

What We Know After 23 Years of FOG Program Work



Presenter: Byron Ross

October 12, 2023

Why have a FOG Program?

- Preventing FOG related Sanitary Sewer Overflows
 - Commercial and Residential
- Preventing Sewer Line Blockages & Back-ups



Sewer Line - Clear vs. FOG Obstruction



Why have a FOG Program?

- Reducing Sewer Maintenance and Related Operating Costs
- Reducing Sewer Corrosion and Odor Impacts



Code of Federal Regulations (CFR)

40 CFR Part 403.5(b)(3) identifies specific prohibitions which include

- (3) Solid or viscous pollutants in amounts which will cause obstruction to the flow in the POTW resulting in Interference;



Treatment Works Protection

- Wastewater Treatment Plant
- Sewer Pumping Stations
- Sewer Pipes and other conveyances
- Also...Any devices and systems used in the storage, treatment, recycling, and reclamation of municipal sewage or industrial wastes of a liquid nature.



POTW is more than just the treatment plant

- “Any User” is commonly listed in sewer use ordinances. So not just Industrial and Commercial Facilities but also Residential.

Defining Fats, Oils & Grease (FOG)

FOG: Organic polar compounds derived from vegetable/plant or animal sources that are composed of long chain triglycerides. (fatty acids and glycerol).



FOG have weak acids, but can have corrosion impact

Fatty Acids

First # is number of carbons: Second # is number of double bonds in fatty acid chain

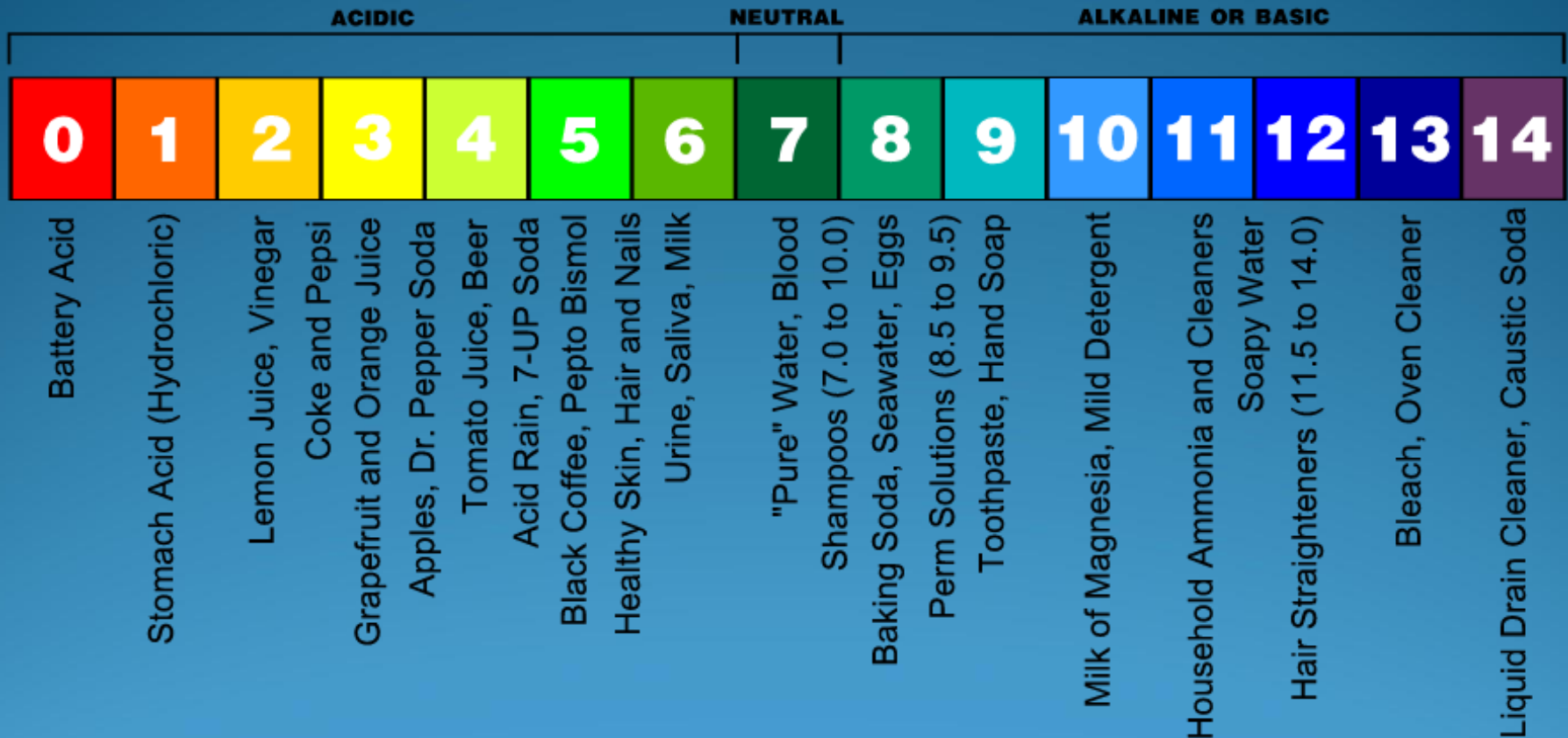
Fatty Acid	Lipid # ID
Oleic	18:1
Palmitic	16:0
Stearic	18:0
Linoleic	18:2
t-Elaidic	18:1
Palmitoleic	16:1
Myristic	14:0
Margaric	17:0
t-Octadecadienoic	18:2
Gadoleic	20:1
Linolenic	18:3
Myristoleic	14:1
Pentadecanoic	15:0
Eicosadienoic	20:2
t-Hexadecenoic	16:1
Arachidic	20:0
Eicosatrienoic	20:3

- Saturated
- Monosaturated
- Polyunsaturated
- Trans
 - Hydrogenated
 - Partially Hydrogenated

Have used Fatty Acid Analysis Profile to Identify potential sources

pH Scale

pH of Common Substances



Federal minimum is 5 std. units.

Grease Interceptor waste pH can be 4 to 6 s.u. WHY?

Food Service Establishment's waste fats, oils & grease - 2 Types...

- **“Yellow” grease:** unadulterated spent FOG removed from FSE. Major source of yellow grease is deep frying. Put this type grease in the grease recycle bins, normally at the back of the FSE.
- **“Brown” grease:** floatable FOG, settled solids and associated kitchen wastewater retained by grease interceptors and grease traps. Grease discharged from the kitchen sinks, dishwasher, floor drains, etc...



“Yellow” Grease (in recycle bin) ultimate uses:



- 61% Animal Feed Additive
- 22% Fatty Acids/Glycerol to help make surfactants, plastics, resins, textiles and cosmetics
- 9% Soap Making
- 4% Lubricants
- 4% Misc. (biodiesel, fuel for vehicles)

There was some confusion with the first FOG Programs (and still is for some cities)



Basis for FOG Program Implementation



GUIDE FOR EVALUATING CAPACITY, MANAGEMENT, OPERATION, AND MAINTENANCE (CMOM) PROGRAMS AT SANITARY SEWER COLLECTION SYSTEMS

- EPA CMOM Programs
- State Regulations
- Local City or Municipal Sewer Use Ordinance, or FOG Management Policy

9 Key Elements of FOG Program

- EPA Region IV CMOM Policy Document



GUIDE FOR EVALUATING CAPACITY,
MANAGEMENT, OPERATION, AND
MAINTENANCE (CMOM) PROGRAMS
AT SANITARY SEWER COLLECTION
SYSTEMS

- **Legal Authority**
- **Plan Review & Design Standards**
- **Inspections**
- **Permitting / Control Mechanisms**
- **Enforcement**
- **Communication**
- **Performance Measures**
- **Public Education**
- **Information Mgt. System**

Legal Authority

Legal Authority to control the discharge of FOG, including ability to implement a permit and enforcement program.

