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UNIFIED FACILITIES GUIDE SPECIFICATION

References are in agreement with UMRL dated January 2014
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DIVISION 46 - WATER AND WASTEWATER EQUIPMENT

SECTION 46 25 14

COALESCING [OR VERTICAL TUBE] OIL-WATER SEPARATORS

02/11

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UNIFIED FACILITIES GUIDE SPECIFICATION

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SECTION 46 25 14

COALESCING [OR VERTICAL TUBE] OIL-WATER SEPARATORS
02/11

****
NOTE: This guide specification covers the requirements for parallel plate, and vertical tube gravity oil-water separators to remove free oil and particulate matter from oily waste water.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).
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NOTE: Vertical tube coalescers shall not be used on Army projects
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NOTE: When influent conditions require treatment beyond the capability of a parallel plate, vertical tube, or API type gravity separator (e.g. presence of a mechanical or chemical oil-water emulsion), the designer shall prepare specifications to add one or more of the following unit operations to the separation system to comply with discharge criteria:

Hydrocyclone
Chemical pretreatment unit
Flocculator

Dissolved air floatation unit
Electrocoagulation unit
Filter membranes
Cartridge filters
Activated carbon absorber
Multimedia filtration
Sludge dewatering equipment

In addition, these separators are not intended as containment devices. Where applicable regulations dictate containment of accidental spills, suitable containment systems shall be designed.

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NOTE: The following information shall be shown on the project drawings:

1. Inlet and outlet pipe invert elevations.

2. Sampling ports integral with the influent pipe and effluent pipe, when required.

3. Accessory equipment.

****

PART 1 GENERAL

1.1 REFERENCES

****

NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

****

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA 10084 (2005) Standard Methods for the Examination of Water and Wastewater

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2010; Errata 2011) Structural Welding Code - Steel

ASME INTERNATIONAL (ASME)

ASME B16.5	(2013) Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24 Metric/Inch Standard

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M	(2012) Standard Specification for Carbon Structural Steel
ASTM C990	(2009) Standard Specification for Joints for Concrete Pipe, Manholes and Precast Box Sections Using Preformed Flexible Joint Sealants
ASTM E165/E165M	(2012) Standard Practice for Liquid Penetrant Examination for General Industry

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC SP 10/NACE No. 2	(2007) Near-White Blast Cleaning

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-DTL-24441	(2009; Rev D) Paint, Epoxy-Polyamide, General Specification for

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 600/4-79/020	(1983) Methods for Chemical Analysis of Water and Wastes

1.2 SYSTEM DESCRIPTION

1.2.1 Applications

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NOTE: Delete parts of paragraph which are not applicable for project with respect to liquid carrier. Identify oily wastewater source(s) such as machine and paint shops, aircraft maintenance operations, aircraft washrack and rinse (corrosion control) areas, tank farm and fuel transfer areas, runway and fire training areas, bilge and ballast water, accidental spills, and contaminated stormwater runoff.
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NOTE: Pumping of influent will mechanically emulsify oil in water unless a positive displacement pump or other low emulsifying, de-rated pump is used.
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****
NOTE: Identify site specific atmospheric conditions that would produce a corrosive environment for oil-water separator materials so that the proper protective coatings or corrosion resistant materials can be provided.
****

The separator shall remove free oil [and] [emulsified oil] [and suspended solids] from oil-in-water mixtures of [freshwater] [freshwater and seawater] [seawater] originating from [_____] operations. The influent oil-in-water mixture will [flow by gravity] [be pumped] to the unit which [will] [will not] be located in an area with a corrosive atmosphere. [The corrosive atmosphere is composed of [_____].]

1.2.2 Influent Characteristics

****
NOTE: Insert maximum design flow and wastewater characteristics which have been established by direct measurement and chemical analysis.
****

Provide oil-water separator designed for a maximum flow of [_____] liters per second gallons per minute. Operating temperatures of the influent oil-in-water mixture will range from [_____] to [_____] degrees C degrees F and ambient air temperatures will range from [_____] to [_____] degrees C degrees F. The specific [gravity] [gravities] of the [oil] [oils] at operating oil-water temperatures will range from [_____] to [_____]. The specific gravity of the [freshwater] [freshwater and seawater] [seawater] at operating temperatures will range from [_____] to [_____]. The average specific gravity of the suspended solids is [_____]. The influent is further characterized as follows:

