

The History and Evolution of Grease Interceptors

Presented by:

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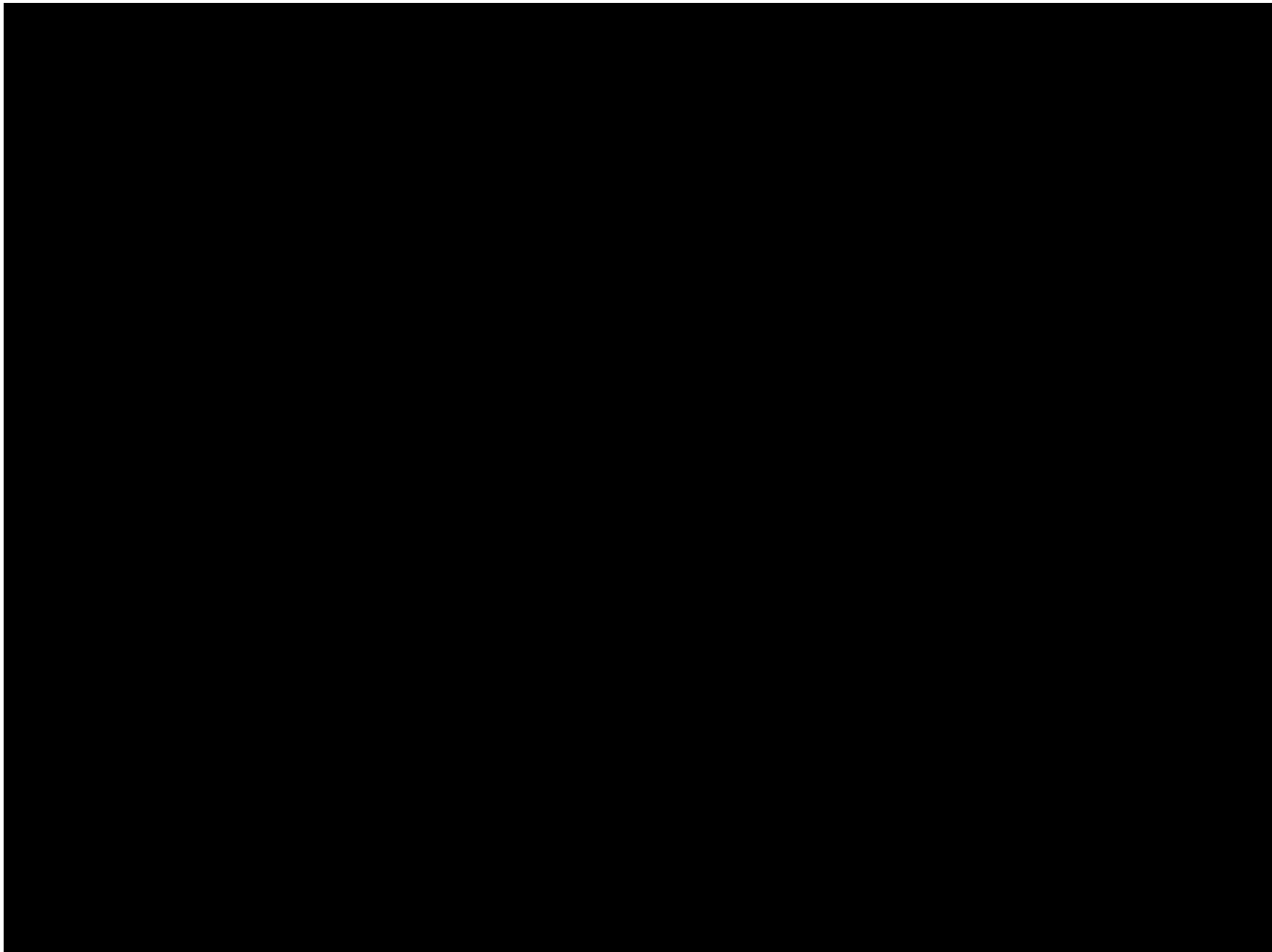
WW II



CONSERVATION DIVISION • WAR PRODUCTION BOARD

Presents

**Out of the
FRYING PAN
into the
FIRING LINE**





SYMPOSIUM ON GREASE REMOVAL *
DESIGN AND OPERATION OF GREASE INTERCEPTORS
BY F. M. DAWSON AND A. A. KALINSKE
Iowa Institute of Hydraulic Research

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Grease interceptors (or "grease traps" as they are sometimes called) have been used in plumbing drainage systems for many years. They are frequently required by plumbing regulations, especially for restaurants. In general, such interceptors have been used for one or for all of the following reasons: (1) To prevent clogging of waste lines with grease, (2) to prevent large quantities of grease from reaching the sewage disposal works, (3) to facilitate the reclaiming of grease because of its economic value. The latter reason is, of course, of present a very important one for intercepting all waste grease and fats. The separation of gasoline and oils from waste water is also accomplished by use of a similar type fixture installed in the plumbing system; however, this paper will be concerned primarily with grease interceptors.

The grease interceptors used at present are for the most part commercial products of various patented designs constructed of cast-iron (ceramic insides have been used during the war). If properly installed and serviced, they do a fair job of preventing fats and grease from getting into the sewerage system. However, proper installation and servicing is usually the exception. To perform its job properly an interceptor should be installed as close to the fixture discharging greasy wastes as possible, and should be so designed and installed as to be easily cleaned. The less mixing and emulsifying there is, the easier the grease will separate from the waste water. Also the possibility of clogging the drain lines between the fixture and the interceptor will be prevented if the interceptor is installed near the fixture.

Up until a few years ago the use of grease interceptors, especially in domestic installations, has in general not been overly successful. The interceptors were too small to handle adequately the rate of flow, and the owners did not properly remove the grease which had been collected in the interceptor. If, however, it is desired to separate the grease from the waste water in as complete a manner as possible and also to have the grease in good condition, an interceptor of the proper size installed right at the fixture which discharges greasy waste water is the best solution to the whole problem of grease removal.