Sewer Use Ordinance should include FOG program regulations or reference the City or Department FOG Management Policy or Ordinance.

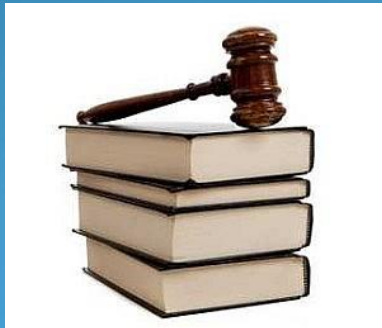


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Plans Review & Design Standards

- I know that many cities' wastewater departments and codes departments have trouble communicating!
- I know that one of the most frequently asked questions I get is “What type and size grease control equipment do we need for this restaurant/ food service establishment?”



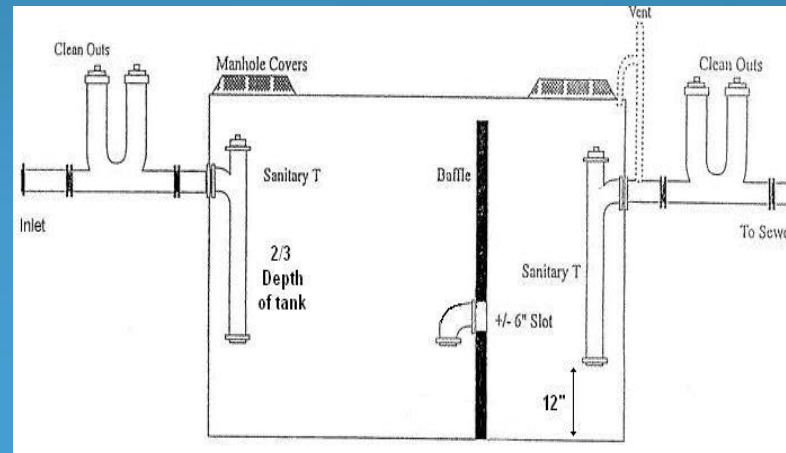
Plans Review & Design Standards

- Specification of accepted devices to control the discharge of FOG.
- Establishment of standards for the design and construction of FOG control devices.
- Establishment of construction inspection protocols
 - *Is FSE plans review process working?
 - *Are some FSEs slipping through unapproved?
 - *Who is responsible for Rough-In Inspections, final approvals?



Plans Review considerations

- Wastewater Department and Codes communication?
- How will new FSE GCE plans review process work?
- What about FSEs upgrading or FSE replacing existing FSE? Cannot rubberstamp.
- What formulas or sizing calculations will be used?



Plans Review

- Undersizing and Oversizing Grease Control Equipment are both bad.
 - Undersizing can allow short-circuiting and FOG discharge to sewer system.
 - Oversizing can allow hydrogen sulfide generation, corrosion, and odors

FOOD SERVICE ESTABLISHMENT FOG INSPECTIONS

- ❑ Establish FOG Compliance Inspection Protocols
- ❑ What will be the frequency of the inspections?



Some cities think that just checking the grease interceptor depth of grease is all you need to do during an inspection

Food Service Establishment FOG Inspections – Overview, Recon

- Inspection Safety Considerations
- Equipment Needed for the Inspection
- Inspection Form and Materials Needed
- Grease Control Equipment Check
- Downstream Manhole Checks
- Visual Observations at the Food Service Establishment
- Inspection Review with Food Service Establishment owner or manager

INSPECTION SAFETY CONSIDERATIONS

- Vehicles/Traffic

- Safety Vest – Always have it on!
- Vehicle equipped with flashing lights
- Orange traffic or road cones or barricades
- Plan to have multiple vehicles if in high traffic area



I know that I have had several near-death experiences in parking lots.

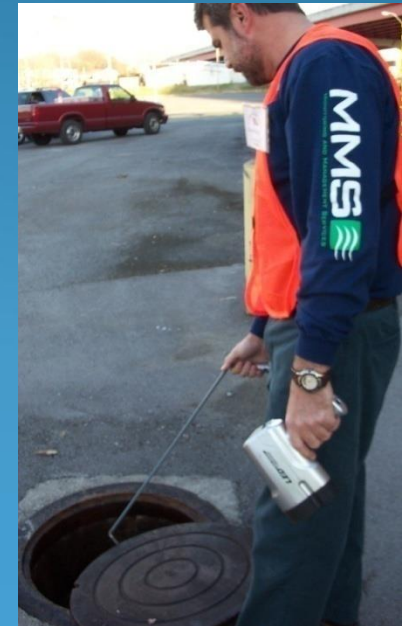


Inspection Safety Considerations

- Opening and Closing Manholes
 - Dangerous Gases (Hydrogen sulfide, methane, etc...)
 - Manholes are a confined space!
 - Have manhole pullers and pry bars
 - Never put your fingers or hand under a partially opened manhole cover!