****
NOTE: List additional types and concentrations of detergents, anti-oxidants, solvents, acids or bases, and heavy metals that may be present in the oil-in-water mixture. If these additional items are present: chemical addition, flocculation and dissolved air flotation, or other appropriate unit operations may be needed for effective treatment of these constituents.
****

Oil-in-Water Mixture	Minimum	TO	Maximum
Total solids	[_____]	to	[_____] mg/L
Total suspended solids	[_____]	to	[_____] mg/L
[Total grease and oil]	[[_____]]	[to]	[[_____] mg/L]

Oil-in-Water Mixture	Minimum	TO	Maximum
[Petroleum hydrocarbons]	[[_____]]	[to]	[[_____] mg/L]
Detergent content	[_____]	to	[_____] ppm
pH	[_____]	to	[_____]
Oil droplet size	Greater than [20] microns		

1.2.3 Performance Requirements

****
NOTE: Make choice based on standards or guidelines established by environmental regulatory agency(ies); or other design considerations, such as unit wastewater treatment process(es) that follow downstream from this separator. Quantity of free oil removed is dependent on characteristics of oil-in-water mixture. The practical minimum concentration achievable is 10 mg/L for a parallel plate separator under ideal conditions.
****

****
NOTE: In general, free oil is defined as dispersed oil globules that rise to the surface of the water in which it is contained. The rate of rise of the oil particle is a function of its size and specific gravity as defined by Stoke's Law. Oil droplets with diameters of greater than 20 microns and specific gravities of 0.95 or less are considered to constitute the free oil form. Smaller oil droplet diameters are attributed to mechanically or chemically emulsified oil.
****

The [grease and oil] [petroleum hydrocarbon] concentration in the effluent from the oil-water separator shall not exceed the following limitations:

Contaminants	Maximum
[Total grease and oil, 30-day average]	[[_____] mg/L]
[Total grease and oil, daily maximum]	[[_____] mg/L]
[Petroleum hydrocarbon, 30-day average]	[[_____] mg/L]
[Petroleum hydrocarbon, daily maximum]	[[_____] mg/L]
[_____]	[_____]

To achieve [this goal] [these goals], it will be necessary to remove all free oil droplets equal to or greater than [20][_____] microns.

1.3 SUBMITTALS

****
NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project.

The Guide Specification technical editors have designated those items that require Government approval, due to their complexity or criticality, with a "G". Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a "G" to an item, if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.
****

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are [for Contractor Quality Control approval.][for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Separator[; G][; G, [_____]]

[Accessory equipment[; G][; G, [_____]]]

Submit shop drawings for separator [and accessory equipment] including principal dimensions, location of fittings and unit foundation. Include data to verify center of gravity with the unit empty and filled with water.

SD-05 Design Data

Separator[; G][; G, [_____]]

[Accessory equipment[; G][; G, [_____]]]

Submit analysis, signed by a registered professional engineer, which indicates that at the calculated overflow rate, the separator will be provided with the required square meter square feet of projected plate separation area to achieve the specified performance under laminar flow (i.e. Reynolds number of less than 500) conditions. Calculations shall take into account the rate of flow, potential surge flow, influent concentrations, particle characteristics, fluid temperature, fluid specific gravities, and pH.

SD-06 Test Reports

Shop hydrostatic test[; G][; G, [_____]]

Submit results of hydrostatic and dynamic testing.

Inspection

Field hydrostatic test

Preoperational test

In-service test

SD-07 Certificates

Separator corrosion protection[; G][; G, [_____]]

Submit written verification on the fabricator's letterhead that surface preparation and coating application were performed in accordance with the manufacturer's printed recommendations for the coating system.

SD-08 Manufacturer's Instructions

Separator system[; G][; G, [_____]]

SD-10 Operation and Maintenance Data

Separator system, Data Package 3[; G][; G, [_____]]

[Accessory equipment, Data Package 3[; G][; G, [_____]]]

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Delivery and Storage

Inspect materials delivered to site for damage; unload and store with minimum handling. Store materials on-site in enclosures or under protective coverings. Protect materials not suitable for outdoor storage to prevent damage during periods of inclement weather, such as subfreezing temperatures, precipitation, and high winds. Store materials susceptible to deterioration by direct sunlight under cover and avoid damage due to high temperatures. Do not store materials directly on ground. If special precautions are required, prominently and legibly stencil instructions for

such precautions on outside of equipment or its crating.