DANIEL FROSTMAN

A great many types of commercial grease interceptors are and have been on the market and with these many "home made" designs. However, the basic principle of grease interception in all such designs is that

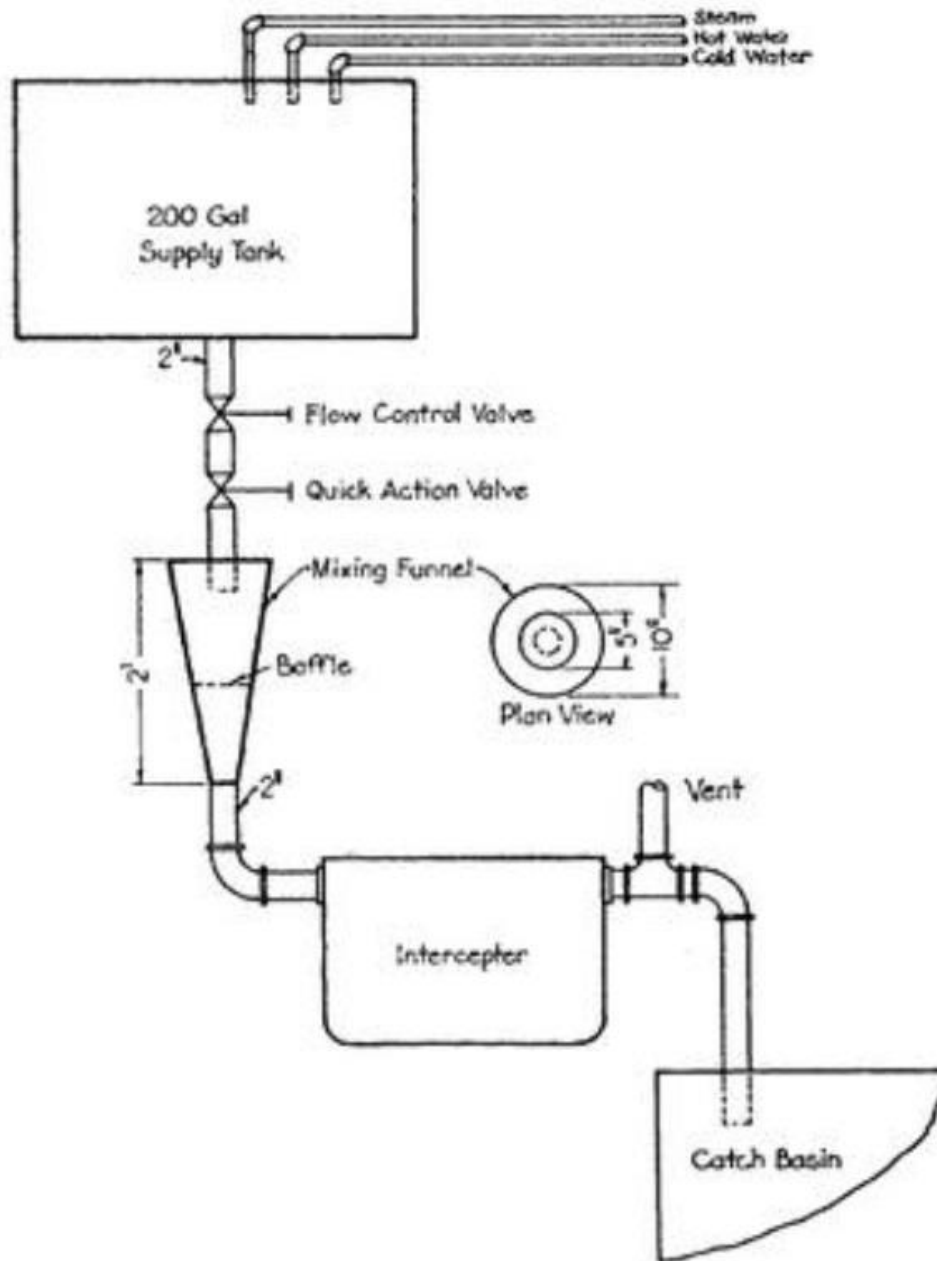
*This symposium of four papers was presented at the Sixteenth Annual Meeting of the Iowa State Hygiene Society, Des Moines, Iowa, March 21, 1936.

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Francis Murray Dawson, Dean of Engineering, Iowa Institute of Hydraulic Research, 1936-1944



Gravity-Differential Separation of *free floating* fats, oils and grease



1942 Test
Apparatus
at IHR Lab

Grease Interceptor Performance Requirements:

- Average efficiency, 90% minimum
- Capacity, 2 lbs grease for each 1 gpm

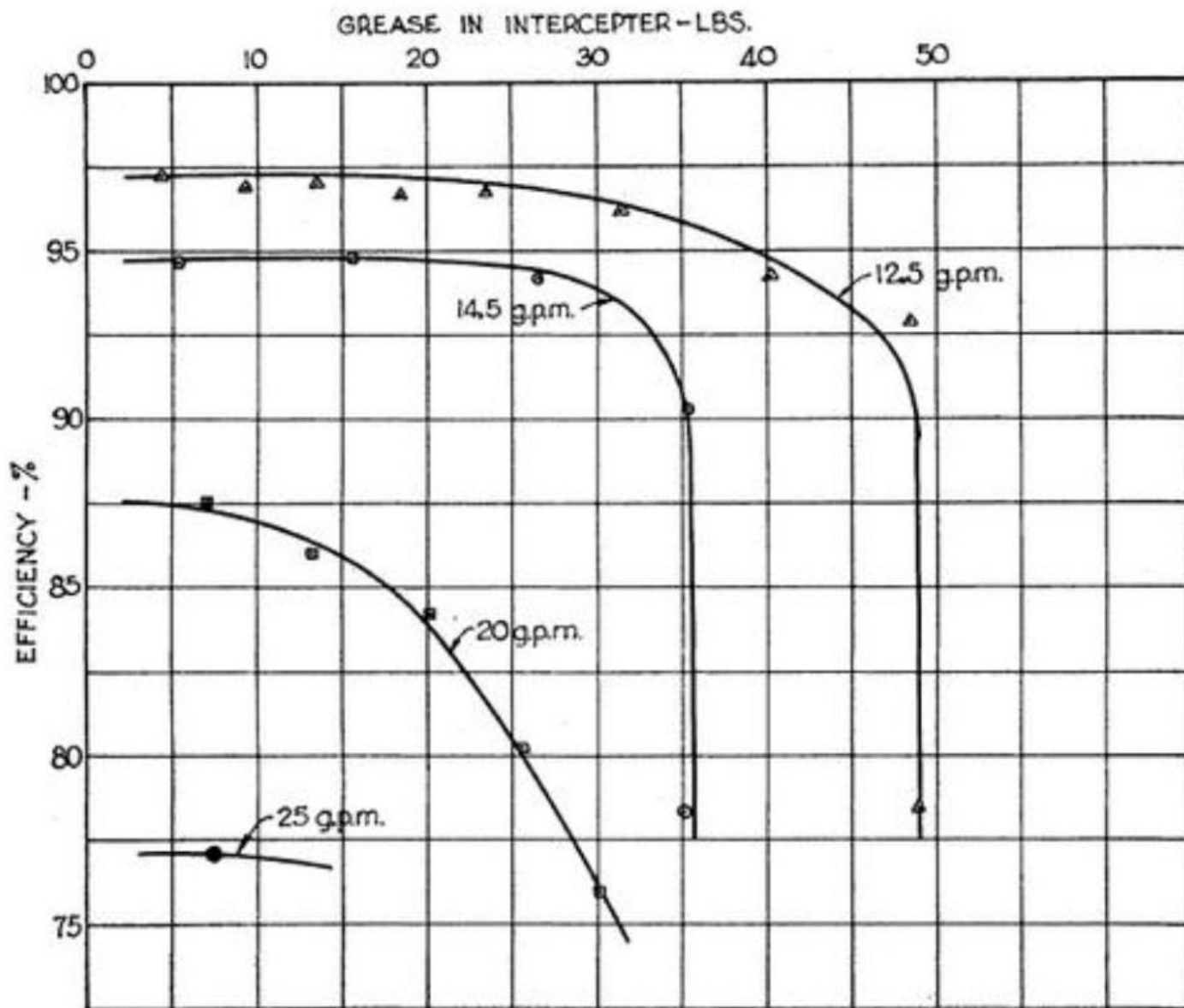


FIG. 2.—Typical laboratory test data for a commercial grease interceptor.