Manhole ring



Safety Considerations



GOOD



BAD

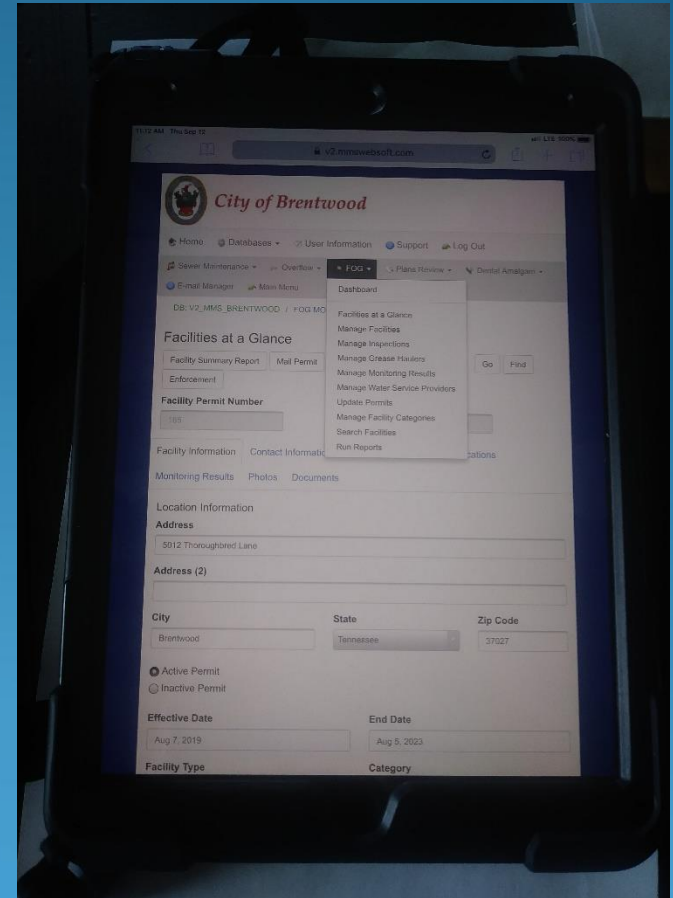


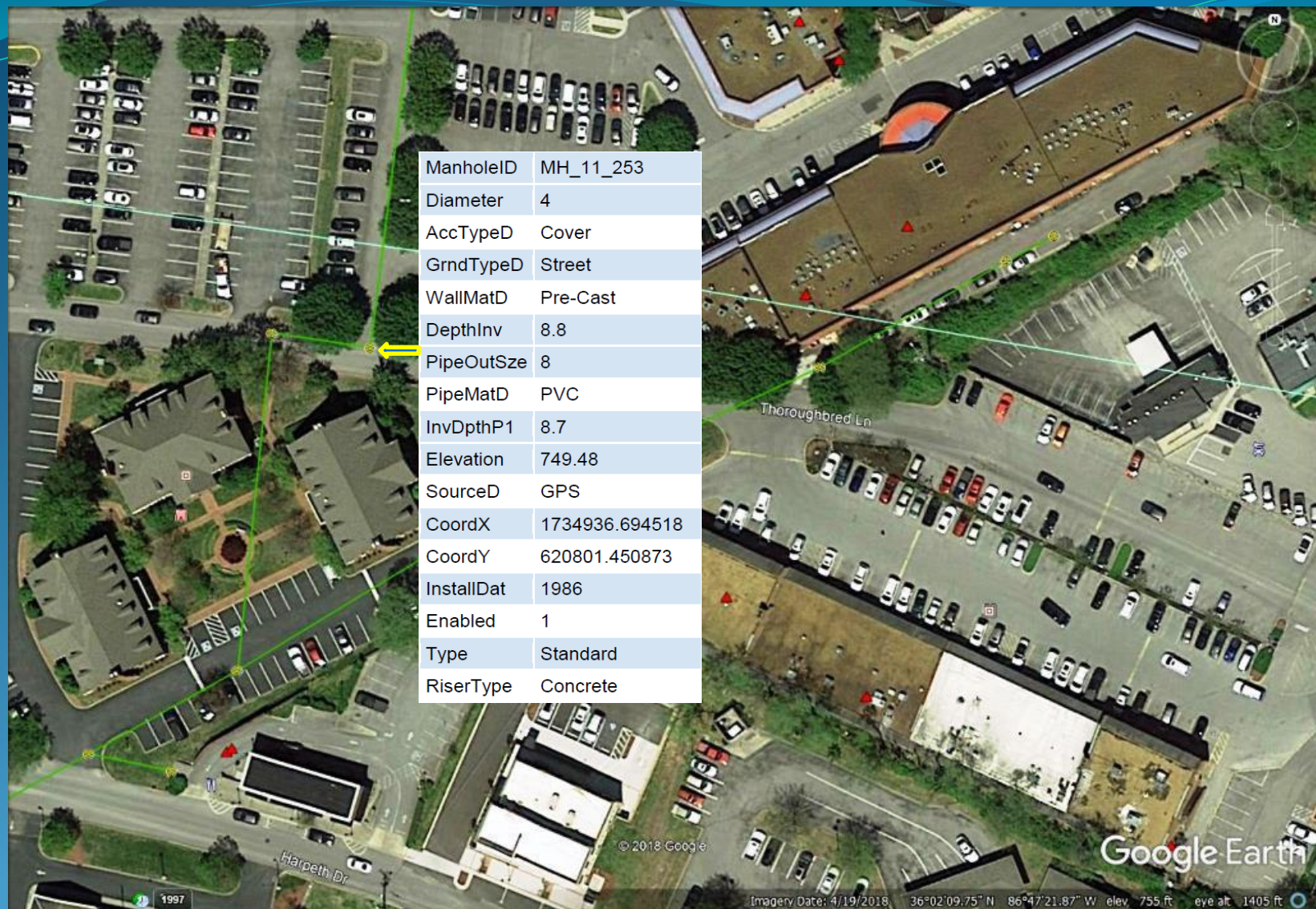
BAD

I know that you should never allow plastic manhole lids/covers to be used

Other Equipment Needed

- iPad (preferred), or laptop, or iPhone to document inspection information and photos
- A web-based FOG database is preferred to allow real time entry of inspection data and photos





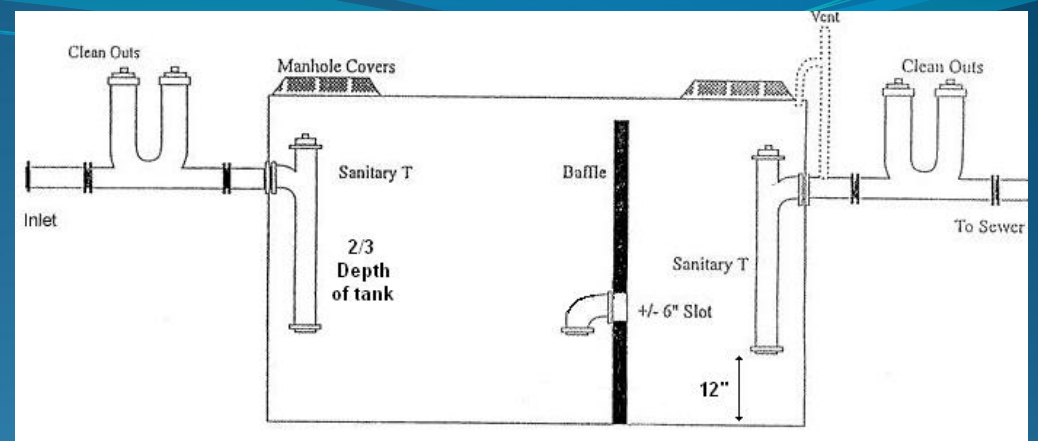
Sewer Plat access. KMZ file of sewer manhole and line locations overlaid on Google Earth.

Poll Question #1

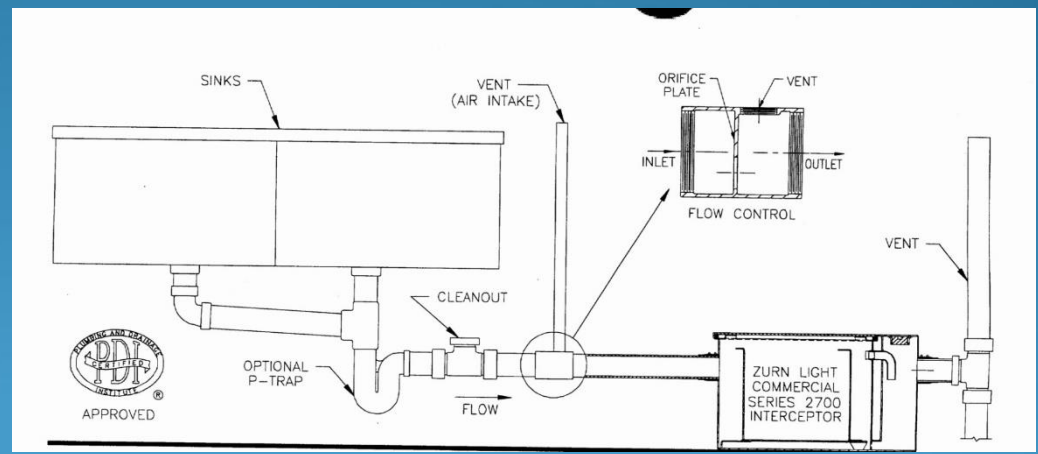
- How long have you been involved with FOG Program Work?
 - A. < 1 year
 - B. 1 to 5 years
 - C. 6 to 10 years
 - D. > 10 years
 - E. Not applicable

Inspection Form

Grease Control Equipment Information – Grease Interceptors and Grease Traps



Gravity Grease Interceptor



Grease Trap
(AKA Hydromechanical Grease
Interceptor)