1.4.2 Handling

Handle separator in such a manner as to ensure delivery to final location in sound, undamaged condition. Take special care not to damage interior and exterior surfaces of separator, coalescing plates, [or tubes] and associated supports and pipe coatings or linings. Make satisfactory repairs to damaged materials at no cost to Government. Carry and do not drag materials.

PART 2 PRODUCTS

2.1 MATERIALS

****
NOTE: Insert reinforced concrete or other suitable material if carbon steel is not acceptable. On larger separators (e.g. flow rate greater than 3.16 L/s 50 gpm, 6 mm 1/4 inch minimum thickness for carbon steel is recommended. Consult manufacturers' data.
****

Use [3/16] [_____] mm inch minimum thick carbon steel conforming to ASTM A36/A36M [_____] or material having equivalent structural properties and corrosion resistance for separator, hoppers, stationary and adjustable weirs, nozzles, flow distributor and energy dissipator device, bolts, seals, stiffeners, washers, [separator cover] and nuts. Weld in accordance with AWS D1.1/D1.1M to provide watertight separator that will not warp or deform under load. Use welders qualified in accordance with AWS Standard Qualification Procedure. Grind welds smooth and remove weld spatter. Fabricate free of kinks and sharp bends in a manner not to reduce the strength of steel to a value less than that intended by the design. Size and shape of bends shall be uniform. Clean and finish [carbon steel] [_____] surfaces as described in paragraph entitled "Separator Corrosion Protection."

2.1.1 Separator Corrosion Protection

2.1.1.1 Steel Separator

After shop conducted hydrostatic tests have been successfully completed, provide a MIL-DTL-24441 coating system to the interior and exterior surfaces of the separator. Prior to shop painting, abrasive blast clean the surfaces in accordance with SSPC SP 10/NACE No. 2 to a surface profile of 0.025 to 0.0625 mm 1 to 2 1/2 mils. Apply primer conforming to MIL-DTL-24441/1, Formula 150 applied to a minimum dry film thickness of 0.075 to 0.10 mm 3 to 4 mils. Apply intermediate coat conforming to MIL-DTL-24441/2, Formula 151 applied to a minimum dry film thickness of 0.075 to 0.10 mm 3 to 4 mils. Apply topcoat conforming to MIL-DTL-24441/3, Formula 152 applied to a minimum dry film thickness of 0.075 to 0.10 mm 3 to 4 mils. Total dry film thickness shall not be less than 0.23 mm 9 mils. Repair and replace areas of the coating system which are found to be damaged or defective upon delivery of equipment to the site or found to be defective due to work of the applicator. An interior polytetrafluoroethylene liner with a minimum thickness of 3 mm 1/8 inch may be provided in lieu of paint coating the interior separator surfaces.

2.1.1.2 Other Than Steel Separator

****
NOTE: If other than steel is specified for the separator material, the designer shall specify an appropriate protective coating system for the separator material specified.
****

After shop conducted hydrostatic tests and have been successfully completed, provide a coating system which will protect the separator from the oil-in-water mixture, [atmosphere,] and in situ soil conditions specified herein.

2.1.1.3 Cathodic Protection

****
NOTE: Specify cathodic protection for metal separators in contact with soil. Design cathodic protection in accordance with the current edition of UFC 3-570-02N, "Electrical Engineering Cathodic Protection" and edit the appropriate guide specification for inclusion in the project specification.
****

For [below ground] [partially above and partially below ground] [above ground] metal separators, provide cathodic protection with test stations as specified in Section [26 42 13.00 20 CATHODIC PROTECTION BY GALVANIC ANODES] [26 42 19.00 20 CATHODIC PROTECTION BY IMPRESSED CURRENT] in addition to the protective coating.

2.1.2 Substitutions

****
NOTE: Designer shall check manufacturer's literature to assure construction material option selected is capable of withstanding anticipated forces and moments for the size of separator designed. Navy has experienced some problems with the fiberglass covered plywood and timber units when the fiberglass cracks; due to water seepage, wood has deteriorated causing structural failure.
****

****
NOTE: Insert suitable material if carbon steel is not acceptable. Consult manufacturers' data.
****

Separators constructed of [reinforced fiberglass][or] [reinforced glass fiber resin laminates over a rigid urethane foam core] may be provided in lieu of carbon steel [_____]. Provide fiber glass separator with lifting straps. Glass fiber reinforced plastic weirs may be accepted as a suitable weir and baffle material provided that necessary requirements for anchorage of these items include provisions for contraction and expansion. Surfaces shall be seamless, chemically resistant to oil-in-water mixture, and resistant to ultraviolet deterioration.

