



Wastewater Pretreatment Devices and Design Options for Typical & Unusual Applications

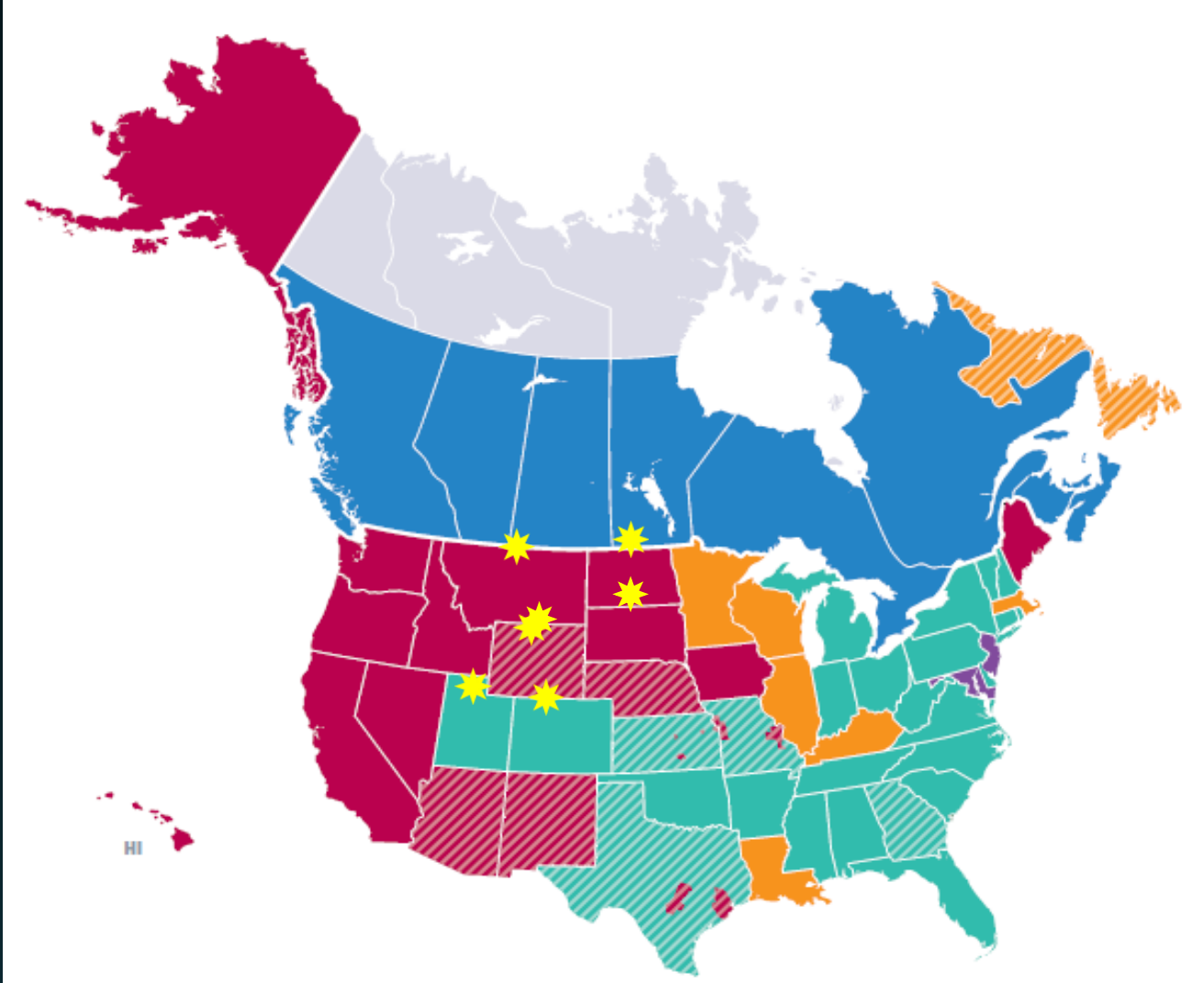
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The background of the slide features a vertical strip on the left side showing a close-up of ocean waves with white foam. The rest of the background is a dark teal color with a subtle, wavy pattern.

Outline

- Codes Overview
- Typical Device Types, Applications & Sizing, Uses
 - Hydromechanical & Gravity Grease Interceptors
 - Oil/Water Separators
 - Sand Interceptors
 - Other Separators
- Alternate Devices and Design Options (for several applications)

Codes Overview – USA & EPA Region 8 States (Colorado, Montana, N. Dakota, S. Dakota, Utah & Wyoming)



Uniform Plumbing Code (UPC)- **ND, SD, MT**

International Plumbing Code (IPC) – **UT, CO, WY**

Independent Plumbing Code

National Standard Plumbing Code (NSPC)

National Plumbing Code of Canada (NPCC)

Not Available

Statewide/Province

By Municipality

UPC & IPC Applicability

- Apply to adoptee states (state wide)
- Local ordinances – establish additional provisions (more protective/additional provisions & code variance process)
- Apply to construction/alteration plumbing (under Building Permits, Plumbing Permits)
- Local city/county Plumbing Official & delegates (plans reviewers) determine compliance with the UPC/IPC & Local Plumbing Code
- Existing facility plumbing compliance concerns – addressed by DOH and Utility inspectors

UPC & IPC Requirements Provisions are Intended to:

- **Protect public health and safety** in buildings for all water and wastewater related design, installation by providing minimum safeguards for people at homes, schools and workplace.
- **Protect the private drainage system**
- **Protect public sewer** (or onsite septic system)
 - Ensures proper plumbing system trapping & venting
 - Defines minimum drains, sinks and devices required to connect to the pretreatment device
 - Prevents the discharge of FOG, sand, solids, and other substances to the receiving sewer system
 - Ensures Local Limits compliance? **NO!**

Codes Overview – UPC & IPC

- Updated and Adopted every 3 years (Typical)
- Plumbing Technical Committee (TC) prepare updates
- Tentative Interim Amendments (TIA) – clarifications (proposed by IAMPO - *International Association of Plumbing and Mechanical Officials*)
- 2018 Additions of UPC & IPC Currently Apply
- 17 Sections in the UPC (Chapter 10 – Interceptors & Traps)
- 15 Sections in the IPC (Chapter 10 – Traps, Interceptors & Separators)

UPC Chapter 10 Sections Overview:

1001-1008 – Trap requirements

1009.0 - Interceptors (clarifiers) and separators – intercept/remove oil, sand, sediment, flammable wastes, and acid or alkali substances

1010.0 – Grease Interceptors (clarifiers) requirements for meat slaughterhouse & packing facilities

1011.0 – Interceptors (clarifiers) for auto wash racks, machinery/machine parts washing (and floors)

1012.0 - Lint strainer & interceptors requirements for commercial and industrial laundries

1013.0 - Separator requirements for bottling establishments

1014.0 - Grease interceptors – fats, oils, grease removal (includes HGIs, GGIs)

1015.0 – FOG Disposal System requirements

1016.0 – Sand Interceptor requirements

1017.0 – Oil & Flammable Liquid Interceptor requirements

IPC Chapter 10 Sections Overview:

1002 – Trap requirements

1003 - Interceptor and separator requirements

1003.3 – Grease Interceptors

1003.4 – Oil Separators

1003.5 – Sand Interceptors in Commercial Establishments

1003.6 – Clothes Washer Discharge Interceptor

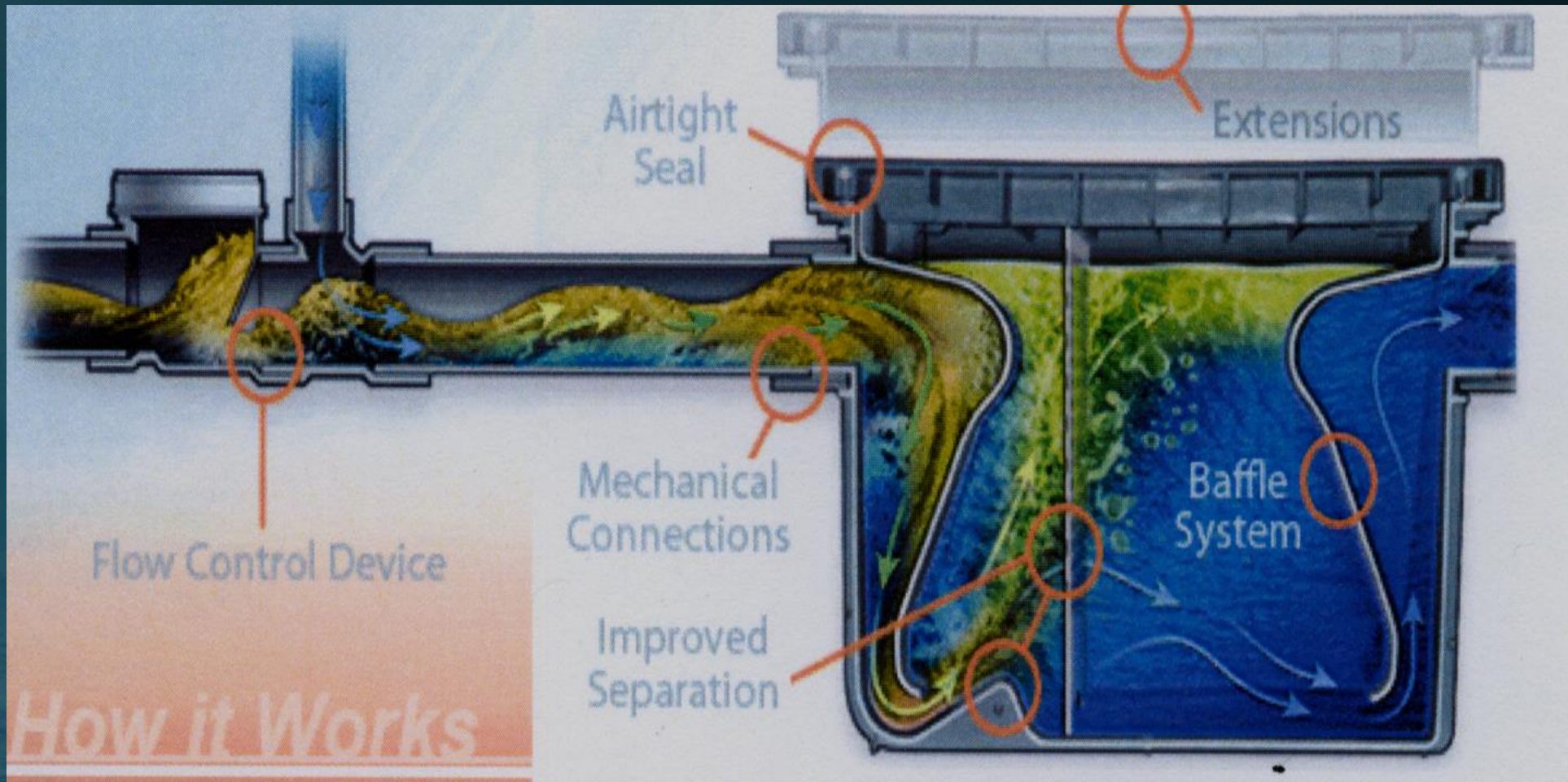
1003.7 – Bottling Establishments

1003.8 – Slaughterhouses

1003.9 – Venting of Interceptors and Interceptors

1003.10 – Access and Maintenance of interceptors and separators

Device Overview - Hydromechanical Grease Interceptors (HGI)



Device Overview - Hydromechanical Grease Interceptors (HGI)

- Interior or exterior units, above or below ground
- Use **vented flow control (required)** & air entrainment principles to increase FOG removal time
- Device shall be **vented**, to a point downstream of the device, to the sanitary sewer system
- Multiple sources may discharge to the HGI
- Dishwashers and Food Waste Disposal Units **MAY NOT** discharge to the unit!

Device Overview -Hydromechanical Grease Interceptors (HGI)

- **Sized based on Flow Rate and the Pounds of Grease Storage Capacity**), as follows:

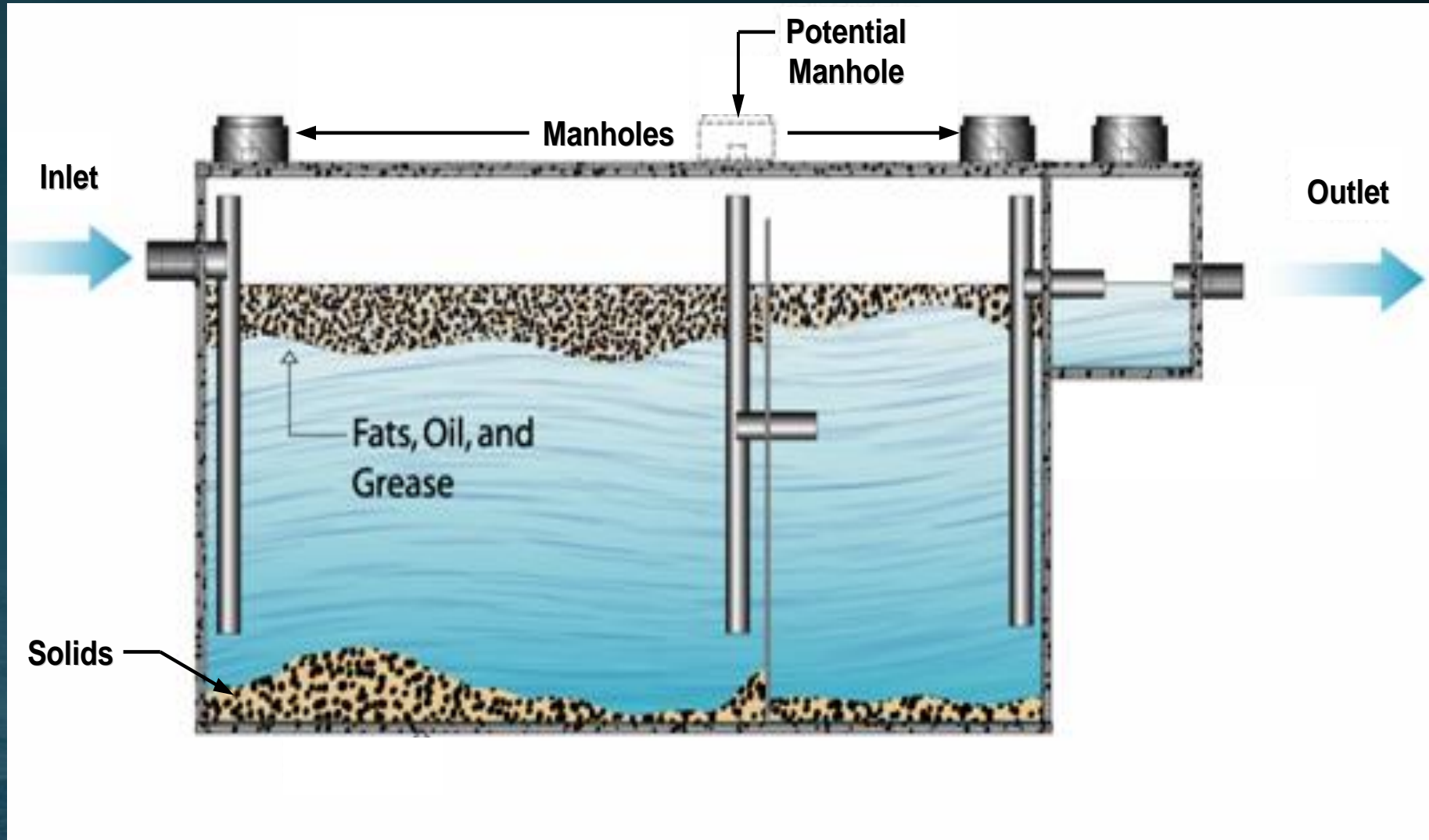
- The full pipe gravity flow rate for the diameter of pipe connecting to the HGI; **or**
 - The total combined flow rates of all drainage fixtures connected to the HGI; **AND**
 - The Pounds of Grease Storage Capacity of the HGI (i.e., 2 x the rated Flow Rate)
- Devices shall **comply with sizing & testing** in accordance with:
 - PDI G101 (GI's*, GTs & Automatic GRDs), PDI G102 (w/FOG sensing alarms)
 - ASME A112.14.3 Appendix A (GIs*, GTs), ASME A112.14.4. (Automatic GRDs) ASME A112.14.6 (GRDs w/FOG Disposal Systems) which includes 100 mg/L FOG (device performance) limit!
- *Excludes exterior GGIs designed to UPC / IPC & local requirements*