Grease Interceptors

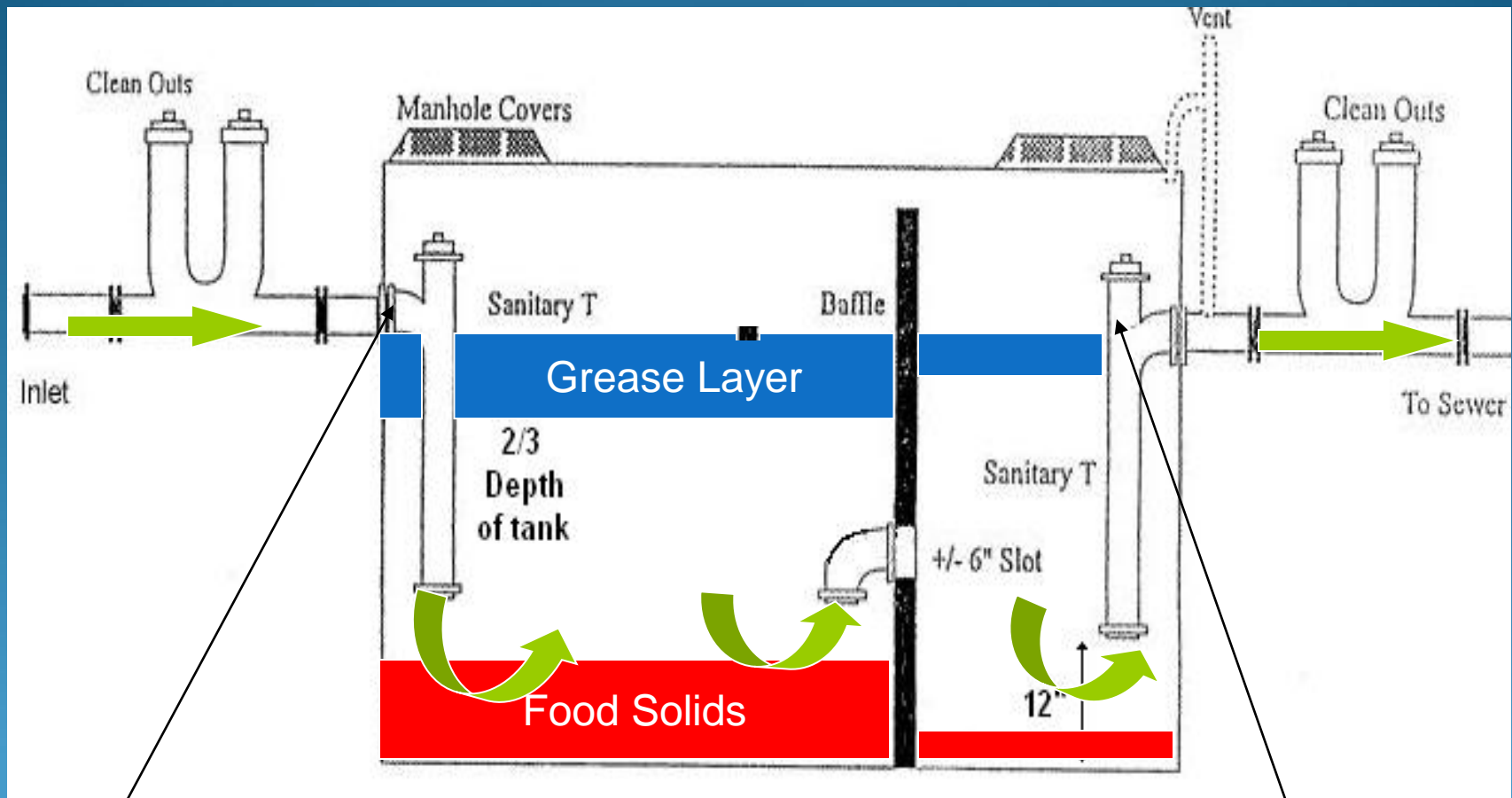


Grease Interceptor Types/Materials

- Concrete
- Fiberglass
- Plastic
- Steel



Grease Interceptor – How it Works



Influent T

Effluent T

Inspection Form

1.) Grease Interceptor? ___ Yes ___ No
(For #1, if "NO" then go to # 17)

2.) Interceptor Size(gallons) ___ 500 ___ 750 ___ 1000 ___ 1500 ___ 2000
 ___ 3000 ___ Two Interceptors in series ___ Other: _____

3.) Manhole Access: ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 ___ 8

4.) Grease Layer Depth: ___ 1"-3" ___ 4"-6" ___ 6"-9" ___ >10"

