the modules.

Repeat all of the above steps for the front row of modules, being sure they are flush against the back row. Overlap the corrugated plates as necessary.

Install the front locating angles (2) flush with the coalescing modules.

Take several photographs of the plate module installation for future reference in and training purposes. Note: the belt skimmer must be installed before any operation of the separator as it is necessary for a worker to enter the pit under the skimmer to install the belt and lower roller.

Operating Instructions:

The unit is a passive gravity system and the only thing that must be done to start the system is to fill it initially with clean water. This is done to keep the area downstream of the oil dam clean and oil free.

After the system is filled with **clean** water, it is ready for operations. It is important to fill the system each time it is emptied with clean water to keep the outlet area from being contaminated with oil from the inlet area. The inlet is by gravity flow and the outlet pump system is by others.

Maintenance Instructions:

1. After approximately 250 hours of actual flowing operation (or six months installation, whichever is sooner), the inlet area of the separator and the upstream grit chamber should be checked to determine if an excessive amount of solids have accumulated. This is necessary because otherwise the solids may accumulate enough to plug the lower part of the modules. In this case, efficiency will be reduced and hydrocarbons in the outlet water may exceed allowable limits.

2. After approximately the first 1000 hours of operation, the inlet area should be cleaned as follows:

- a. Remove cover or open lids as appropriate.
- b. Remove the water from the vault.
- c. Remove any sludge accumulation. Note sludge quantity and position.

If a large quantity of solids have accumulated in the front of the separator and in the inlet end of the plates, the plate modules may either be cleaned in place or removed and cleaned.

To clean the modules, first stop the flow to the unit, remove the oil, and drain or pump out the water.

In general, those solids that enter the coalescing modules will accumulate in the first 6-10 inches of the front packs. For cleaning in place, connect a pressure water hose (at least 60 psig) to the special plate cleaning wand. Provide a vacuum truck or other means of disposing of the sludge and dirt in the vessel. Turn on the water to produce a spray from the wand and insert slowly into each large hole of the plate modules, starting

at the upstream end. As the water flushes the dirt out of the plate modules into the inlet chamber, it should be removed by the vacuum hose or to an oily water sewer. Note: if desired, the *water* can be collected and recycled to the inlet of the separator later after cleaning.

For cleaning out of the vessel, remove plate modules, flat and corrugated seal sheets. Flush with hose to oily water drain. NOTE: DO NOT DISASSEMBLE PLATE MODULES. Use a hose to flush the tank and sweep all sediment out of the drain connections. A fire hose at 10-15 psi or a standard garden hose with spray nozzle at normal domestic pressure are effective cleaning tools, or the cleaning wand can be used out of the system as well as in place. In a similar manner steam hoses can be used to flush plate modules. ***Take extreme care using steam as high temperatures will damage the plates.*** Examine tank interior for damage and repair any damage to internal coating (if provided). Inspect skimmers (if provided) for damage and replace as necessary.