HGI Design Limitations

- No minimum solids removal performance requirements (in ASME or PDI standards)
- Limited solids storage capacity issues:
 - Excessive solids discharges
- Low retention time issues:
 - Fine particles (flour, dough, fruit seeds)
 - Suspended particles
- Excessively hot water discharges
- Odorous to maintain (for indoor devices)



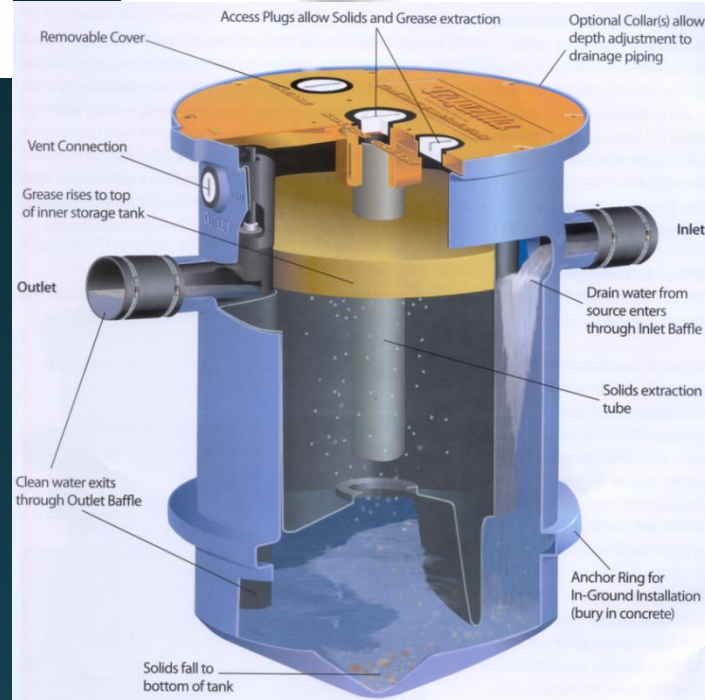
Device Overview - Gravity Grease Interceptors (GGIs)



Device Overview - GGIs

- Exterior installation
- > 500 gallons capacity
- Separation achieved by wastewater retention time, flow control, venting, internal baffling
- Sized, designed and installed per UPC or IPC requirements
- **UPC & IPC Sizing:** based on Drainage Fixture Units (DFU) flow rate and 30 minute waste retention time

GGIs Construction



GGI Limitations

- Superfine Particles – (flour)
- Suspended particles
- Excessive solids loading, flow rates
- Excessively hot water discharges



Device Overview - Oil Water Separators (OWSs)



Used to remove oil (and some sand), hydraulic oils and fluids, for various applications, including elevator sump pits)

UPC/IPC OWS Device Requirements

UPC 1011.0 – Interceptors (clarifiers) for auto wash racks, machinery/machine parts washing (and floors)

UPC 1017.0 – Oil & Flammable Liquid Interceptor requirements

UPC 1017.0 – Where Required – repair garages & gas stations that perform oil changes, factories that generate oily or flammable wastes as a result of manufacturing, storage, maintenance, repair or testing processes

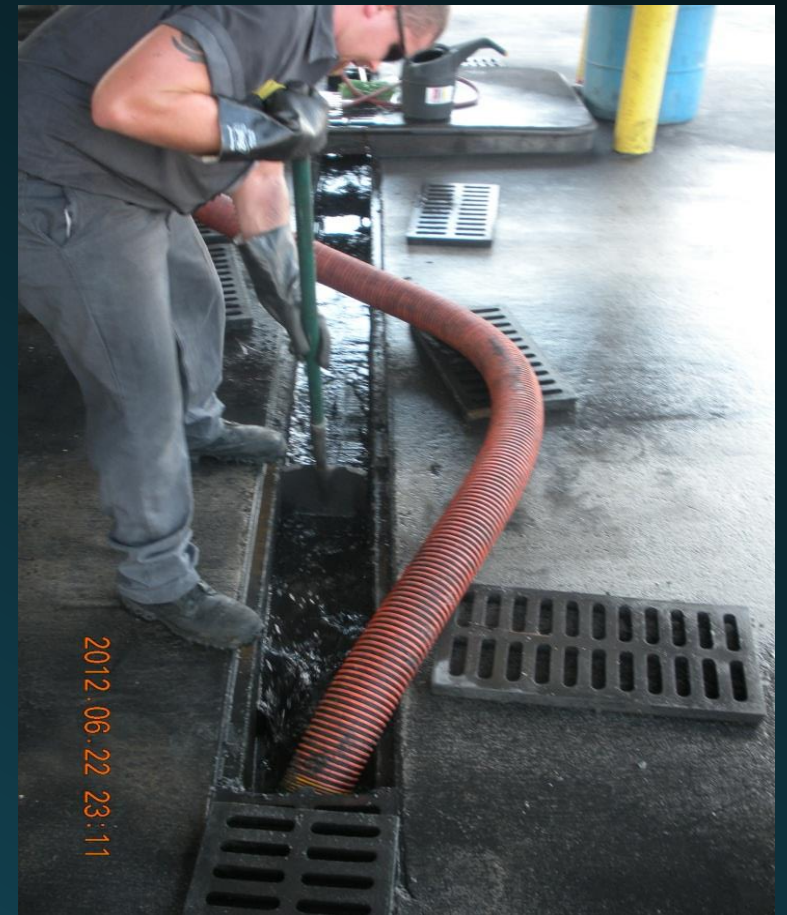
IPC 1003.4 – Oil Separators (where required) At repair garages, car-washing facilities, at factories where oily and flammable liquid wastes are produced and in hydraulic elevator pits...