1969

HEADQUARTERS
Environmental
Protection
Agency



1970

Federal Water Pollution
Control Act (1948) Amended

Clean Water Act

Established the basic
structure for regulating
pollutants discharged into the
waters of the United States

1972

Key revisions:



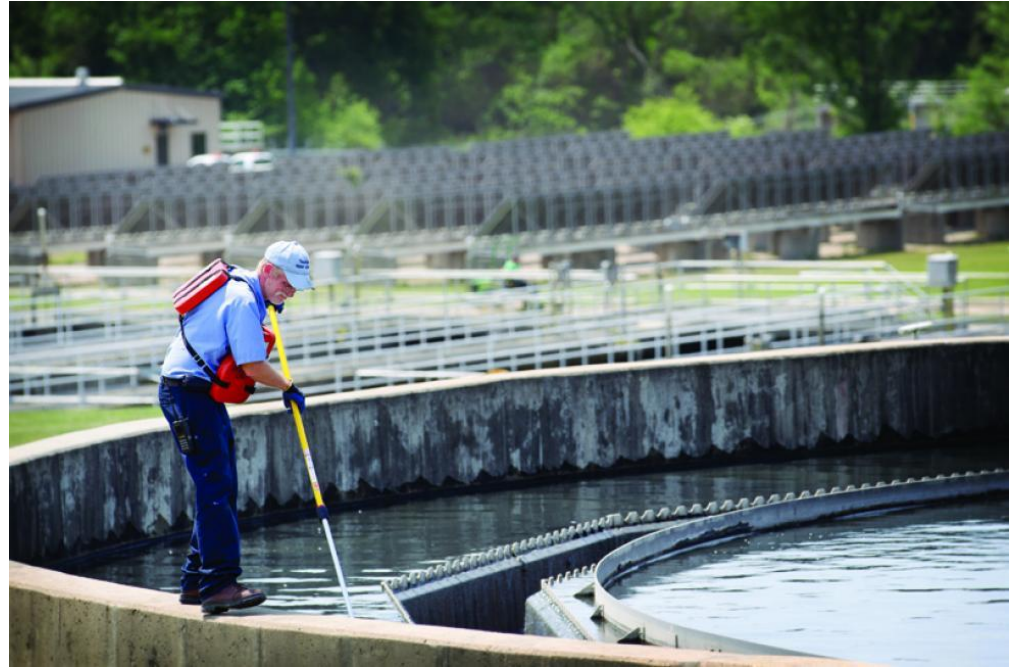
Made it unlawful for any person to discharge any pollutant from a point source into navigable waters, unless a permit was obtained under its provisions;

Key revisions:

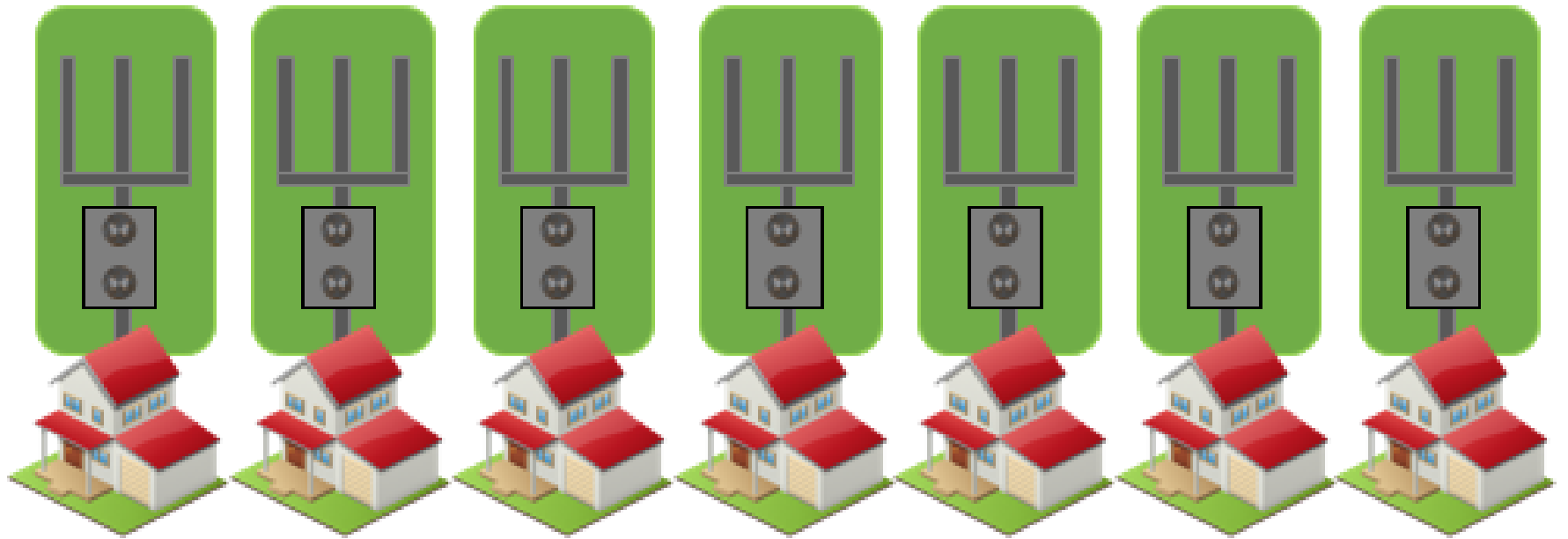


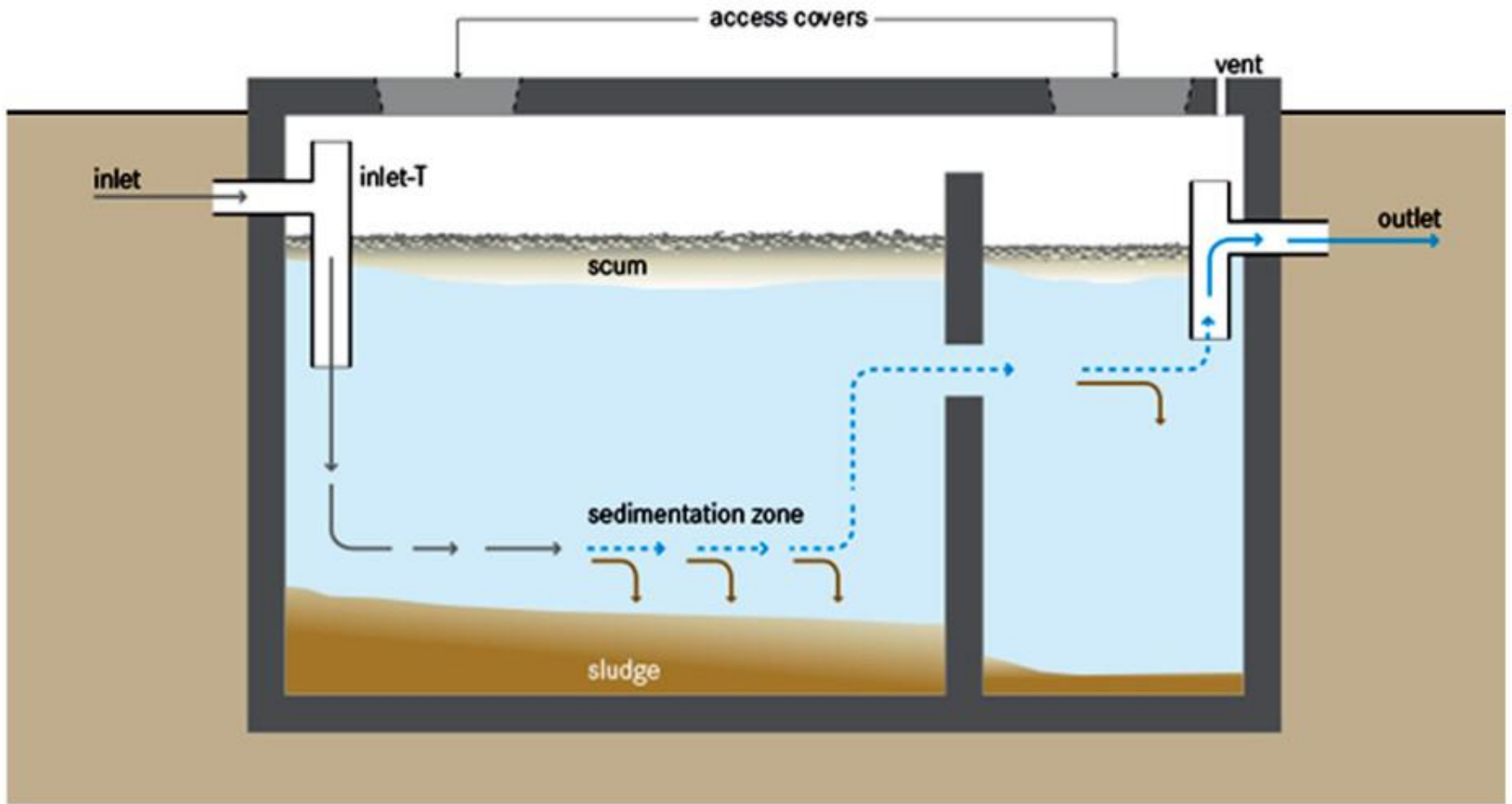
Gave EPA the authority to implement pollution control programs such as setting wastewater standards for industry;

Key revisions:

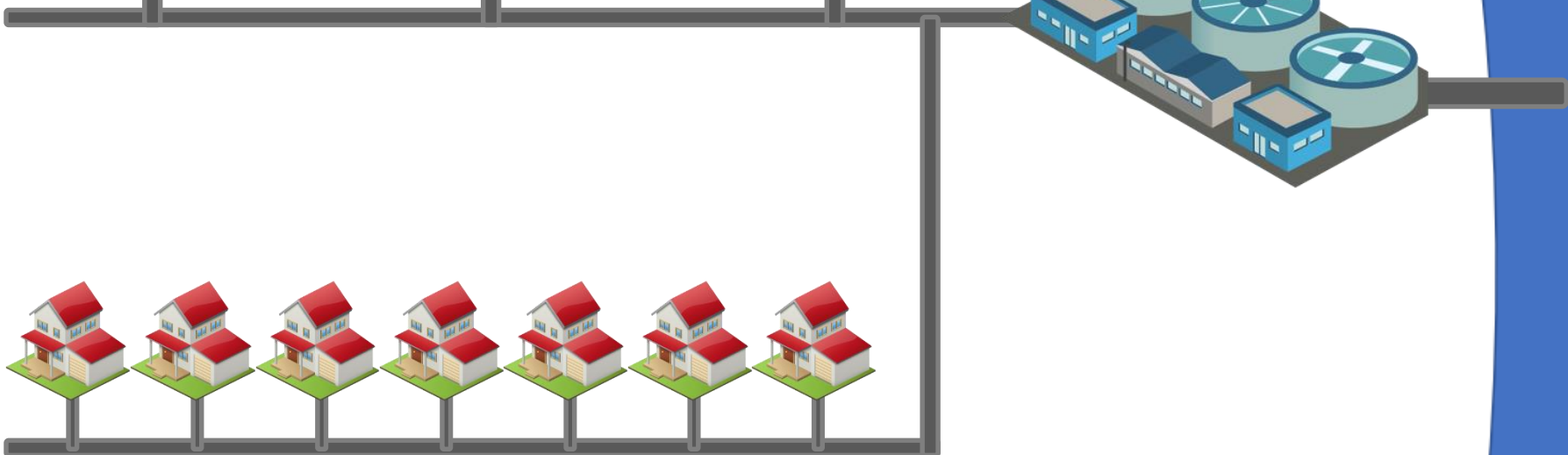
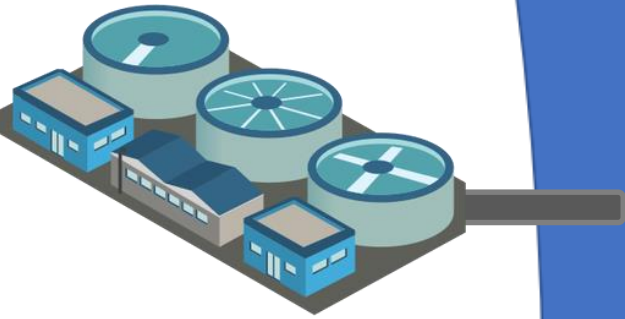
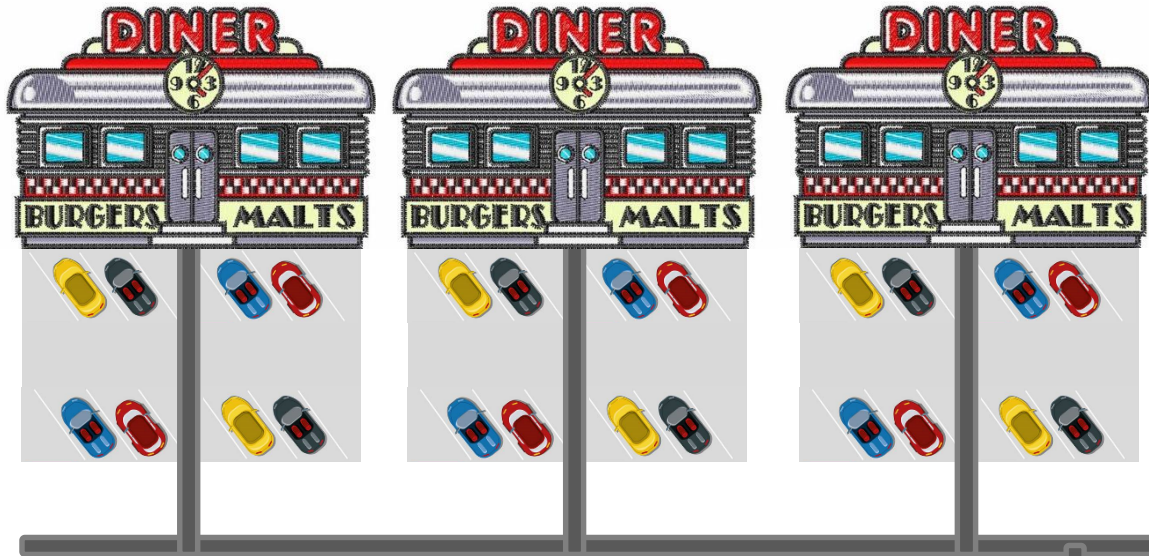


