NPCA WHITE PAPER

DESIGN CONSIDERATIONS AND DISCUSSION OF PRECAST CONCRETE GRAVITY GREASE INTERCEPTORS

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INTRODUCTION

In many jurisdictions, there is a lack of clear regulatory guidance concerning the effective pretreatment of grease-laden wastewater from institutional and commercial food handling establishments. This document strives to provide a clarification of the field-proven performance of precast concrete gravity grease interceptors.

The National Precast Concrete Association (NPCA) has provided this document to clarify the basic principles of gravity grease interceptor operation and performance. The vision for this document is to be an informational tool that helps owners, specifiers and municipalities understand the most effective on-site process to remove grease and solids from commercial and industrial wastes. This document will discuss methods of achieving measurable, effective, efficient and safe grease/solids removal from wastewater.

GUIDANCE AND DISCUSSION ON SPECIFYING GREASE INTERCEPTORS

Necessity of Grease Interceptors

The purpose of the gravity grease interceptor is to reduce the amount of Animal and Vegetable Fats, Oils and Greases (AVFOG or FOG) in wastewater to acceptable levels as established by the Authority Having Jurisdiction (AHJ). Precast concrete gravity grease interceptors should be provided with easy access for maintenance, be sized to hold large quantities of grease (to reduce pumping/cleanout costs) and be outdoors to facilitate easy inspection and reduce the possibility of food contamination during cleanout.

Solidified grease can cause sewer blockages and overflows that pose unnecessary health hazards as raw sewage backs up into residence or commercial establishments. A properly plumbed and maintained grease interceptor will protect sewer systems from these occurrences.

Municipalities continue to require food establishments and other FOG generators to pretreat their grease-laden waste streams through the use of interceptors to protect the sewer system. Non-conforming establishments can face fines and the associated costs for blockages, overflows and cleanup.

Precast concrete gravity grease interceptors have proven over time to offer a low cost, durable, efficient and sustainable solution to removing grease from wastewater flows.

Several studies were reviewed which used observation and sampling of field conditions. In these studies, several similarities stand out. The sample data indicates that undersized interceptors or traps performed very poorly when compared to effluent quality guidelines. Only properly sized, outdoor grease interceptors provided acceptable effluent quality. For example, a study in the city of Austin, Texas, concluded that retention time was the single most important factor in grease separation and that precast concrete gravity grease interceptors are required for acceptable retention times.

Care must be taken when comparing studies and testing methods evaluating the efficiency of FOG removal. Actual wastewater usually contains various emulsifying chemicals, and the mixture is agitated before discharge to the trap or interceptor. While it would be impractical to evaluate all the variables that make up wastewater, it is important to remember that increasing the retention time (by increasing size) allows time for the FOGs to separate, as described by Stokes Law.

Effluent Discharge Criteria

Currently, there is no one recognized maximum allowable level of FOG discharge in the United States or Canada, although discharge limits set by regulatory bodies are relatively similar. These similarities can provide the basis for one standard that satisfies all regulatory bodies. (If your local authority is not listed here and it publishes a maximum discharge standard, please forward it to NPCA for consideration in future updates to this paper.)

Some examples of jurisdictions which have stated measurable maximum allowable FOG discharge requirements are as follows:

U.S. E.P.A. .....150 mg/l

Dallas, Texas .....200 mg/l

Toronto, Ontario .....150 mg/l

Austin, Texas .....200 mg/l

Fort Wayne, Indiana.....200 mg/l

Kansas City, Missouri.....200 mg/l

Stockton, California.....200 mg/l

Jurisdictions that have maximum allowable grease discharge limits in the range of 150 to 200 mg/l, and that measure and enforce these limits can greatly reduce the costs associated with grease in a public sanitary sewer system.