2.1.3 External Surfaces

****
NOTE: Include bracketed text as appropriate for below ground or partially below ground installations.
****

External surfaces and appurtenances shall be resistant to corrosion from the in situ soil, [backfill material,] [groundwater,] [and surface runoff] [surface runoff and the surrounding atmosphere] [soil pH] [soil resistivity].

2.1.4 Internal Surfaces

****
NOTE: The solvents in oil allow some plastic composite surfaces to absorb the oil. Once the plastic surfaces become saturated with oil they can become sticky. This is especially critical with plates since solids will tend not to slide down and eventually will clog the area between the parallel plates, resulting in increased maintenance.
****

Parallel plate [or vertical tube] material and orientation shall enhance oil coalescence and solids removal, and be corrosion and chemically resistant to the oil-in-water mixture [and atmosphere] as specified in paragraph entitled "SYSTEM DESCRIPTION."

2.1.5 Hardware

Bolts, stiffeners, washers, nuts, screws, pins, and fittings as required shall be corrosion resistant [and resistant to seawater]. Provide materials that are inherently corrosion resistant and not merely treated with a corrosion-resistant coating, such as provided by the galvanizing process.

2.1.6 Accessibility

****
NOTE: Separators below grade with access manholes and extension tubes to the surface are not recommended because of the obvious problems associated with visual inspection, cleaning, maintenance and safety. The designer is encouraged to provide an open type unit with removable grates, covers, or guard rail in order to minimize safety problems and improve accessibility. The preferred design is a separator with top at or above grade and open to the atmosphere, or if absolutely necessary, a cover which is completely removable. Access for routine sampling of wastewater should be provided. The cover should be designed so that it is easily removable by one person without the use of special hoists or other equipment. A separator that is completely open will require a guardrail around the top. However, if the designer is faced with an air emission standard (i.e. State of California) the separator may need to be vapor tight and would

preclude the use of open separators.
****

Do not bury tops of separators. Make the entire top area of the separator visible from ground surface. Separators below grade with access manholes and extension tubes to the surface will not be permitted. Use separators with an open top or a completely removable cover. Use open top separators with removable grating unless otherwise shown. Use top cover and grating that is easily removable by two persons. As a minimum provide access hatches over the following areas: parallel plates, oil storage compartments, Influent sampling area, effluent sampling area, oil skimmer, and weirs. Parts subject to wear or requiring adjustment, inspection, cleaning or repair shall be accessible and capable of convenient removal when required.

2.2 SEPARATION CHAMBER

Provide [above ground] [below ground] [partially above and partially below ground] separator to withstand hydraulic and soil loadings under static and dynamic conditions while empty and during operating conditions. Provide adequate support for additional loadings from separator appurtenances including weirs, hoppers, internal supports, parallel plate [or vertical tube] oil coalescers, equipment transportation, and rapid lowering and braking of load during handling operations. Bolt separator [and accessories] to weld-fabricated, structural steel skid base, or mount on manufacturer's standard base.

2.2.1 Lifting Mechanism

****
NOTE: For units fabricated from fiberglass, specify straps. In a salt water environment substitute acceptable non-corroding metal such as but not limited to copper-nickel, 316 stainless steel, or monel. Aluminum is unacceptable. Consult manufacturers' data.
****

Fit separator with lifting [lugs] [straps] [padeyes] [supports] for handling and installation. Each [lug] [strap] [padeye] [support] shall carry the total dry weight of the separator and attendant appurtenances. Prominently display lifting instructions on [anodized aluminum] [_____] plate located on outside of separator.

2.2.2 Flanges

Use only flat face flanges and drill 1,034 kPa 150 pound ANSI Standard bolt circle and remove burrs. Use flanged piping connections that conform to ASME B16.5, welding neck type.

2.2.3 Weirs

****
NOTE: Insert suitable material if carbon steel is not acceptable. Consult manufacturers' data.
****

****
NOTE: Angle of slope of hopper bottom shall be

greater than the angle of repose of the stored material. Volume and angle of repose for solids collected to be determined by designer based on oil-in-water mixture characteristics and frequency of cleaning.