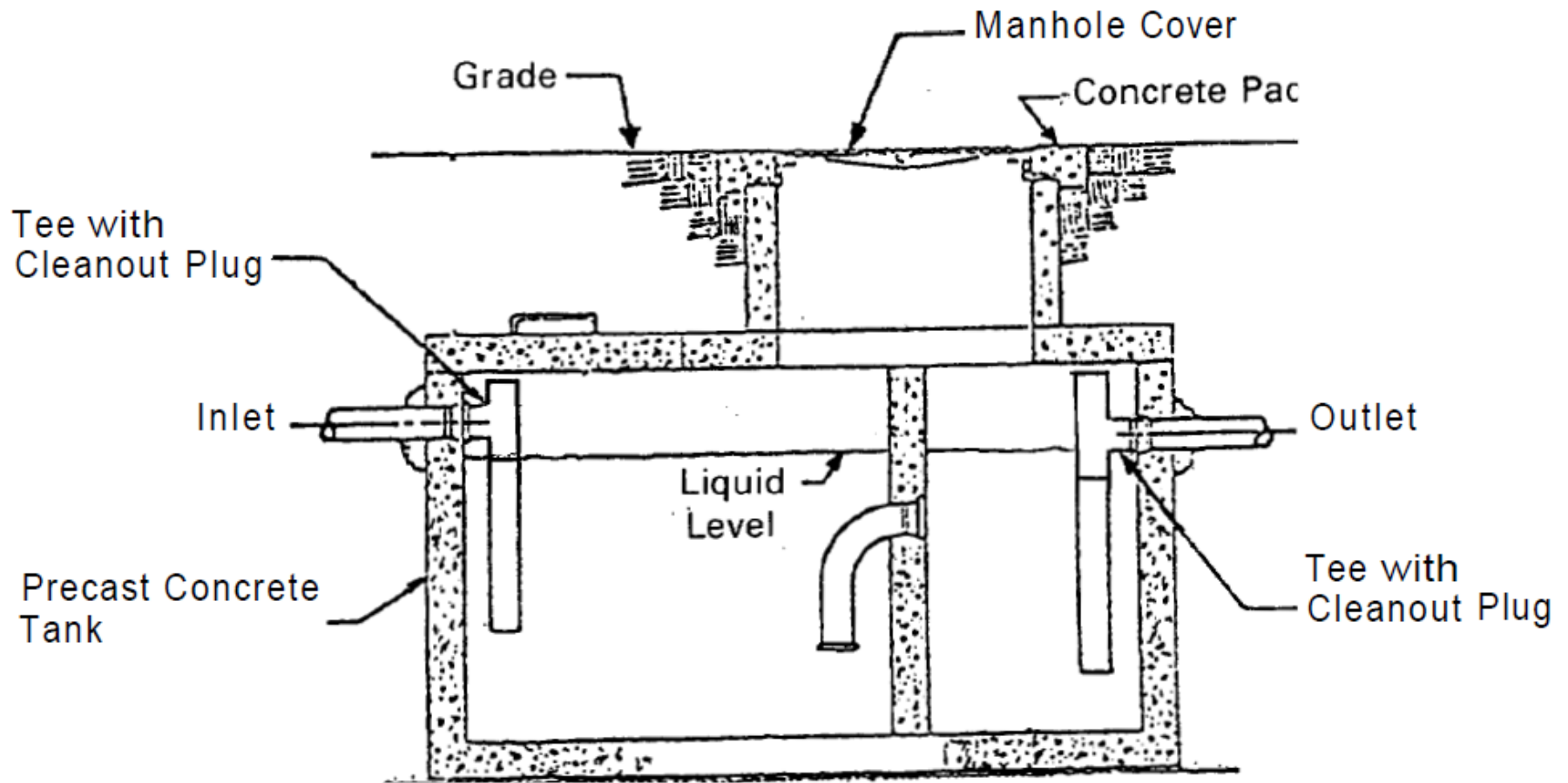
Funded the construction of sewage treatment plants under the construction grants program





What does the future look like for prefabricators of septic tanks?





1. RESTAURANTS:

$$(D) \times (GL) \times (ST) \times \left(\frac{HR}{2}\right) \times (LF) = \text{Size of Grease Interceptor, gallons}^a$$

D = number of seats in Dining Area

GL = Gallons of wastewater per meal , normally 5 gal

ST = Storage capacity factor -- minimum of 1.7
onsite disposal - 2.5

HR = Number of hours open

LF = Loading factor -- 1.25 interstate freeways
1.0 other freeways
1.0 recreational areas
0.8 main highways
0.5 other highways

United States
Environmental Protection
Agency

Office of Water Program
Operations
Washington DC 20460

Office of Research and
Development
Municipal Environmental Research
Laboratory
Cincinnati OH 45268

Technology Transfer



Design Manual

Onsite Wastewater Treatment and Disposal Systems

1980

HYGI Design Manual, 1979
M.C. Nottingham
Pasadena, CA

Works cited by EPA Design Manual, Onsite
Wastewater Treatment and Disposal Systems, 1980

**International Association of
Plumbing and Mechanical Officials**

**UNIFORM
PLUMBING
CODE**

1982
EDITION

Adopted at the Fifty-Second Annual Conference
OCTOBER, 1981

**INTERNATIONAL ASSOCIATION OF PLUMBING
AND MECHANICAL OFFICIALS**
(A Non-Profit Organization)

APPENDIX H

Recommended Procedures for Sizing Commercial Kitchen Grease Interceptors

H1 Waste Discharge Requirements

(a) Waste discharge from fixtures and equipment in establishments which may contain grease, including but not limited to, scullery sinks, pot and pan sinks, dishwashing machines, soup kettles and floor drains located in areas where grease-containing materials may exist, may be drained into the sanitary waste through the interceptor when approved by the Administrative Authority.