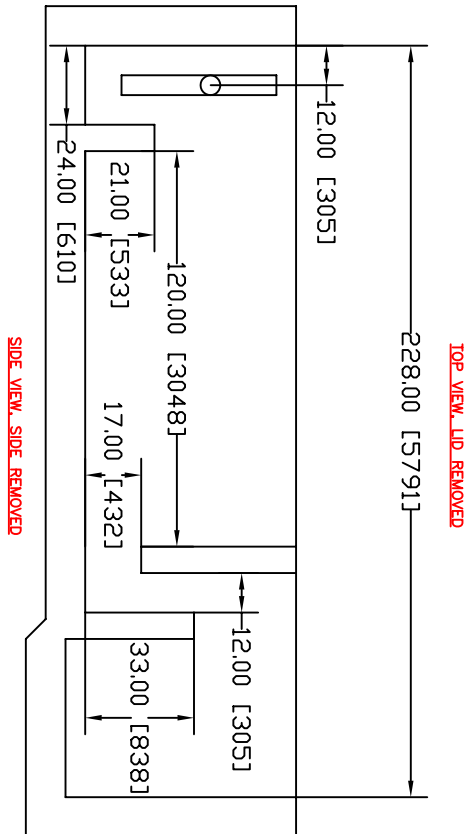
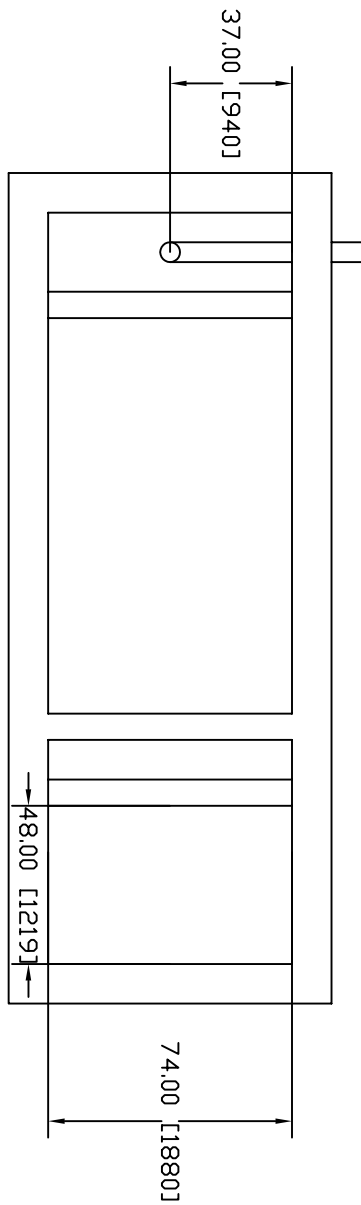
To restart unit, reinstall modules and seals. Refer to the photos taken during the initial installation for reassembly. To reinstall modules, follow the following steps:

1. Install plate modules, stacking them the same way they were previously installed, starting on one side of the plate area.
2. Install the flat sheet seals in the space between the plate packs and the vault wall. Install the corrugated sheet between the flat sheet and the vault wall. The fit is supposed to be tight, so it may be necessary to flatten the corrugated sheet slightly by pulling on the ends, or use a board
3. For start-up fill with clean water and open any valves that might have been closed so that water will flow. Note: The quantity of sludge found in the Inlet section should be used as a basis for determining the next interval before cleaning.

If the sludge level is very low, the cleaning interval can be extended. If the sludge is more than 1/3 up the plate modules, the interval should be shortened.

Note:

Plates do not need to be cleaned until white. Some oil on the plates will not cause deterioration of performance. It is only necessary to remove all sludge from between the plates and any very heavy oil coating.