****

Attach stationary weirs and adjustable weir supports to separator side walls to provide a watertight seal between adjoining compartments and trough to prevent hydraulic short-circuiting. Use carbon steel [_____] for weir plates and baffles. Provide sharp crested weirs of size and section specified by manufacture. Provide slotted holes in weir plates and baffles or supports to permit horizontal and vertical adjustment of weir or baffle. Use nondeteriorating sealant or gaskets for mounting weir plates. Fill voids between separator wall and weir plate with sealant to make watertight.

2.2.4 Low Point Drains

Provide means at low points for dewatering separator.

2.2.5 Identification Plates

****

NOTE: In a salt water environment substitute acceptable non-corroding metal such as but not limited to copper-nickel, 316 stainless steel, or monel. Aluminum is unacceptable. Nomenclature (or system identification) to be established by designer.

****

Provide [anodized aluminum] [_____] identification and instruction plates and stamp necessary data. Securely affix plates, in prominent location, to separator with nonferrous screws or bolts of not less than 3 mm 1/8 inch in diameter. Nomenclature shall be [_____].

2.2.6 Instruction Plates

Instruction plates shall describe special or required procedures to operate and service equipment, and shall include warnings of hazardous procedures and notice of safety and health requirements. Plates shall be durable and legible throughout equipment life.

2.2.7 Warning Sign

On entrances to the separator (and entrances to the vault) place a permanent sign which states the following: "DO NOT ENTER separator (OR VAULT) OR PERFORM HOT WORK ON OR IN separator UNTIL THE ATMOSPHERE HAS BEEN TESTED AND CERTIFIED GAS FREE AND SAFE."

2.3 INLET COMPARTMENT

****

NOTE: Where a separate sedimentation basin has been provided the volume of the inlet compartment may be reduced. If total solids are less than 100 mg/L, these elements may be eliminated after adequate benchscale testing has been completed to support this conclusion. Designer shall indicate run of solids removal line from outlet nozzle to a point

above grade.
****

Provide inlet compartment of sufficient volume to effectively reduce influent [suspended] [settleable] solids and dissipate energy. Use inlet compartment that provides a minimum of 45 minutes detention ahead of the oil coalescing compartment. Provide nonclogging flow distributor and energy dissipator device [and the primary solids collection hopper as specified in paragraph entitled "Reduction of Solids"]. Locate [adjustable, primary surface oil overflow weir and] sample ports as recommended by the manufacturer.

2.4 OIL SEPARATION COMPARTMENT

2.4.1 General

The maximum surface loading rate for the oil separation compartment shall be [_____] liters per square meter per day) [_____] gallons per day per square foot. The separator will also provide a minimum detention time within the oil separation compartment of [_____][45] minutes at design flow. Detention time will recomputed by calculating the volume of the separation zone within the separator and dividing this volume by the design flow rate. For computing detention time, total volume shall be reduced by 20 percent for the space occupied by settled solids (sediment) and accumulated oil at the surface.

2.4.2 Parallel Plates

Provide parallel plates at an angle from 0.70 to 1.05 rad 40 to 60 degrees with respect to longitudinal axis of the plate corrugations and space not less than 19 mm 3/4 inch apart for removal of free oil and settleable solids. Configuration used shall not promote solids buildup on plates which would increase velocities to point of discharging an effluent of unacceptable quality. Maintain laminar flow at maximum design flow rate throughout plate packs including entrance and exit so as to prevent re-entrainment of oil(s) with water. Flow through plate packs shall be in a downflow mode parallel to plate corrugations or cross-flow perpendicular to plate corrugations, so that the oil collects and coalesces at high point of corrugations and rises to top of pack without clogging from oil or settleable solids. Make minimum effective projected surface area ([_____]square meters [_____]square feet).

****
NOTE: Vertical tube coalescers shall not be used on Army projects
****

[2.4.3 Vertical Tubes

If vertical tubes are provided, install tubes perpendicular to bottom of tank and align in a pattern to maintain laminar flow at maximum design flow rate through tube packs including entrance and exit to prevent emulsifying the oil(s) with water. Inlet to tube packs shall prevent hydraulic short-circuiting of oil-in-water mixture across the top of the tubes.