(b) Toilets, urinals and other similar fixtures shall not waste through the interceptor.

(c) All waste shall enter the interceptor through the inlet pipe only.

H2 Design

(a) Interceptors shall be constructed in accordance with the design approved by the Administrative Authority and shall have a minimum of two compartments with fittings designed for grease retention.

(b) There shall be an adequate number of manholes to provide access for cleaning all areas of an interceptor; a minimum of one (1) per ten (10) feet of interceptor length. Manhole covers shall be gas tight in construction having a minimum opening dimension of twenty (20) inches.

(c) In areas where traffic may exist the interceptor shall be designed to have adequate reinforcement and cover.

H3 Location

(a) Each grease interceptor shall be so installed and connected that it shall be at all times easily accessible for inspection, cleaning and removal of the intercepted grease. A grease interceptor may not be installed in any part of a building where food is handled. Location of the grease interceptor shall meet the approval of the Administrative Authority.

(b) Interceptors shall be placed as close as practical to the fixtures it serves.

SIZING GREASE INTERCEPTORS

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(c) Each business establishment for which a grease interceptor is required shall have an interceptor which shall serve only that establishment.

H4 Sizing Criteria

(a) Parameters—The parameters for sizing a grease interceptor are hydraulic loading and grease storage capacity, for one or more fixtures.

(b) Sizing Formula—The size of the interceptor shall be determined by the following formula:

$$\frac{\text{Number of meals}}{\text{per peak hour}^1} \times \frac{\text{waste flow}}{\text{rate}^2} \times \frac{\text{retention}}{\text{time}^3} \times \frac{\text{storage}}{\text{factor}^4} = \text{Interceptor size (liquid capacity)}$$

¹Meals Served at Peak Hour

²Waste Flow Rate

| | |
|--------------------------------|---------------|
| a. With dishwashing machine | 6 gallon flow |
| b. Without dishwashing machine | 5 gallon flow |
| c. Single service kitchen | 2 gallon flow |
| d. Food waste disposer | 1 gallon flow |

³Retention Times

| | |
|--------------------------|-----------|
| Commercial kitchen waste | |
| Dishwasher | 2.4 hours |
| Single service kitchen | |
| Single serving | 1.5 hours |

⁴Storage Factors

| | |
|-----------------------------------|----------------------|
| Fully equipped commercial kitchen | 8 hour operation: 1 |
| | 16 hour operation: 2 |
| | 24 hour operation: 3 |
| Single Service Kitchen | 1.5 |

H5 Effluent Sampling

An effluent sampling box on grease interceptors may be required by the Administrative Authority.

H6 Abandoned Grease Interceptors

Abandoned grease interceptors shall be pumped and filled as required for abandoned sewers and sewage disposal facilities in Section 1119 of the Uniform Plumbing Code.

**UPC Grease Task Group Meeting
January 25 & 26, 2005
IAPMO Headquarters
Ontario, CA**

January 25, 2005 attendees included: Rand Ackroyd, Tim Allinson, Sherrill Bond, Sid Cavanaugh, Joe Cunningham, Kook Dean, Linda Deunay, Mike Gitter, Stephen Hamilton, Wayne Harrison, Mark Kawamoto, Don Kirkland, Terresa Moritz, Rick Oliver, Phil Ribbs, Bill Rice, Linda Shadler, John Shaffer, Billy Smith, Bill Sobanski, Stan Steinbach, Max Weiss, John Halliwill, Maribel Campos, Anne Sonner, Ken Browne, Jay Peters, Michael Kobel.

January 26, 2005 attendees included: Rand Ackroyd, Tim Allinson, Sherrill Bond, Sid Cavanaugh, Joe Cunningham, Linda Deunay, Stephen Hamilton, Wayne Harrison, Mark Kawamoto, Don Kirkland, Terresa Moritz, Rick Oliver, Phil Ribbs, Bill Rice, Linda Shadler, Billy Smith, Stan Steinbach, Max Weiss, Maribel Campos, Anne Sonner, Ken Browne, Jay Peters, Michael Kobel.

Following are the cumulative, consensus recommendations of the Task Group following these two days of final meetings. While not presented in the order discussed at the meetings, these are all the recommendations of the Task Group.

Delete term: ~~Grease Trap~~

Add term: Hydromechanical Grease Interceptor (HGI)

Add sizing method for HGI:

Table 10-2 – 1015.1

Table 10-2
Hydromechanical Grease Interceptor (HGI)
Sizing Chart*

| DFU | HGI FLOW (gpm) |
|------------|-----------------------|
| 8 | 20 |
| 10 | 25 |
| 13 | 35 |
| 20 | 50 |
| 35 | 75 |
| 172 | 100 |
| 216 | 150 |
| 342 | 200 |
| 428 | 250 |
| 576 | 350 |
| 720 | 500 |

*Based on intermittent potentially full flow in drainage lines.

Delete Appendix H

Add new sizing method for Gravity Grease Interceptors (GGI):

Table 10-3
Gravity Grease Interceptor Sizing

| DFUs (1) | Interceptor Volume (2) |
|-----------------|-------------------------------|
| 8 | 500 gallons |
| 21 (3) | 750 gallons |
| 35 | 1,000 gallons |
| 90 (3) | 1,250 gallons |
| 172 | 1,500 gallons |
| 216 | 2,000 gallons |
| 307 (3) | 2,500 gallons |
| 342 | 3,000 gallons |
| 428 | 4,000 gallons |
| 576 | 5,000 gallons |
| 720 | 7,500 gallons |
| 2112 | 10,000 gallons |
| 2640 | 15,000 gallons |