Exception: An oil separator is not required in hydraulic elevator pits where an approved alarm system is installed.

UPC/IPC OWS Device Requirements

- Sized based in Flow Rate (typical) or based on square footage of auto repair facility (service area)
- Device manufacturers must rate device based on Flow Rate
- Venting is required for both the separator and waste oil storage compartment (if present)
- If Oil is removed, must discharge (via minimum 2" line) to a 550-gallon tank (minimum size)

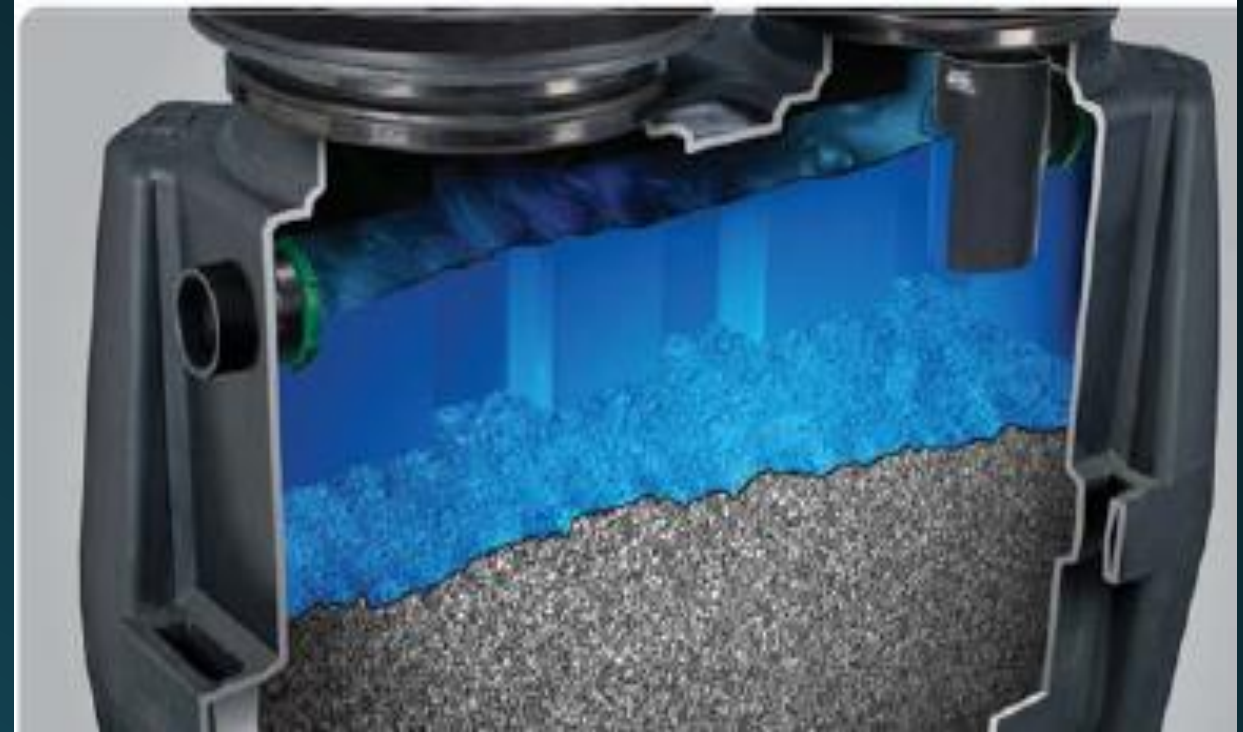
Device Overview - Sand Traps



Used to remove some sand, from many applications

Device Overview - Sand/Solids Interceptors

- **Captures** sand, solids, bottles, slaughterhouses, heavy industrial process solids, etc.
- Commonly used in car wash recycling systems, placed prior to OWS
- Solids Interceptor is now more common as pretreatment to HGIs





Sand Interceptor/Trap Device Design Requirements

- Constructed of Concrete, Brick, Steel or any watertight material, and Interceptors must have an interior baffle
- Sized based on Flow Rate (typical), and for Floor Sand Traps must be designed to NOT overflow device at full design flow
- Separators manufacturers must rate device based on Flow Rate
- (UPC only) Minimum Dimensions of 2 feet x 2 feet, and a depth of 2 feet

Device Overview - Solids Interceptors



③ Polypropylene Basket Filter Options (actual sizes shown)

Buttons, Change, Gravel	Lint and Hair, Fish Scales, Gravel and Sand	Precious Metals, Sand
Coarse - 0.3" x 0.27" opening	Medium - 0.1" x 0.08" opening	Fine - 0.03" x 0.025" opening
 -C	 -M	 -F

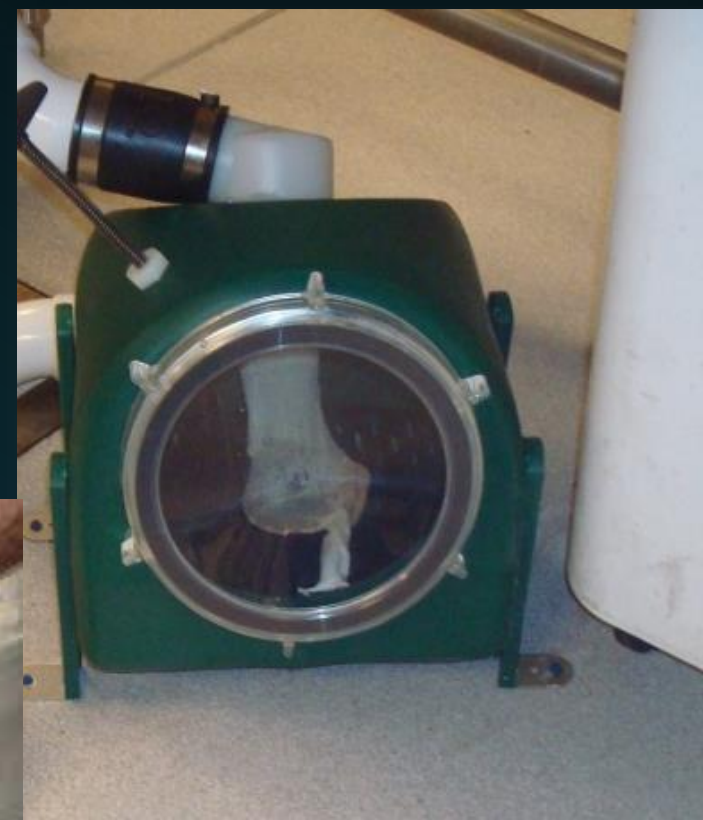


Alternate Design Scenario Review

HGI – Alternate Design Options

Fine Particle Strainers installed upstream to the HGI - to capture:

- Espresso grinds
- Coffee grinds
- Fruit pulp, seeds
- Tobacco (Hookah Clubs)
- Pre-rinse sink solids
- Food waste grinder material



HGI – Alternate Design Options

Fine Particle Strainers installed upstream to the HGI - to capture:

- odorous foods:
 - Fish, fish scales, meat scraps



HGI – Alternate Design Options

Solids Interceptors installed upstream to the HGI - to capture excessive solids



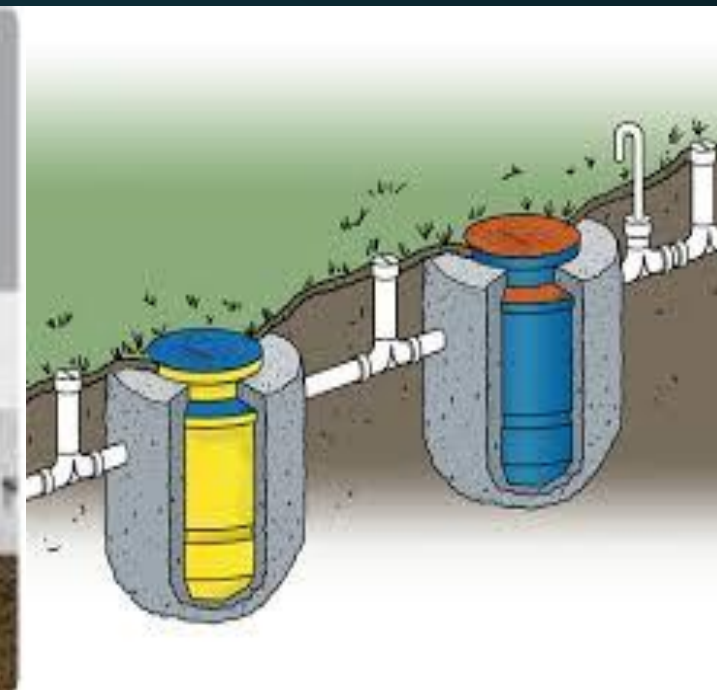
Alternate Design Options - GGIs

- Multiple GGIs **connected together**:
 - **in series** (to increase the retention time needed capture suspended solids, flour)
 - **in parallel** (to reduce system flow rate)



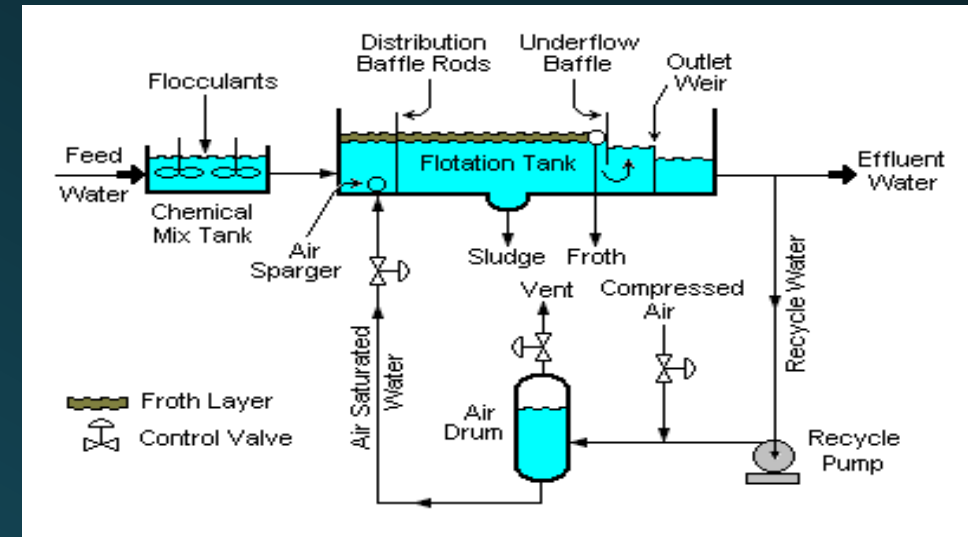
Alternate Design Options - GGIs

- Solids interceptors prior the GGI (to capture suspended solids)
 - Sized based on discharge flow rate



Alternate Design Options-Dissolved Air Flotation (DAF)

- Used to address the removal of solids or FOG – in many industrial applications (dairy, commercial laundries, & others)
- Used in high flow rates applications or when higher pollutant removal efficiency is needed
- removal is achieved by dissolving air (under pressure) in the wastewater and then releasing the air at atmospheric pressure to form tiny bubbles which adhere to the suspended matter that is then removed by a skimmer



Alternate Design Options - Trash Compactors

- 750-gal GGI to treat food waste
- Area designed to minimize stormwater

AND

- Hydraulic oil containment area wall/curbing (no discharge to sewer);
OR
- OWS designed to treat hydraulic oil discharges and any stormwater falling into pad area (discharging to sewer)



Alternate Design Options - Trash Compactors

OWS (discharge to sewer) sized:

- Total compactor hydraulic fluid storage volume;
- If uncovered, stormwater flows (based on 100-year, 1 hour rainfall event flow rate for the region (in inches of rain/hour), & the square footage of pad area discharging stormwater to the drain)
- Show grading plan to confirm stormwater is being minimized



Trash Compactor Design

OIL WATER SEPARATOR SIZING CALCULATION

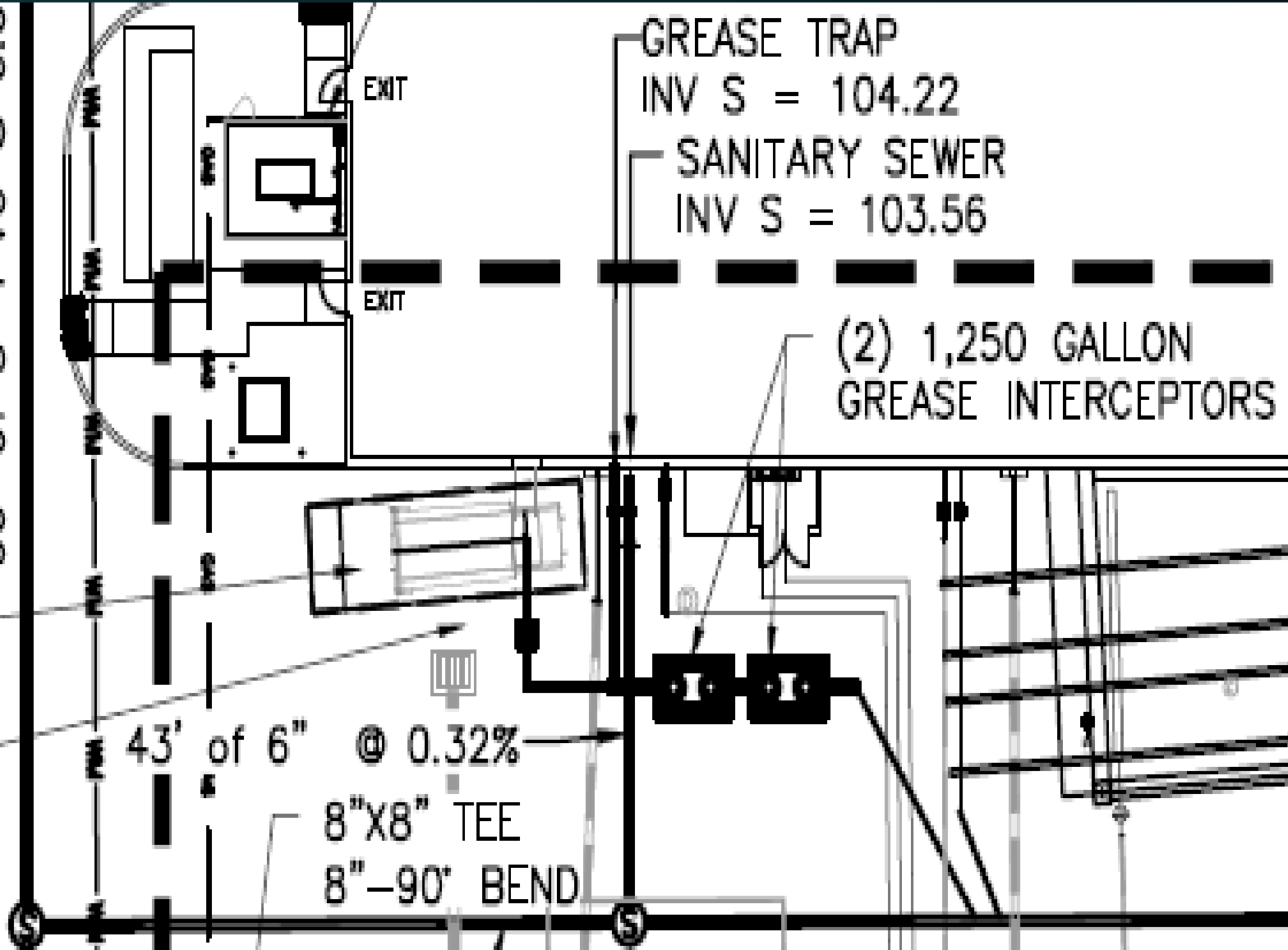
25.0 TOTAL GALLONS OF HYDRAULIC OIL USED IN PHILADELPHIA TRAMRAIL PT-330 COMPACTOR
(0.375 FT(RAIN WATER) X 34.5 FT X 10 FT) x 7.48 = 967.73 GALLONS IN DRAIN AREA
25.0 + 967.73 = 992.73 GALLONS TOTAL
992.73/100 = 9.93 GALLONS PER MINUTE FLOW RATE