5.) Influent T visible? ___ Yes ___ No

6.) Influent T attached & in good condition: ___ Yes ___ No ___ Unknown

7.) Effluent T visible? ___ Yes ___ No

8.) Effluent T attached & in good condition: ___ Yes ___ No ___ Unknown

9.) Mid - Wall Baffle visible? ___ Yes ___ No

10.) Baffle Wall in good condition: ___ Yes ___ No ___ Unknown

11.) Grease Interceptor Hauler used: _____

12.) Bacteria/Enzymes used: ___ Yes ___ No

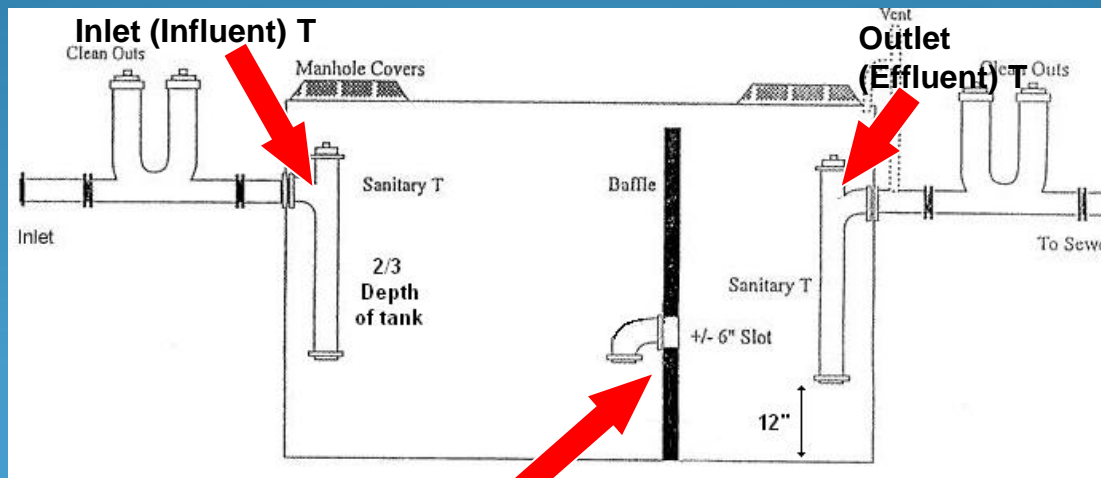
13.) Product Name: _____

14.) Frequency Interceptor Cleaned: _____

15.) Complete Contents Pumped? ___ Yes ___ No

16.) Records of Maintenance/Cleaning Available? ___ Yes ___ No

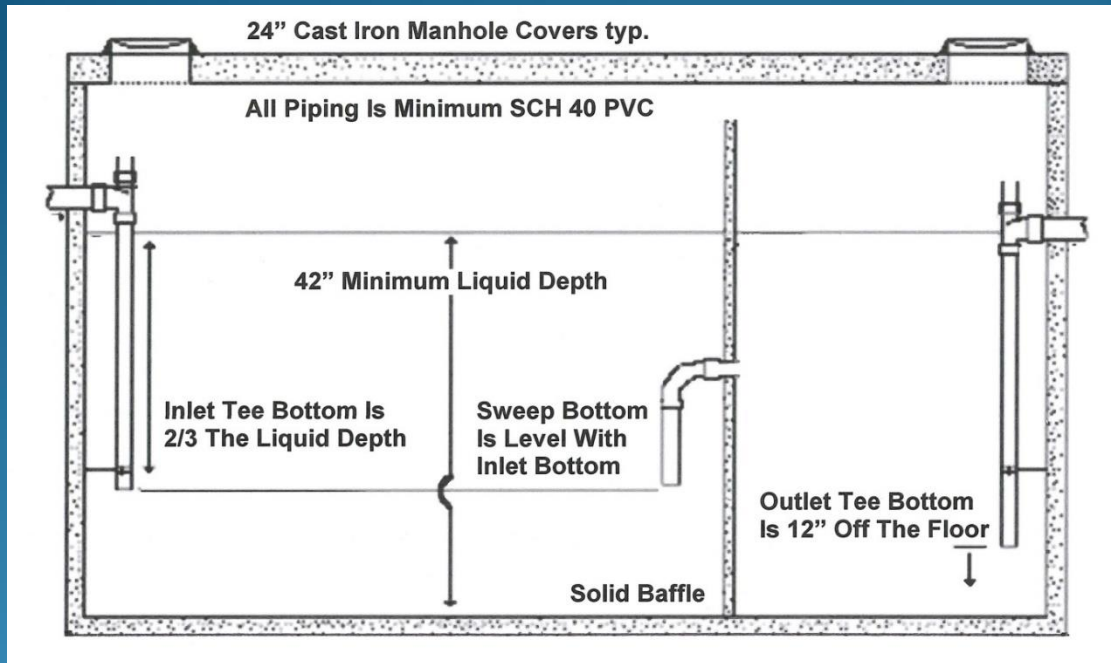
17.) Last date cleaned: _____



Baffle wall w/ hole

- Grease Control Equipment Information – Grease Interceptors

Monolithic Body Design vs. Two Piece Design



The tank shall be of a monolithic body design, separated by a solid baffle into 2/3 total capacity inlet chamber and 1/3 total capacity outlet chamber. It shall have 24" access ways over each drop tee. Flow through the baffle will be provided by a 90 degree sweep. All perforations and seems shall be sealed with hydraulic cement or welded. All piping shall be a minimum of schedule 40 PVC solvent welded; pipe clamps and/or hangers may be required. All parts of the system shall be made water and gas tight from two way cleanout upstream of tank to two way cleanout downstream of tank including any risers to grade; proper venting allowed.

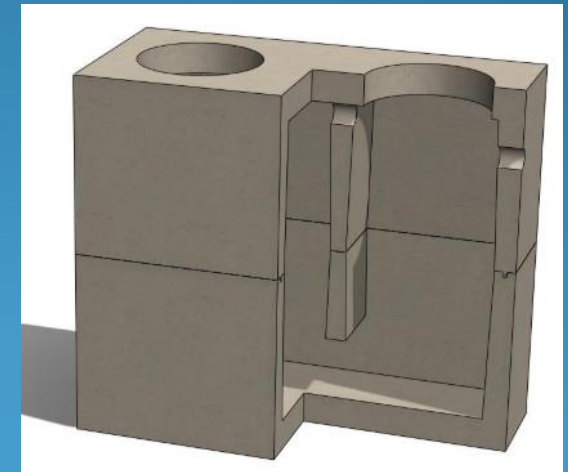


Diagram from Leco Industries

Monolithic = Tank Body with Cover/Lid

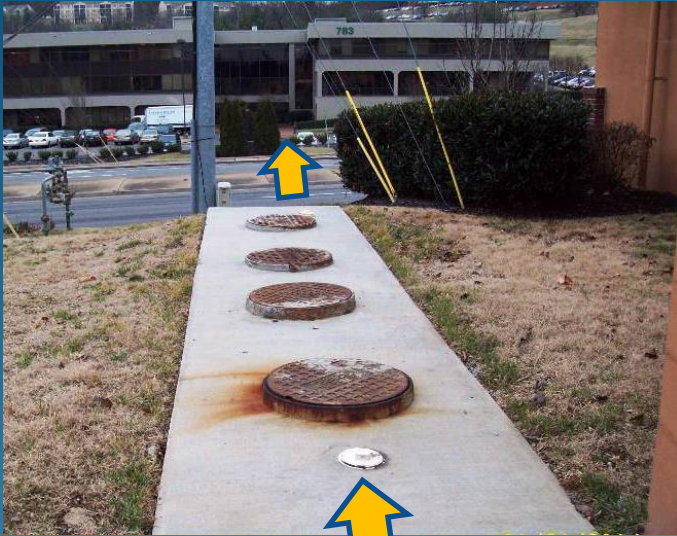


Older Two Piece Interceptor Seams

Interceptor leaking at two piece seam



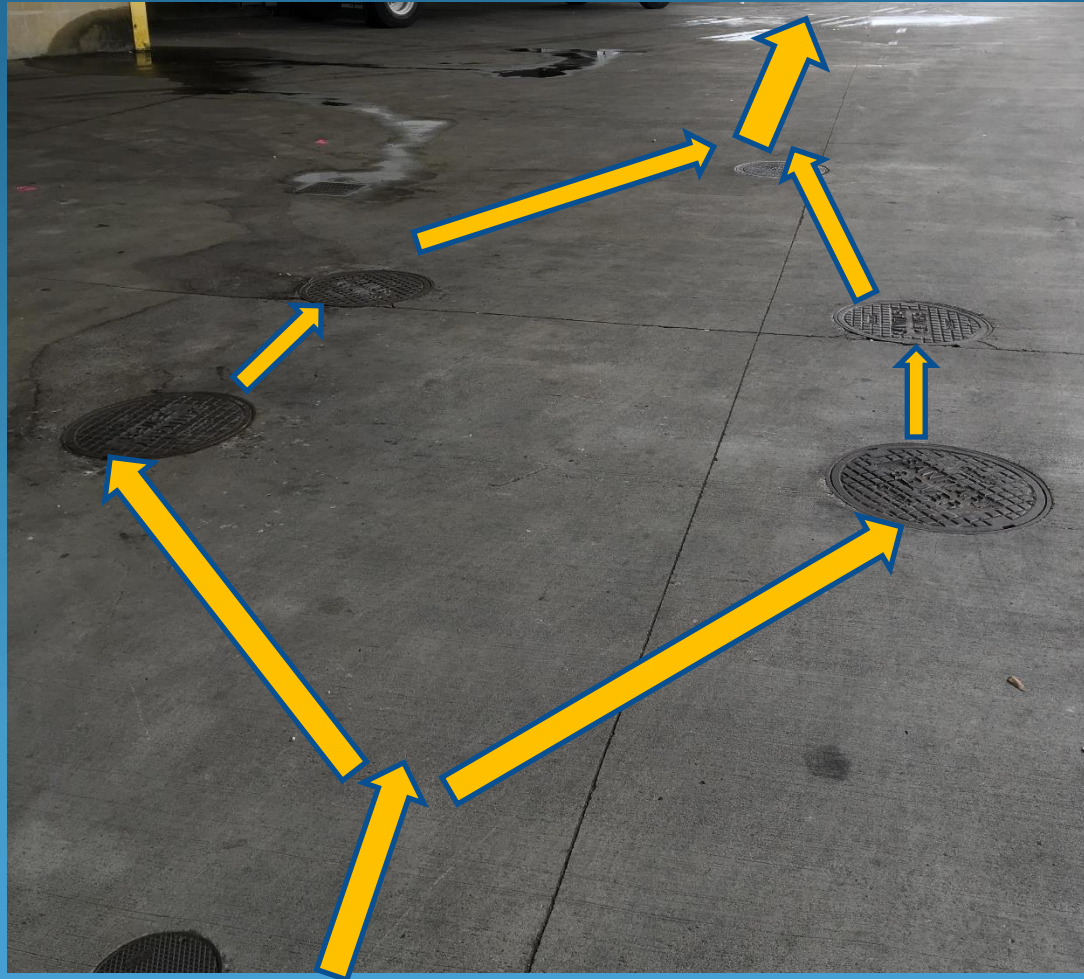
Interceptors in Series Installation



Less potential issues,
preferred set up



Parallel Interceptor Installation



More
potential
issues

Risers for Manholes



Good



Bad

Result of bad
manhole riser
materials used



Outlet Tee is critical



Minimum Schedule 40 PVC

No Inlet Tee is a problem

- Does not allow for proper retention time
- Clogs, backups in facility are more likely
- Shortcircuiting of kitchen wastewater occurs



FOG layer itself can block inlet wastewater flow

Alternative Tee material & direct wall attachment – no good



Result of SD-35 plastic baffle attached to wall of interceptor...