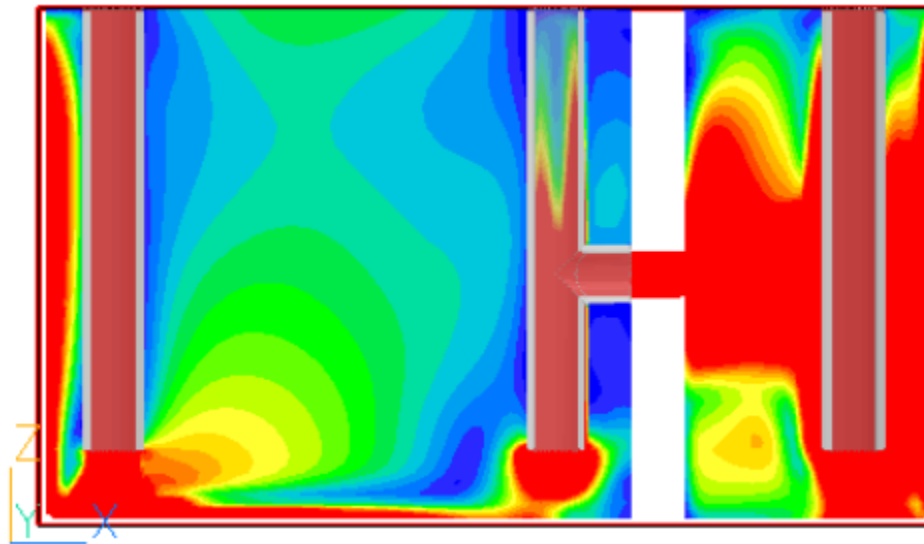
Notes

(1) The maximum allowable DFUs plumbed to the kitchen drain lines that will be connected to the grease interceptor.

(2) This size is based on: the DFUs, the pipe size from this code; Table 7-5; Useful Tables for flow in half-full pipes (ref: *Mohinder Nayyar Piping Handbook*, 3rd Edition, 1992).

(3) Based on 30-minute retention time (ref.: Metcalf & Eddy, Inc. *Small and Decentralized Wastewater Management Systems*, 3rd Ed. 1998). Rounded up to nominal interceptor volume.

2008 WERF Report: *Assessment of Grease Interceptor Performance*

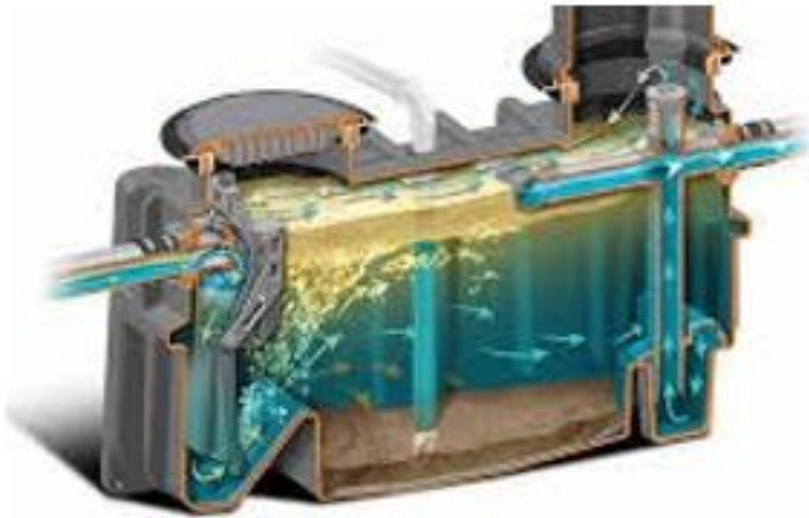


Short-circuiting from uncontrolled turbulence and velocity at 20 min RT

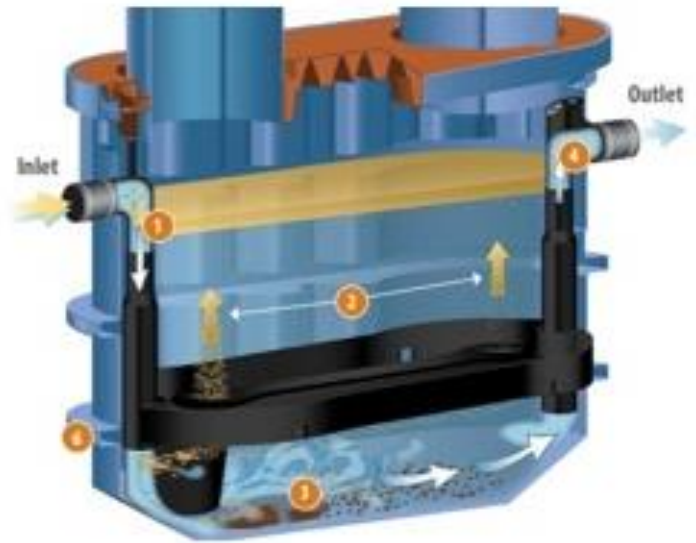
High-capacity Hydromechanical 2006 - 2018



High-capacity Hydromechanical Grease Interceptors Emerge...