]2.4.4 Supports

Brace and support individual plates [and tubes] or plate packs [and tube packs] to withstand loads associated with transportation and operation of

units, including inplace cleaning. Equip each plate [or tube] pack with lifting lugs or other attachments for handling and installation. Each lug shall carry total weight of plate pack [or tube pack]. Provide adequate structural supports to facilitate inplace cleaning of plate pack [or tube] bundles.

2.4.5 Baffles

Provide oil retention baffle, adjustable surface oil overflow weir with trough, and stationary underflow baffle. Position underflow baffle to prevent resuspension of solids that have accumulated in secondary solids hopper.

2.5 OUTLET COMPARTMENT

Provide outlet compartment of [_____] cubic meter cubic feet, an adjustable overflow effluent weir, a sampling port, and nozzles.

2.6 ACCESSORIES [AND ACCESSORY EQUIPMENT]

****
NOTE: Specific project requirements may include one or more of the following accessories:

Access platforms
Access ladders (with minimum 1050 mm 42 inch extensions above hatch opening with locking device)
Handrailing
Waste oil transfer pump
Oily waste transfer pump
Sludge transfer pump
Sludge or waste oil storage tanks
Immersion heaters
Tank windows
System monitoring and control instrumentation (e.g. oil content monitor, oil-water interface sensors, control panel, pressure gages, high level alarms, oil flooded alarms, tank level indicators)
Sight glasses
Inlet strainer (duplex)
Air vent valve
Pitot tube sampling valve assemblies
Check valves
Manually actuated valves
Motor actuated valves
Explosion proof doors
Separator backwash system

Select and specify as required. For those accessories required in the project, specify detailed requirements (including sizes, ratings, capacities, performance characteristics) in subparagraphs under paragraph entitled "ACCESSORIES [AND ACCESSORY EQUIPMENT]."
****

****
NOTE: Review applicable Federal, State, and local air pollution and ventilation requirements to

determine need for vapor containment.
****

Provide bolts, stiffeners, washers, nuts, screws, pins, gaskets, and fittings as required for adjustable weirs, [separator covers] and parallel plate packs [or vertical tube packs]. [Provide separator covers with a vapor proof seal for vapor control with [_____] mm inch inside diameter gas vents and suitable access manways to each separator compartment.]

2.7 FABRICATION

****
NOTE: Specific project requirements may include one or more of the following accessories:

Access platforms
Access ladders (with minimum 1050 mm 42 inch extensions above hatch opening with locking device)
Handrailing
Waste oil transfer pump
Oily waste transfer pump
Sludge transfer pump
Sludge or waste oil storage tanks
Immersion heaters
Tank windows
System monitoring and control instrumentation (e.g. oil content monitor, oil-water interface sensors, control panel, pressure gages, high level alarms, oil flooded alarms, tank level indicators)
Sight glasses
Inlet strainer (duplex)
Air vent valve
Pitot tube sampling valve assemblies
Check valves
Manually actuated valves
Motor actuated valves
Explosion proof doors
Separator backwash system

Select and specify as required. For those accessories required in the project, specify detailed requirements (including sizes, ratings, capacities, performance characteristics) in subparagraphs under paragraph entitled "ACCESSORIES [AND ACCESSORY EQUIPMENT]."

Where the separator is to be mounted in a concrete vault with a hatch cover, the designer shall address, as a minimum, the following:

1. Hatch covers shall provide access to the entire separator.

2. Hatch covers shall lock in the open position.

3. Light weight covers for non-traffic areas.

4. Interior ladder rungs shall not be set away from cover opening so as to require a person to swing in

and grab.

****

****

NOTE: Review applicable Federal, State, and local air pollution and ventilation requirements to determine need for vapor containment.

****

Provide shop fabricated, skid mounted oil-water separator, or other shop fabricated unit approved by the Contracting Officer, which is comprised of a separator containing an inlet compartment, parallel plate [or vertical tube] oil coalescing compartment, outlet compartment [and the following accessories]:

[Separator Cover [with vapor proof seal]
] [_____]

2.7.1 Shop Hydrostatic Test

Prior to applying coatings, perform hydrostatic test at atmospheric pressure by filling separator with water in the shop for a minimum of 4 hours. Testing shall be conducted after all seams have been cleaned and all welds have been inspected in accordance with ASTM E165/E165M. Acceptance criteria, for the hydrostatic test, is no leakage after 4 hours using a thorough visual inspection for the leaks.