Suspect anything here?

3 access manholes, middle manhole is over baffle wall



Field Case Study 1

Have 2000 gallon GI that is pumped every 2 months with proper inlet and outlet Ts, and baffle wall...but still have heavy FOG in sewer



Why is heavy FOG still in downstream sewer line?
Time for dye test of kitchen fixtures.

Poll Question #2

- How many Food Service Establishments are in your wastewater jurisdiction?
 - A. < 25
 - B. 26 to 100
 - C. 100 to 250
 - D. > 250
 - E. Not applicable

Grease Traps

(Hydromechanical Grease Interceptors)



Under the Sink Grease Trap



In Floor Grease Trap

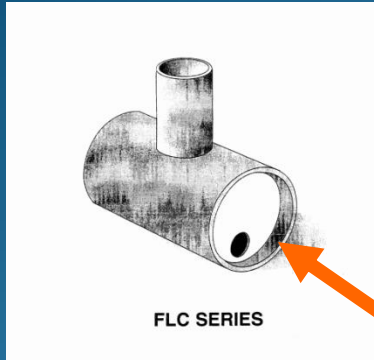


Outside, in-ground Grease Trap

Automated Grease Traps

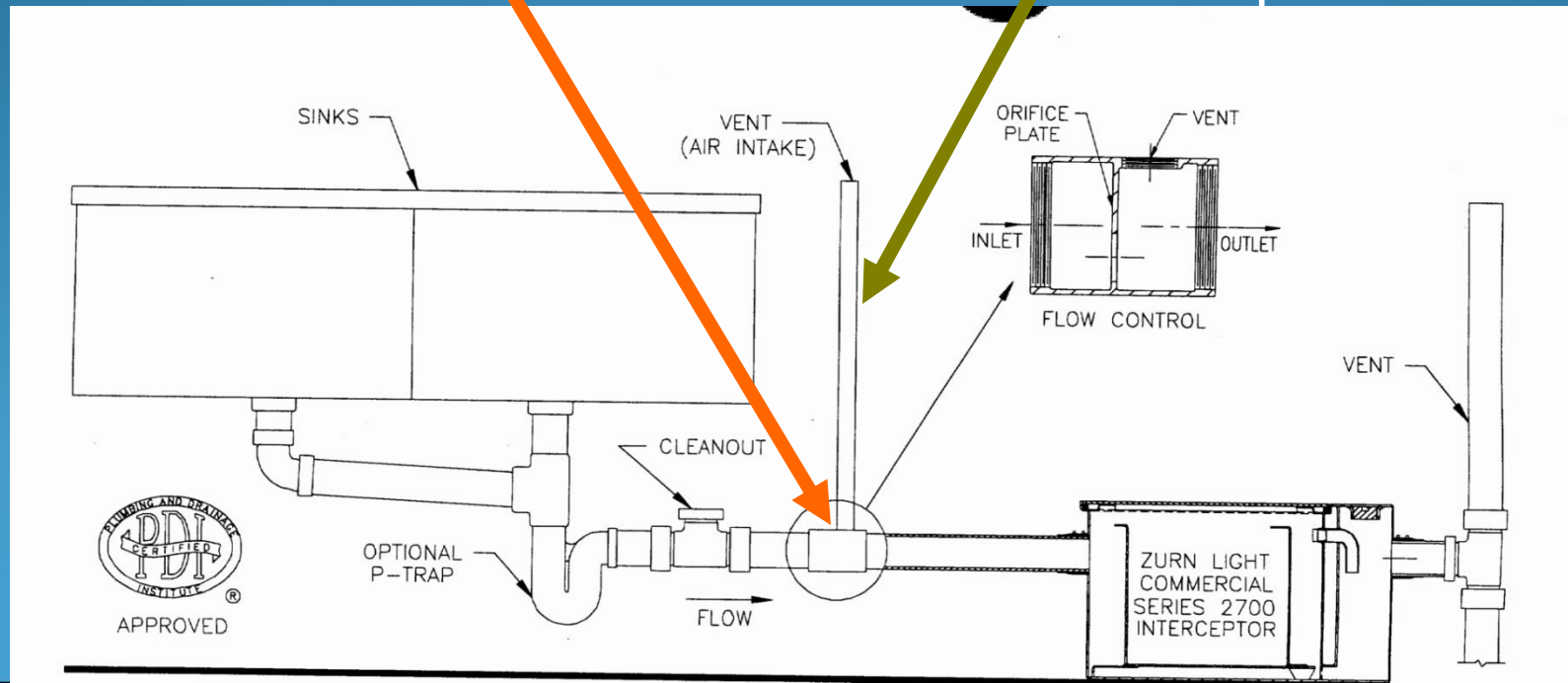


Grease Traps – critical components



Flow restrictor

Vent Pipe



ID of Flow Restrictor and Vent Pipe



Providing access for floor trap flow restrictor and vent



PDI approved

vs. Non-PDI Approved



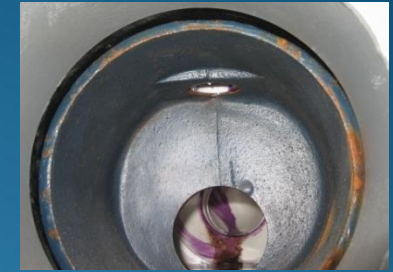
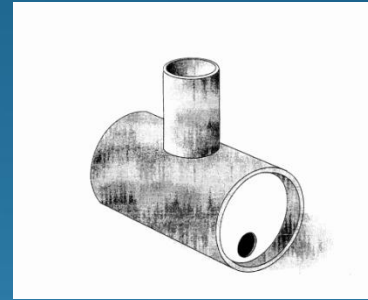
External Flow Restrictor & Vent Pipe



"Flow Control Inside"

GREASE TRAP SIZES

- 5 gpm / 10 lb capacity
- 7 gpm / 14 lb capacity
- 10 gpm / 20 lb capacity
- 15 gpm / 30 lb capacity
- **20 gpm / 40 lb capacity**
- 25 gpm / 50 lb capacity
- 35 gpm / 70 lb capacity
- 50 gpm / 100 lb capacity
- 75 gpm / 150 lb capacity
- 100 gpm / 200 lb capacity



Flow Restrictor allowed rate as gpm and capacity of grease for the unit is lbs.

How do I know the size of the grease trap?



What should be connected to the Grease Trap?



Field Case 2:

Grease Trap with multiple problems....

Can you identify them?

Heavy FOG in downstream sewer from this FSE.



Grease Trap with multiple problems.....

1. No flow restrictor installed
2. Dishmachine connected to the trap. Pre-rinse sink ok, but not dishmachine...high temperatures (140 to 180°F, detergents / surfactants, high flow rate.
3. Fernco/rubber fittings used inside of trap



Field Case Study 3: Anything wrong?



Permitting / Control Mechanisms

- Why issue Permits?
 - Control Mechanism to ensure FSE aware of regulations and requirements
- What type of Permit will be issued?
 - Individual Permits
 - General Permits (Does Sewer Use Ordinance allow this?)