SELECTED ZURN Z1189 - 100 HOLDS 100 LBS OF OIL SLUDGE

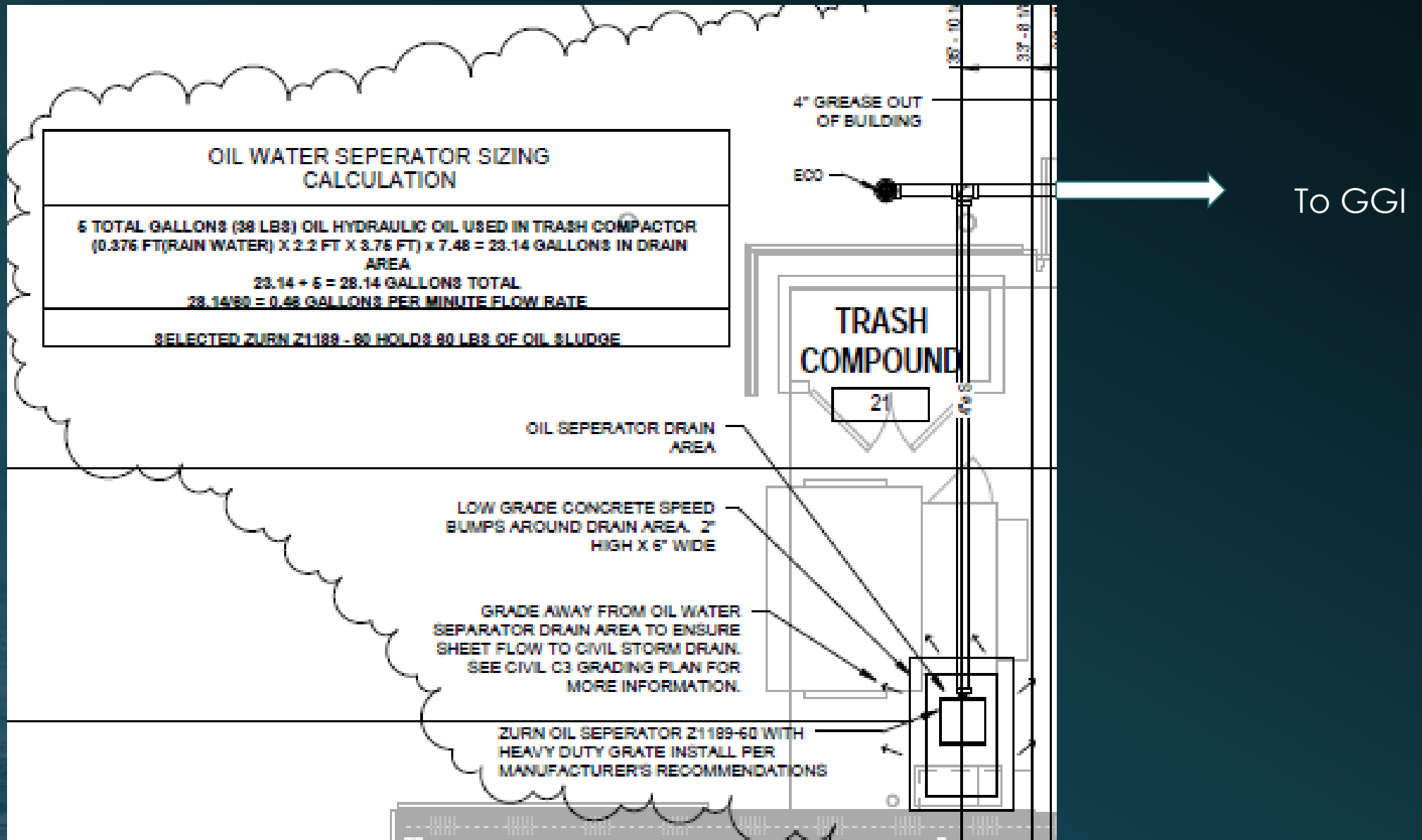
OIL SEPARATOR DRAIN AREA

WAY FROM TRASH COMPACTOR AREA TO SHEET FLOW TO CIVIL STORM DRAIN. SHEET C6.0 FOR MORE INFORMATION

96' of 8" PVC @ 0.3

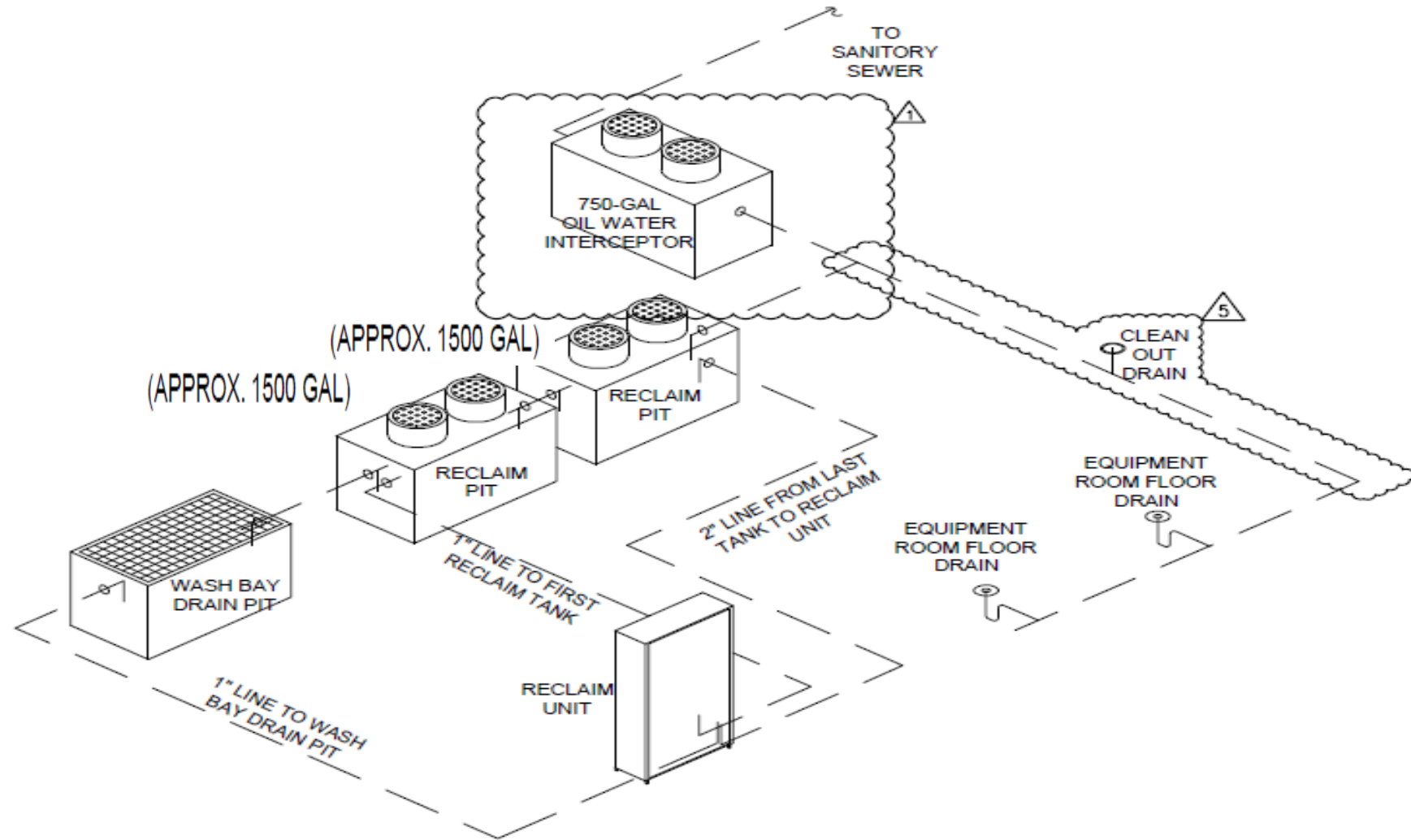


Trash Compactors – OWS Design Sizing Details



Alternate Design Scenario – Carwash Recycle System

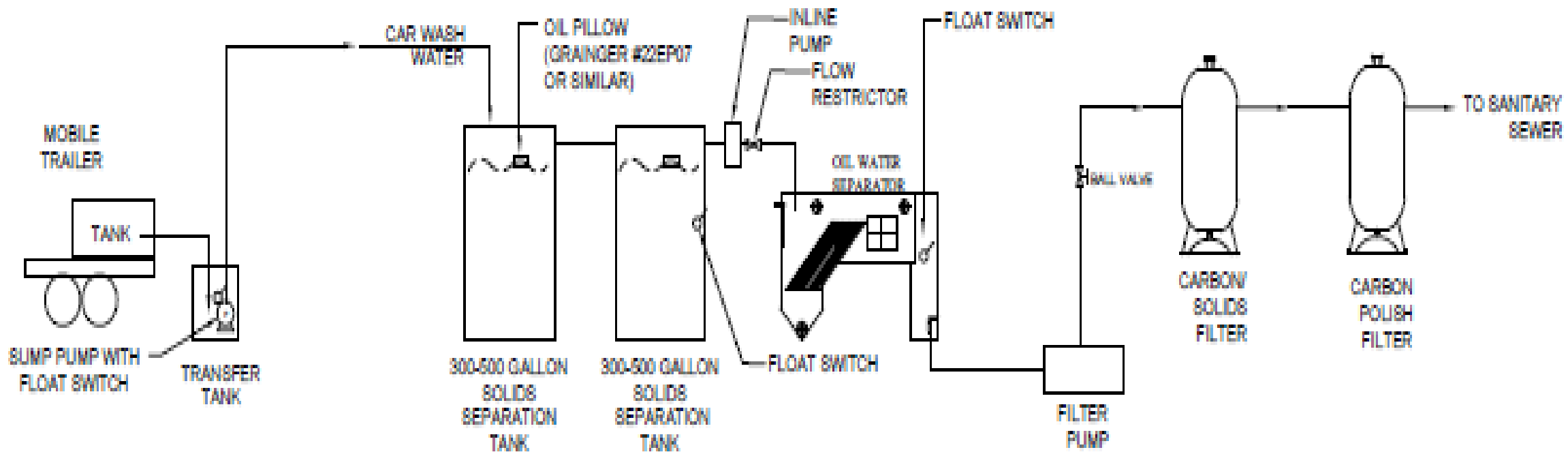
Sand Interceptor or Reclaimed Tanks prior to OWS