2.7.2 Reduction of Solids

****

NOTE: Designer shall address special influent characteristics as part of the design when using this specification. Special characteristics include, but are not limited to, inflow rate, grit content, viscosity of petroleum product, AFFF foam, heavy metals, and reverse emulsion. Determine need for a solid waste basin preceding the separator and specify solid waste basin requirements when required by site conditions.

****

****

NOTE: If total solids are less than 100 mg/L, these elements may be eliminated after adequate benchscale testing has been completed to support this conclusion. Designer shall indicate run of solids removal line from outlet nozzle to a point above grade.

****

Inlet compartment shall reduce [suspended] [settleable] solids to nonclogging level for parallel plates [or vertical tubes,] and provide a uniform oily wastewater hydraulic loading across inlet face of oil coalescing compartment, under laminar flow conditions. Equip compartment with an inlet nozzle with wastewater sampling port, nonclogging flow distributor and energy dissipator device, [primary solids collection hopper,] [primary solids outlet nozzle,] [oil retention weir,] [adjustable surface oil overflow weir with trough,] [primary oil outlet nozzles]. [The oil-water separator shall be preceded by a solid water basin which includes

a removable solids or trash basket. Equip the solid water basin with a hoist for servicing the trash basket. Size the basket to retain all solids larger than 75 mm 3 inches in any dimensions. The solid waste basin shall have a minimum storage volume of [945] [_____] liters [250] [_____] gallons.]

2.7.3 Oil Coalescing Compartment

****
NOTE: The interpretation of "easily removable" has two meanings in the industry. One is the complete removal of the entire bundle from the separator; the second is removal of individual 300 mm square one foot square bundles. The designer shall adapt the specification to the specific demands of the project.
****

Equip oil coalescing compartment with easily removable and reinstallable, parallel, corrugated plates [, or vertical tubes] arranged to optimize separation of free oil from liquid carrier. Use parallel plates [or vertical tubes] that are easily removable without dismantling packs and without confined space entry. Provide adjustable surface oil overflow weir with trough, oil outlet nozzle and stationary underflow baffle, oil retention baffle positioned to prevent discharge of free oil that has been separated from the carrier liquid in inlet and oil coalescing compartments. Provide access to each plate pack [or tube bundle] from top. Each bundle shall be equipped with handles or lifting rings. Plate designs that permit cleaning of plate packs in place are not acceptable.

2.7.4 Wastewater Sampling Port

Equip inlet and outlet compartments, adjustable overflow effluent weir, effluent trough, and wastewater outlet nozzle with wastewater sampling ports permitting easy access for obtaining isokinetic influent and effluent samples.

2.7.5 Connections

Connect the separator at the inlet and outlet pipe invert elevations indicated. Follow equipment manufacturer's recommendation for setting and adjusting top of weir elevations throughout unit.

2.7.6 Storage

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NOTE: Normally oil storage compartments will be contained inside the separator and the requirement for an adjacent waste oil storage tank will be deleted. However, when conditions warrant, an adjacent waste oil storage tank may be provided.In order to size the waste oil tank, the designer shall contact the activity to determine frequency of waste oil collection performed at the activity. Designer shall check current Federal and State requirements governing the need and installation criteria for secondary containment (e.g. double wall waste oil tank).
****

Provide oil and suspended solids collection, storage, and transfer systems

as an integral part of proposed oil-water separator system. As a minimum, the separator oil storage compartment shall have a capacity of not less than 10 percent of the total separator volume.[The adjacent waste oil tank shall have a capacity of [_____] liters gallons.]

PART 3 EXECUTION

3.1 INSPECTION

Inspect each component of separator for compliance with requirements specified in PART 2 PRODUCTS. Redesign or modification of equipment to comply with specified requirements, or necessary redesign or modification following failure to meet specified requirements, shall receive particular attention for adequacy and suitability. This element of inspection shall encompass visual examinations and dimensional measurements. Noncompliance with specified requirements, or presence of one or more defects preventing or lessening maximum efficiency of separator operation, shall constitute cause for rejection.

3.2 INSTALLATION

Lift separator as required without parallel plate packs [or vertical tube packs] in place onto level foundation using lifting mechanism provided. Level separator and bolt to supports to prevent hydrostatic uplift and ensure unit stability. Use a lifting bar through lugs to insert plate packs into separator and place on supports. Caulk around packs and pack supports with sealing compound conforming to ASTM C990 to prevent hydraulic short-circuiting. Avoid abrupt contact between the packs and the separator walls and pack supports to avoid damage. Separator system installation shall be conducted in accordance with manufacturer's recommendations.