FATS, OILS, & GREASE CONTROL PERMIT NO. **Permit #**

AUTHORIZATION TO DISCHARGE UNDER THE CITY SEWER USE ORDINANCE

In compliance with the provision of the Federal Water Pollution Control Act, as amended, (33 U.S.C. 1251 et. seq.; the "Act"), and with the provisions of the City Sewer Use Ordinance:

FSE Name is authorized to discharge Industrial/Commercial Wastewater, from facility's food preparation and kitchen service area, to the City sanitary sewer collection system, from the facility located at **FSE Address, city, st zip code** in accordance with monitoring requirements, maintenance requirements, effluent limitations, and other conditions set forth in this Grease Control Permit.

This permit shall become effective on **05/14/2019** and shall expire on **05/14/2022**.

This permit shall not be reassigned, transferred, or sold to a new owner, new user, or for different premises, without, at a minimum, prior notification to the City Water and Wastewater Department and a provision of a copy of the existing control mechanism to the new owner or operator.

A violation of this permit constitutes a violation of the City Sewer Use Ordinance and shall subject the permittee to the applicable enforcement proceeding(s).

John Wayne
City Water and Wastewater Department

Where did you get your FOG Numerical Limit?

- ▶ In 1949 the Federation of Sewage Works Association (now known as Water Environment Federation – WEF) published *Manual of Practice* (MOP) in which it recommended 100 mg/L as a maximum limit for oil & grease.
 - ▶ In 1973...MOP3 was published and cited FOG domestic concentrations to be in the range of 16 mg/L to 105 mg/L. They further recommended a limit of 25 mg/L for petroleum based oil.
-
- ✓ Many cities have continued with the 100 mg/L oil and grease limit that was established decades ago.
 - ✓ Recommend evaluating the oil and grease local limit so it is technically based.

FOG NUMERICAL LIMITS

- Littleton/Englewood, CO 200 mg/L
- Nashville, TN 100 mg/L
- Lakehaven, WA 50 mg/L
- Austin, TX 100 mg/L
- Los Angeles, CA 600 mg/L (“dispersed”
O&G, total)
Floatable-None visible
- Cary, NC 325 mg/L (method 1664)
275 mg/L (method 413.1)

ENFORCEMENT



Establishment of an enforcement program to ensure compliance with the FOG Control Program.

- Follow-ups to no response for noncompliance
- Escalation in Enforcement Actions
- Recommend FOG Enforcement Response Guide

Noncompliance Categories

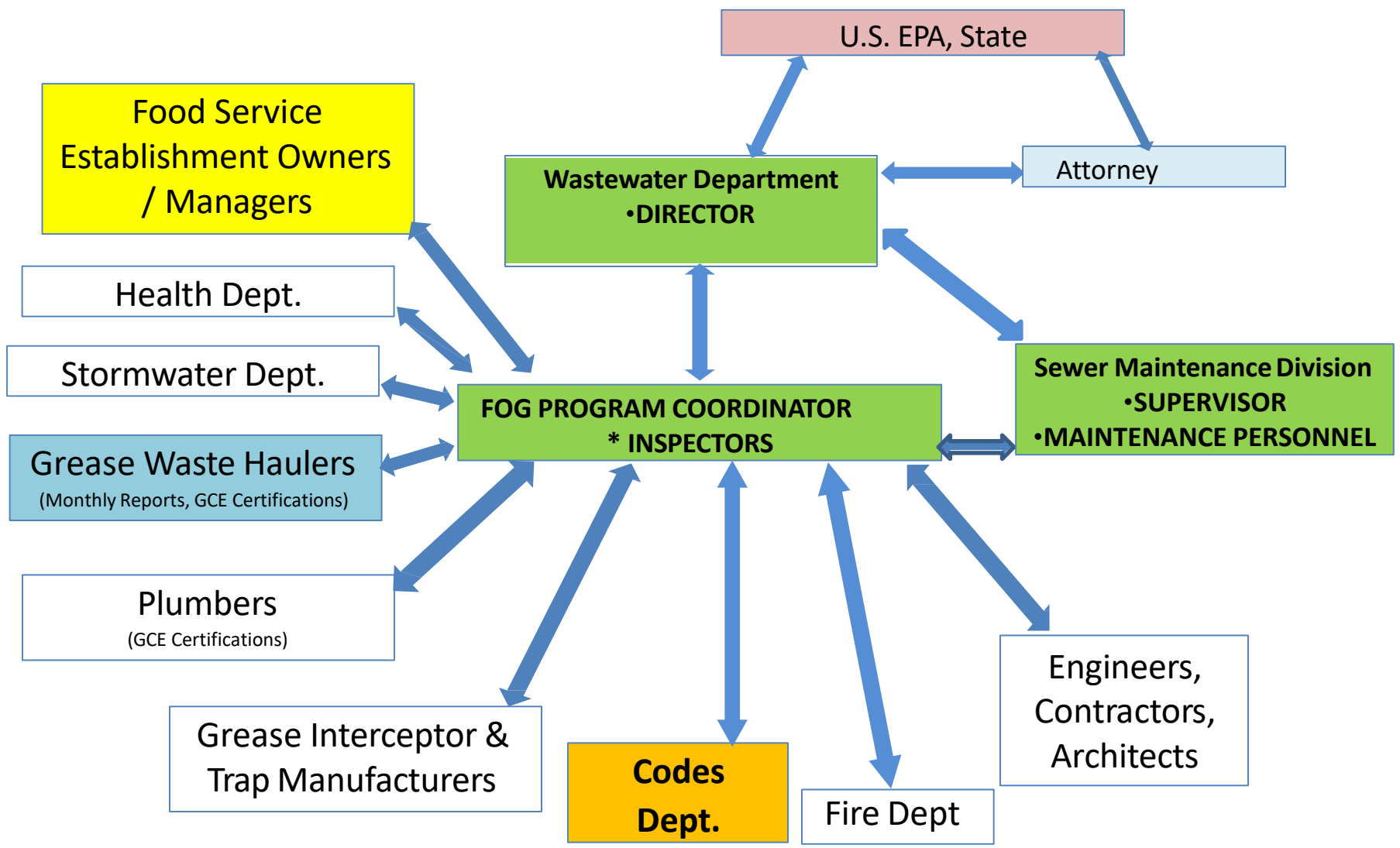
- FOG in City Sewer System
 - Slight, Moderate, Heavy ?
 - Did it cause a sewer line blockage or SSO event?
 - Repeat Offenses
- Inadequate pumping/cleaning of Grease Control Equipment (GCE)
 - Repeat offenses
- Inadequate GCE installed or no GCE installed
- No records available
- Improper disposal of Yellow Grease
- Components of Interceptor or Trap not installed
 - Flow Restrictor, inlet T, outlet T
- No response to initial enforcement action (NCN, NOV)
- Failure to install monitoring equipment or sample vault, or failure to keep automated monitoring calibrated

FOOD SERVICE ESTABLISHMENT AND GREASE WASTE HAULER ENFORCEMENT RESPONSE GUIDE

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	Administrative Orders.....
	Administrative Penalties.....
IV.	Penalty Assessment.....
V.	FSE Enforcement Response Guide Table.....
VI.	Grease Waste Hauler Enforcement Response Guide Table.....

FOG Program Communication



Poll Question #3

What is the area of your FOG program that is most difficult?

- A. Food Service Establishment Inspections
- B. Grease Control Equipment Sizing / Plans Review
- C. Enforcement
- D. Administrative Tracking
- E. Not Applicable

Sanitary Sewer Overflows



Sewer Overflow Response Plan (SORP)



- Written procedures for responding to Sanitary Sewer Overflows (SSOs)
- Communication Is Critical !!!
 - FOG inspectors
 - Wastewater Collection System Maintenance Personnel
 - Wastewater Treatment Plant Operators
 - Management

Sewer Overflow Response Plan (SORP)

- Location, Duration, Volume
- Category... Residential (Single Family or Multi-Family), Commercial, Industrial
- **Cause or Suspected Cause. Primary and Secondary Cause.**
 - FOG, Roots, Wipes/Rags, Gravel/Grit, I & I, Structural, etc...
- History? Previous SSO event at this location? Was this location on the “hotspot” cleaning list?
- **Follow-up actions**
 - If FOG was primary cause, enforcement actions taken?