ISOMETRIC RECLAIM PIT AND DRAINS DIAGRAM

Alternate Design Options - Mobile Truck Wash Discharge

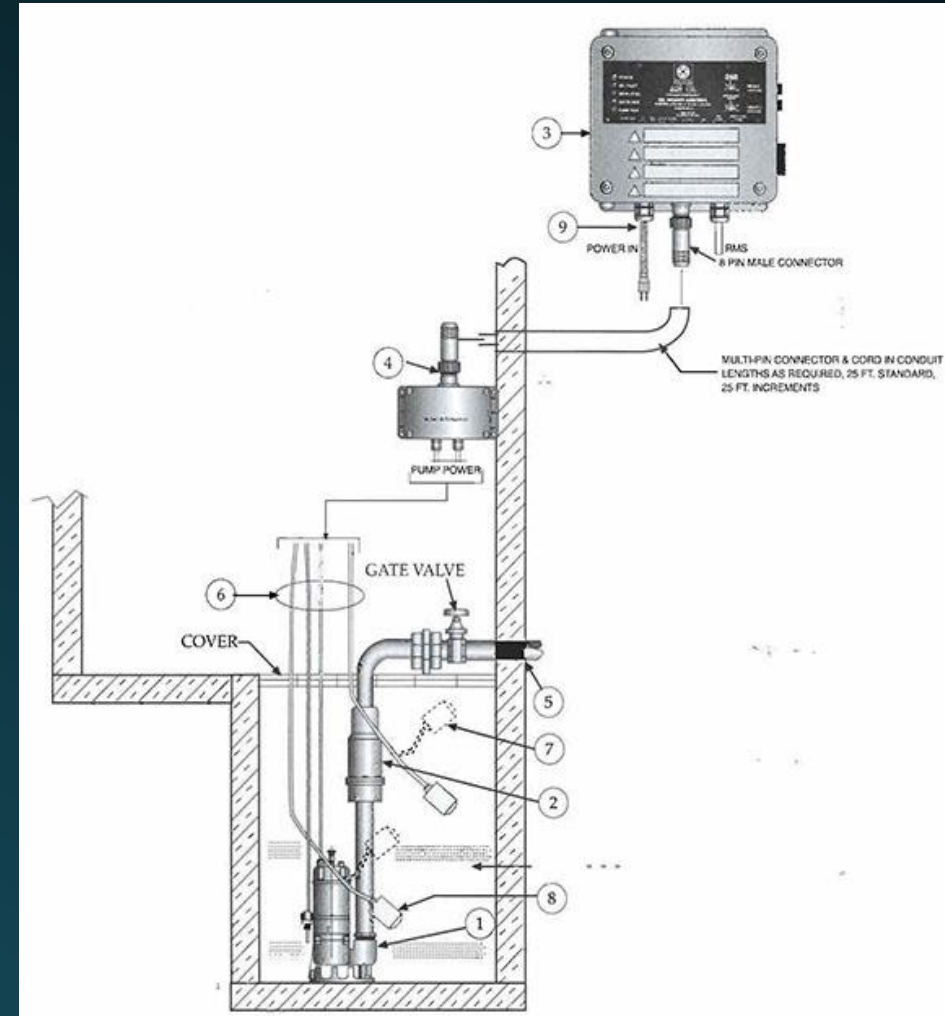
Typical Water Treatment System



Alternate OWS Device – Elevator Sump Pump Pit

Stancor Model SE50 Oil Minder System

- Applications include: hydrocarbon sumps, elevator pits, washdown tanks, manufacturing facilities, transformer vaults and substations
- Separates oily water at 50 gpm
- Oil is contained in sump
- Audible & visual alarms
- Duplex systems available