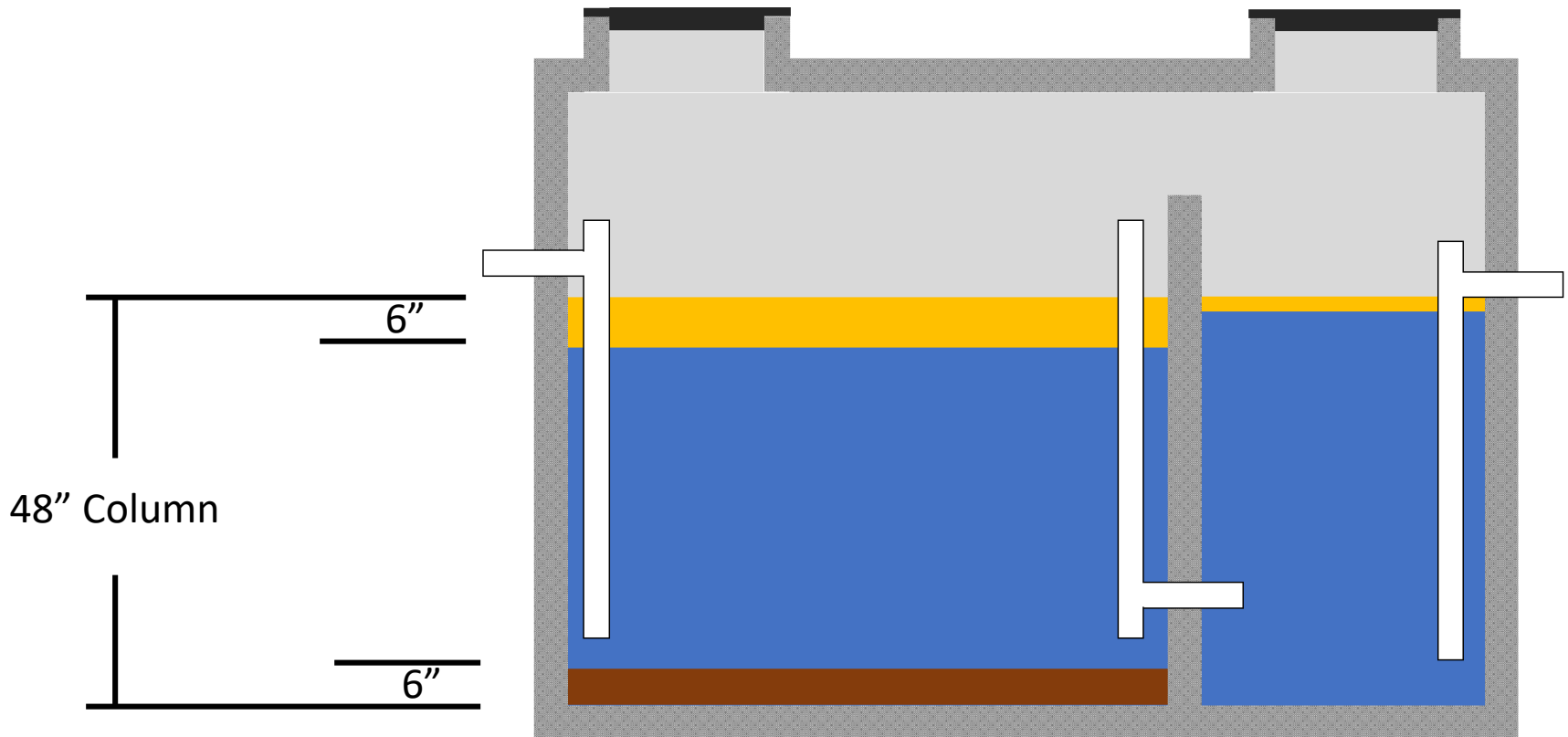
Endura
XL 100



Trapzilla
TZ-1826

100 GPM

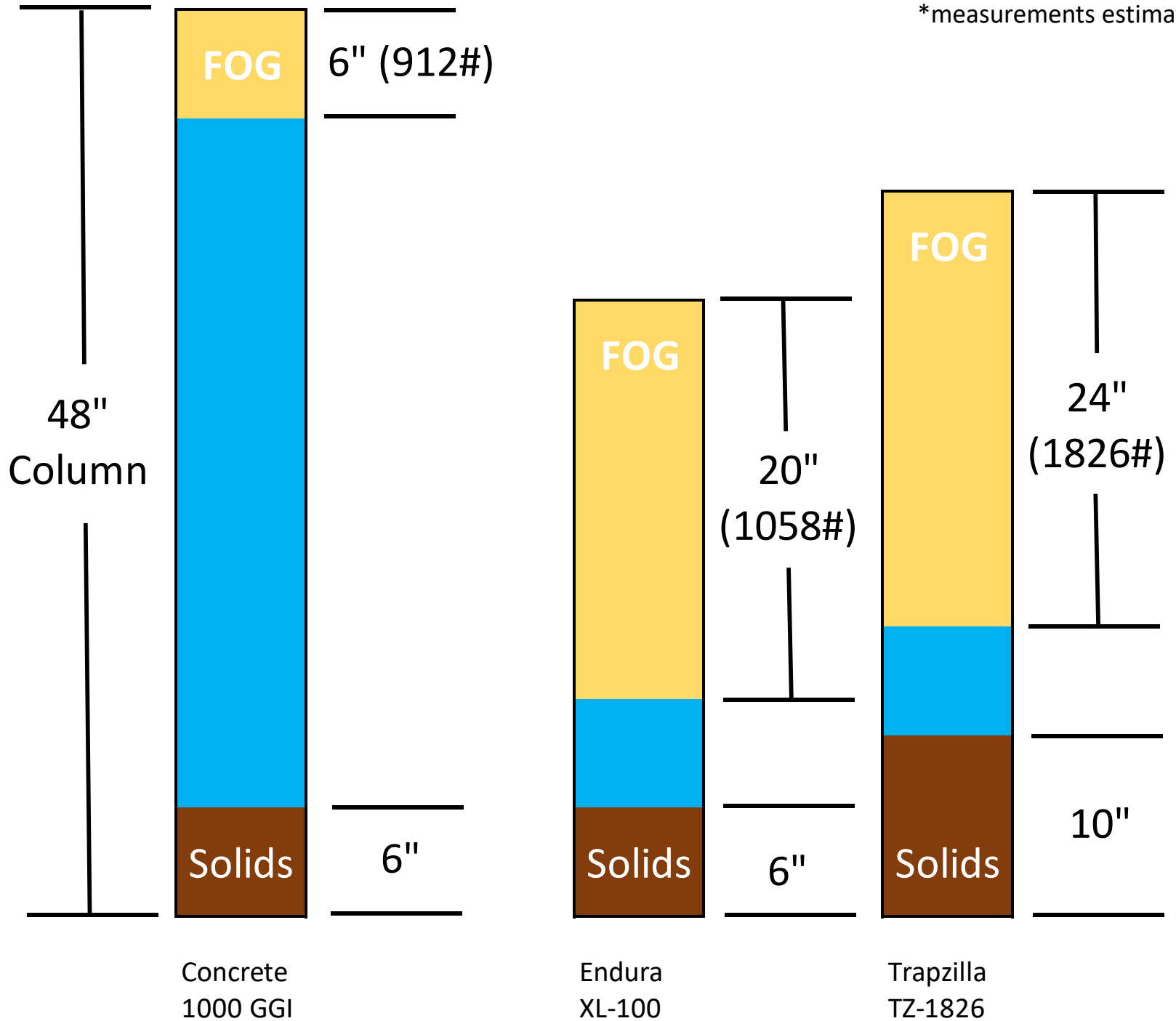
How much FOG and Solids in a 1000 gal. GGI?



(FOG depth) / (total water column) x (total gallons) = gallons of FOG

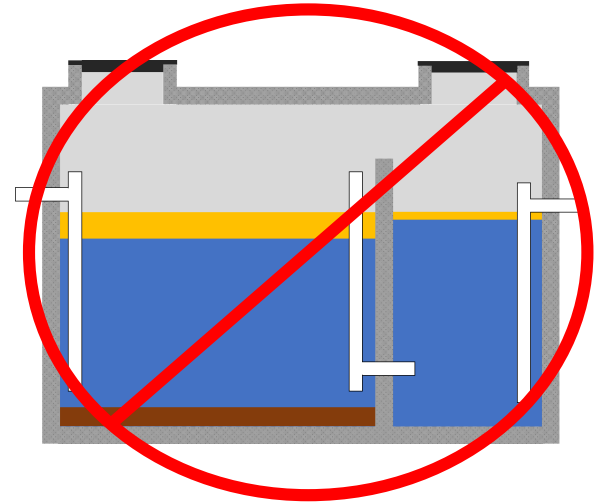
$$(125 \text{ Gallons of FOG}) \times (7.3 \text{ lbs per gal.}) = \mathbf{912 \text{ lbs}}$$

*measurements estimated





PROVEN
performance



ASSUMED
performance

Questions?

Presented by:

Ken Loucks

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