SORP must ID who is responsible for each task.



Tracking and Documentation of Sewer Maintenance Activities



H₂S – Hydrogen Sulfide

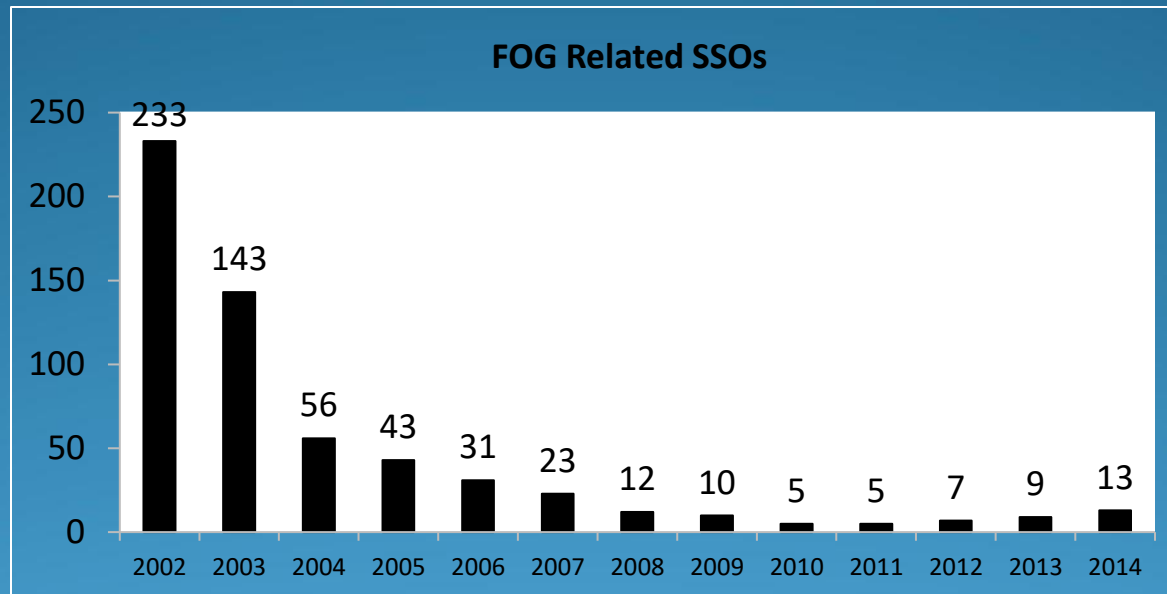


Hydrogen sulfide monitoring



Performance Measures

Establishment of performance indicators to be used to measure the effectiveness of the FOG Control Program.



- Which Performance indicators selected or tracked?
- Are these adequate?
- What indicator or measurement do we want to track and see trend 1 year from now? 5 years from now?
- Do we need to add or revise performance indicators?

Public Education

Public education program directed at reducing the amount of FOG discharged from private residences.

Sewer Use Policy has term “USER”, not just Industry



NO GREASE
PLEASE

FOG Public Education Options

- City Website – needs to be easy to find info and user friendly
- Brochures, mail inserts, handouts
- Door hangers
- Ads – Billboards, vehicle/bus, newspaper, magazines, radio
- Blog, Twitter or other social media
- You Tube videos
- School competition / contests
- Coloring books or other handouts for young kids
- Magnets, scrapers
- Property Mgt. Company/Apt Mgr Newsletter
- Yellow grease recycle drop off locations



MORE DATA TO MANAGE THAN YOU THINK

- Food Service Establishment
 - Owner/contact info, address, sewer plat ID/GIS, etc...
- Inspection Information and History
 - Photos, notes, findings
- FSE Correspondence and Notifications
 - Emails, phone calls,
- Enforcement
 - Ability to save/download documents (NCNs, NOVs, manifests, pictures)
- Grease Control Equipment
 - Type and Size, passed certification?
- Grease Waste Haulers
 - Approved GWH agreement, GCE Certified?, FSEs pumped
- Permit Issuance
- Summary Reports
- SSO or blockage tracking
 - Commercial and Residential

Identifying Illegal Discharges





What is Motive for Illegal FOG Dumping?

- Money and Time Savings
 - Disposal cost savings, personnel and equipment
- Brown Grease Disposal
 - Discounted interceptor and trap pumping to get access to yellow grease (\$100 - \$150 pump vs. \$250 - \$400 pump)
- Yellow Grease Access/Pick up
 - Market prices vary but range is \$0.18 to \$0.50 per pound. Avg 7.4 pounds per gallon. So range of \$1.33 to \$3.70 per gallon

What are prime locations?

- Secluded areas
 - Golf Courses, new residential developments
- Visually blocked areas
 - Behind strip malls
- Can be high traffic area if dumping into the interceptor. People think they are pumping, not dumping.

Time of Day? Most documented instances are from 3 AM to 7 AM

What is potential problem here?

Illegal FOG dumping by grease waste hauler (GWH). Pump and Dump...GWH dumps FOG waste into grease interceptor instead of pumping it



Same Grease Interceptor tank outlet T.

Picture on Left is October 18, 2013 picture of outlet T, picture on right is October 19, 2013 of outlet T after illegal FOG waste dump event. Be aware if you see FOG and trash on top of the outlet T that it could be illegal dump, or a sewer back up problem

Surcharge in riser manhole area of grease interceptor. What is possible problem here?



2 possibilities: 1-back up in private plumbing or City sewer or 2-illegal dump event

What is in the interceptor?



Investigation, Surveillance



What can you do to prevent illegal FOG dumping?

- Include in SUO or FOG Mgt Policy
- Waste Hauler Required Reporting
- Approved GWH Agreement
- GWH or Waste Hauler Permits
- GWH Audits
- Surveillance, Monitoring
- Interceptor Monitoring Devices

Remember...the local level of enforcement and monitoring is the primary driver to ID illegal dumping. Other agencies, EPA Enforcement Division, can help later but local agency really has major responsibility.



Environmental Crimes Case Bulletin

U.S. Environmental Protection Agency
Office of Criminal Enforcement, Forensics and Training



Department of Justice

David Rivera
United States Attorney
MIDDLE DISTRICT OF TENNESSEE

FOR IMMEDIATE RELEASE
FRIDAY, FEBRUARY 19, 2016
WWW.JUSTICE.GOV/USAO/TNM/

CONTACT:
DAVID BOLING
PUBLIC INFORMATION OFFICER
615-736-5956

GREASE HAULING COMPANY AND EXECUTIVES SENTENCED FOR CLEAN WATER ACT VIOLATIONS

NASHVILLE, Tenn. – February 19, 2016 - Southern Grease Company, a grease hauling company that had been based in Dickson, Tennessee, was sentenced yesterday to pay a criminal fine of \$280,000 and to forfeit an additional \$113,500, announced David Rivera, United States Attorney for the Middle District of Tennessee. Southern Grease pleaded guilty in May 2015 to four felony violations arising from its illegal disposal of waste grease into municipal sewer systems. U.S. District Court Judge Aleta A. Trauger imposed this sentence and also ordered Southern Grease to make restitution to municipal authorities in Dickson and Clarksville, Tennessee.

Poll Question #4

Do you currently charge a Food Service Establishment inspection or permit fee?

- A. Yes
- B. No
- C. Not Applicable

What We Know After 23 Years of FOG Program Work

Any other questions?