3.3 FIELD QUALITY CONTROL

3.3.1 Field Hydrostatic Test

After separator has been leveled and secured to foundation and parallel plate packs [or vertical tube packs] are in place, level effluent overflow weir at elevation specified by manufacturer and hydrostatically test unit at atmospheric or operational pressure (for no leakage) for an additional 8 hours by filling with water. Perform the hydrostatic test prior to backfilling below ground or partially below ground installations.

3.3.2 Preoperational Test

The manufacturer's service representative shall inspect, operate, and test unit before in-service testing by the Contractor.

3.3.2.1 Tests

Tests shall include but not be limited to the following:

a. Soundness (without cracked or otherwise damaged parts).

b. Completeness in all details, as specified.

c. Correctness of setting, alignment, and relative arrangement of each component.

d. Verification of proper operation for all system components.

3.3.2.2 Preoperational Investigation and Test Report

Submit manufacturer's service representative's preoperational test report. Document inspections, operations, adjustments, and tests performed and indicate whether they were acceptable or not. For unacceptable items, describe corrective action taken or recommended. Include detailed descriptions of points inspected, tests and adjustments made, quantitative results obtained if such are specified, and suggestions for precautions to be taken to ensure proper maintenance. Include the manufacturer's certificate that equipment conforms to specified requirements and is ready for permanent operation and that nothing in installation will render manufacturer's warranty null and void.

3.3.3 In-Service Test

After hydrostatic test and preoperational test have been successfully completed and unit has been properly connected to influent and effluent piping, allow influent oil-in-water mixture previously described in paragraph entitled "SYSTEM DESCRIPTION" to flow into separator filled with water. Adjust and level [primary] [and secondary] surface oil overflow weirs to optimize oil skimming and minimize water overflow to oil recovery. Optimize operation of unit within 5 working days. Operate unit for a minimum of ten separator volume changes prior to testing for removal of contaminants and document testing results.

3.3.3.1 Analytical Methods

Test and sample preservation methods for test contaminants shall be in accordance with the latest revisions of AWWA 10084, APHA Standard Methods for the Examination of Water and Wastewater, EPA 600/4-79/020, EPA Methods for Chemical Analysis of Water and Wastes, or those substitute methods approved by the governing regulatory agencies having jurisdiction.

3.3.3.2 Test for Contaminants

Verify the separator efficiency by testing influent and effluent for contaminants described in paragraph entitled "Performance Requirements." If effluent quality is found to be unacceptable, then verify influent to effluent performance in particle size removal at the site. Tests shall be performed by an independent certified testing laboratory.

3.3.3.3 Sampling Procedures

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NOTE: The separator top hatch covers are used by many manufacturers to satisfy the sampling port requirement. The designer has the option to provide dedicated sampling points integral to the influent pipe and effluent pipe.
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Within an 8 hour period and at regular intervals collect a minimum of 10 influent and effluent samples from sampling ports provided as part of the separator. Purge each sampling port to remove built-up solids or other material prior to collecting sample. Collect wastewater samples isokinetically in clean glass containers with polytetrafluoroethylene lined caps. Collect duplicate wastewater samples in separate glass containers. Do not attempt to split sample. Use containers for other contaminants as

recommended in references listed in paragraph entitled "Analytical Methods."

3.3.3.4 Acceptance Criteria

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NOTE: Based on standards or guidelines established by environmental regulatory agency(ies) in which the project is located or based upon wastewater treatment process(es) that follow downstream from this separator, specify the maximum unacceptable limit permitted in order for the separator to be accepted as meeting the performance requirements of this specification.

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90 percent of the effluent samples taken shall not exceed the specified daily maximum limit for [grease and oil] [petroleum hydrocarbon] contaminants. The remaining samples shall not exceed [[_____] mg/L for grease and oil] [[_____] mg/L for petroleum hydrocarbon] contaminants. If the separator does not meet requirements of this specification, due to poor workmanship and wrong fabrication dimensions, the unit may be rejected. If the unit is not operating at design efficiency 5 days after installation, Government may reject system. In the event Government rejects unit, Contractor shall remove separator or defective components and replace with acceptable unit or components and test as specified above.

-- End of Section --