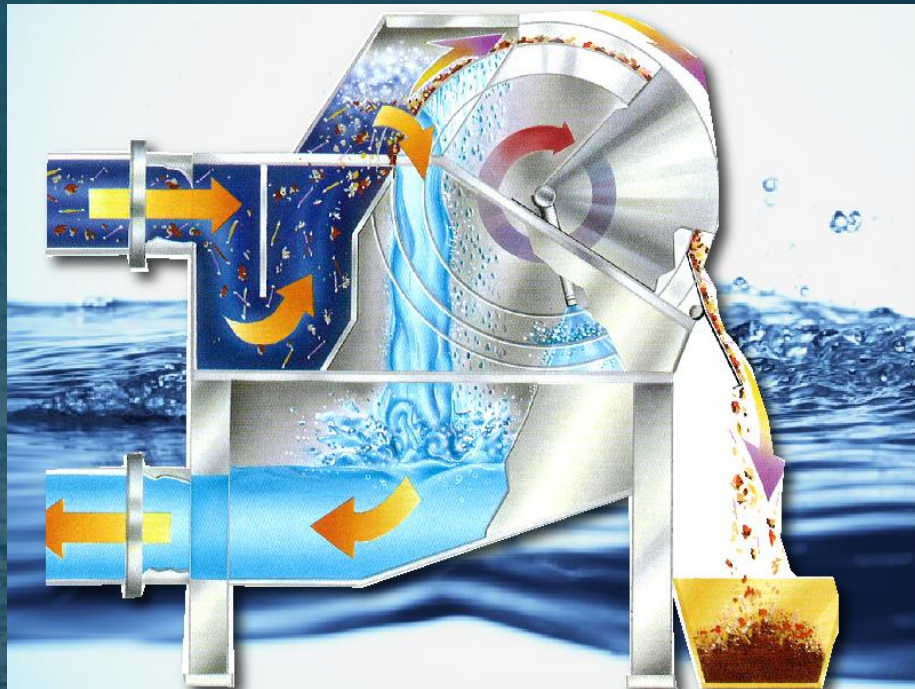


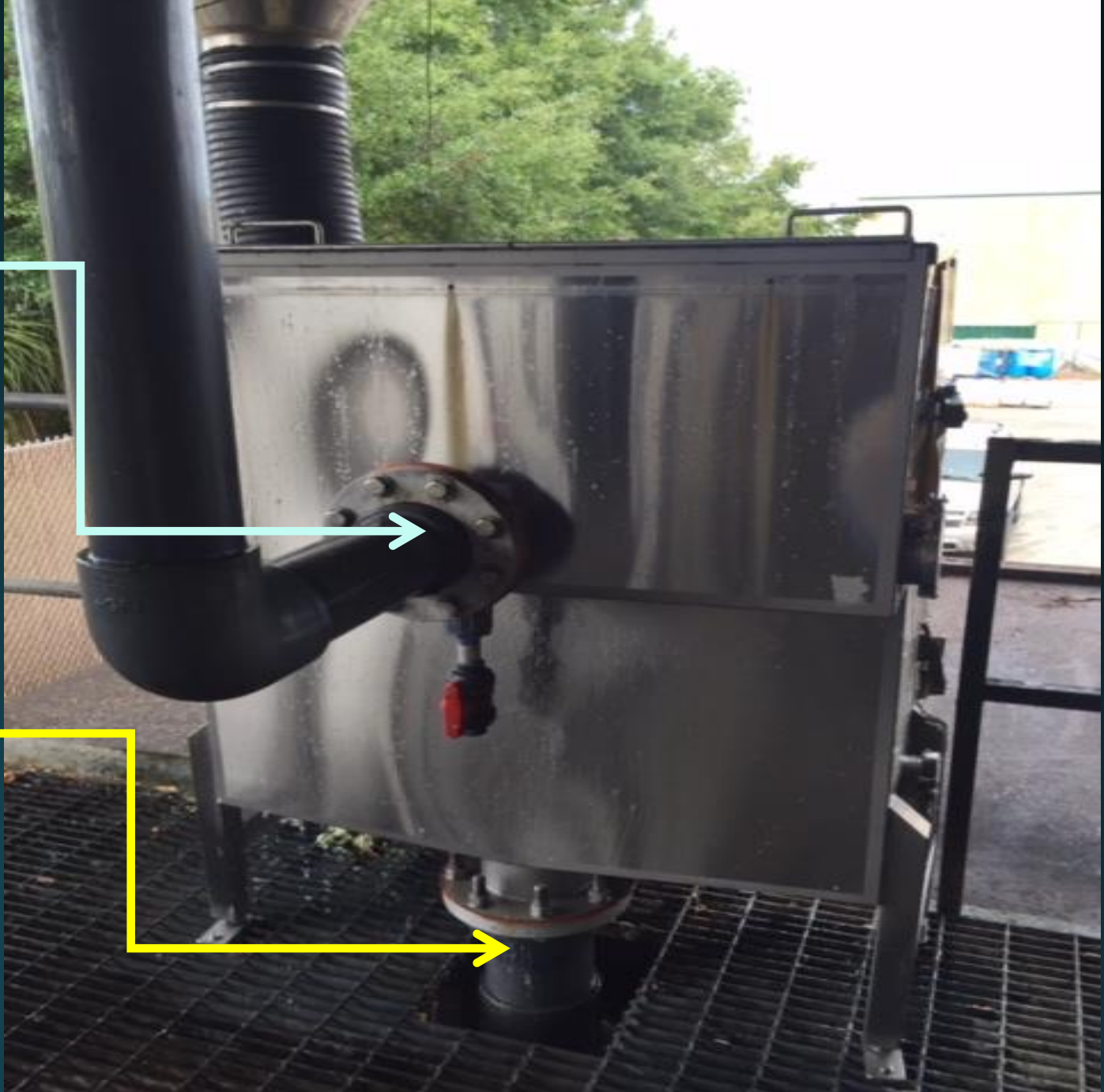
Alternate Separation Device Options - Industrial Food Solids

- Centrifuges
- Static Screens
- Rotary Drum Screens



Solids Separation Static Screen





**Unscreened Solid Laden
Wastewater Infeed From
Industry Process**



**Screened Wastewater
Outfeed to Utility Sewer**



Water flowing over screen

Screened Solids





Thank You!