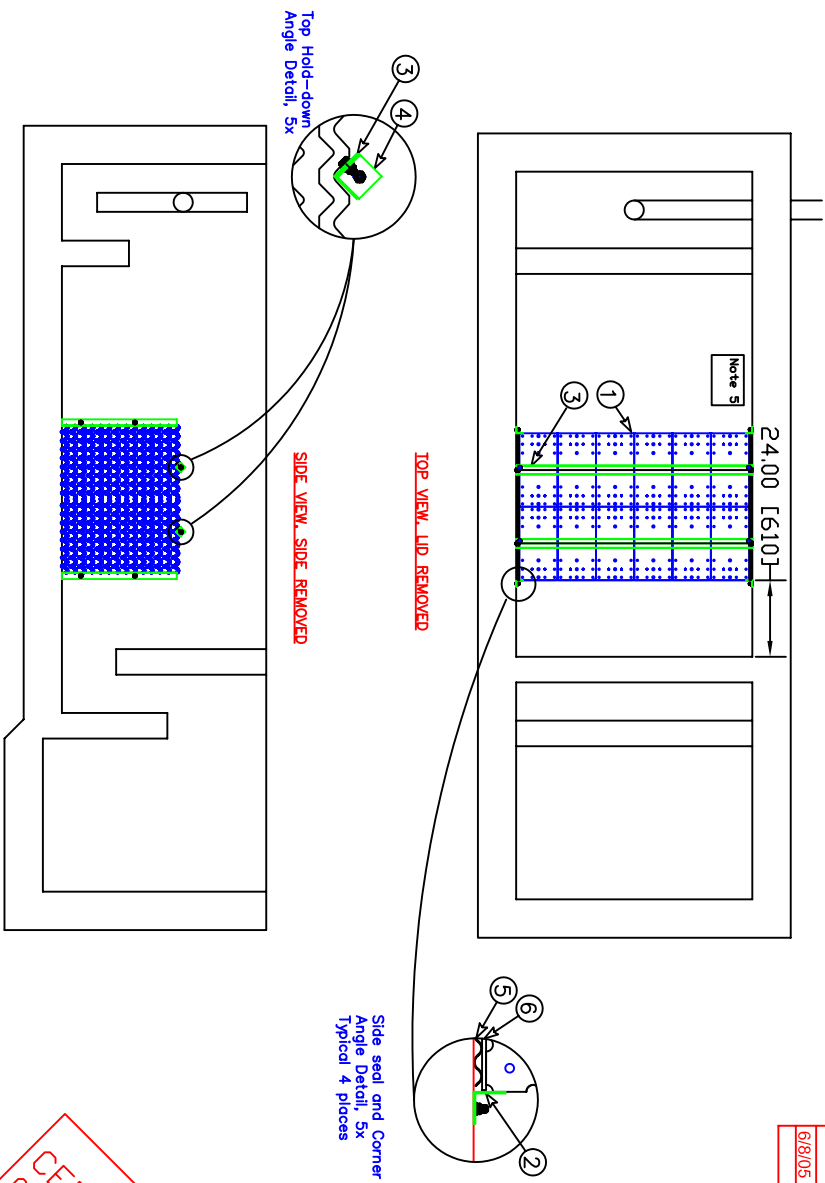
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NOTES:

- 1) Wall must be flat and vertical in the area where plates are installed.
- 2) Floor must be flat where plates are installed without large fillet between wall and floor.

DATE	NO.	REVISIONS

DATE	NO.	REVISIONS
6/8/05	1	Revise per cust Comments



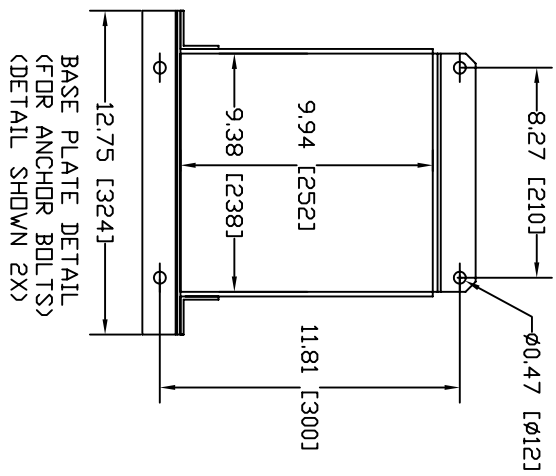
BILL OF MATERIAL

MK	QTY	DESCRIPTION
1	36	COALESCING MODULES, PP, 16 MM NOMINAL
2	4	ALUMINUM ANGLE, 2" x 2" x 0.125", APPROX 36" LONG
3	2	ALUMINUM ANGLE, 2" x 2" x 0.125", APPROX 74" LONG
4	4	ALUMINUM ANGLE CLIP, 2" x 2" x 0.125", 2" LONG
5	4	CORRUGATED POLYESTER / FIBERGLASS, 24" x 36"
6	4	POLYETHYLENE SHEET, 1/4" x 23" x 36"
7		
8		
9		

NOTES:

- 1) Install angle clips for hold downs and vertical angles at pack corners with appropriate size wall fasteners.
- 3) Bolt plate hold down to angle clips with appropriate size bolts.
- 4) See installation and operating manual for plate installation procedures.
- 5) Skimmer location.

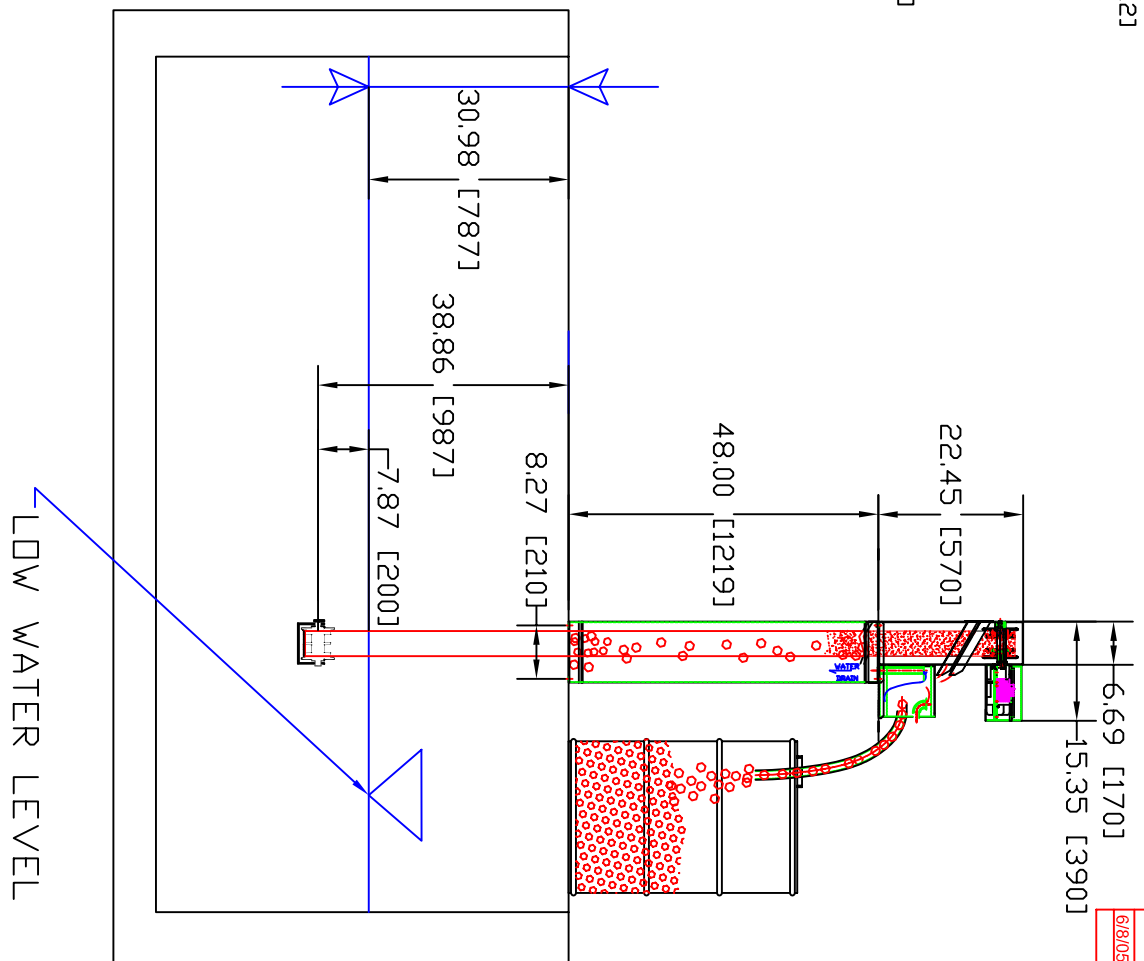
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NOTES:

- 1) Skimmer 110V, 90 Watts
- 2) Estimated wt, with legs, 140 lbs
- 3) Skimmer width (not shown in this view, 10 inches.
- 4) Center skimmer on 9 15/16" X 9 3/8" hole in vault cover plate.



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6/8/05	1	Revise per cust Comments