Factors Affecting Interceptor Sizing

Obviously, the properties of grease-laden wastewater must be considered when determining the size of an effective grease interceptor. For instance, greases and oils have a lower specific gravity than water – when left undisturbed a grease-laden mixture will separate, with the grease and oil floating to the top. Another factor to consider is the congealing temperature of the FOG. Other factors affecting interceptor size include:

Retention Time: Retention time is the amount of time it takes one particle of influent to travel though the system and discharge out of the interceptor. It is a critical factor in removing an adequate amount of FOG. The wastewater entering an interceptor requires a certain amount of time for gravity separation of the FOG to occur. Therefore, designing an interceptor to maximize retention time is the most important factor in its effectiveness. The various studies and specifications referenced in this paper approach retention time differently and calculate differing retention times – however, all agree that the FOG must spend sufficient time in an interceptor to allow for gravity separation.

Flow rates: Wastewater flow rates and retention times are inversely proportional. The greater the flow rate, the lower the retention time. There is no singularly accepted method for calculating the anticipated flow rate but most studies and AHJs agree that it must be taken into account when sizing an interceptor.

Concentration: The strength of the influent waste is another important factor. An effective interceptor should be large enough to accumulate a significant amount of grease without affecting the retention effectiveness, but this should not be the predominant sizing factor, as cleaning frequencies should be factored in.

Pumping Frequency: The size shall be sufficient to optimize cleaning and pump outs (to reduce an owner's operating costs).

Chemistry: Wastewater temperatures and emulsifying chemicals affect the rate at which greases and oils will separate from the wastewater. Therefore interceptors should be large enough to act as a heat sink, giving new influent the time to cool while giving emulsifiers time to release their chemical bonds on greases and oils.

Physical Sizing of an Interceptor

While there are many different schools of thought as to sizing of grease interceptors, there are some consistent themes when comparing a number of proven formulas. Most of the proven sizing formulas take into account the maximum flow rate into the tank (influent). However, the method of establishing a specific influent flow rate differs from one AHJ to another. As an example, the 23rd Edition of the Uniform Plumbing Code (UPC), also commonly called the "Appendix H Method," calculates the influent flow with a value in gallons per meal, depending upon whether the food service establishment (FSE) has a dishwasher.

Flow rate calculations with a dishwasher are performed using a rate of 6 gallons per meal. The rate without a dishwasher is 5 gallons per meal. The 1980 version of the EPA formula, which remains unchanged since that date, calculates the influent flow rate as 5 gallons per meal.

Other methods and AHJs calculate this value by taking the sum of the maximum flow rates per fixture over all fixtures in the facility such as sinks, dishwashers and floor drains. Tables of typical fixture flow rates found in the (United States Environmental Protection Agency) USEPA and UPC codes are shown below:

Typical Plumbing Fixture Flow Rates

Type of Fixture	Gal. Per Minute
Small residence or apartment sink	5
Large residence or dishwasher	10
Restaurant kitchen sink	15
Single compartment scullery sink	20
Double compartment scullery sink	25
2 single compartment sinks	25
2 double compartment sinks	35
Restaurant dishwasher (up to 30 gal. Cap.)	15
Restaurant dishwasher (30 to 50 gal. Cap.)	25
Restaurant dishwasher (50 to 100 gal. Cap.)	40
Floor drain	5

Source: U.S. Environmental Protection Agency

The 24th Edition (2006) and the 25th Edition (2009) of the UPC determine the volume of a gravity grease interceptor using the fixture units of the FSE or the maximum fixture units per applicable pipe size connected to the inlet of the interceptor. Specific information and detail on fixture unit equivalents and values can be found in Chapter 7 of the UPC.

AHJs throughout the country rely upon many factors such as flow rates, fixture units, number of meals served, hours of operation and retention time to determine the appropriate size of the interceptor. An objective view of influent flow rate calculations results in a single fact: AHJs agree that retention time is the single most important factor in determining interceptor size. A retention time value beyond 30 minutes was not found in literature.

Methods for Calculating Interceptor Size

Our research has found these general calculation methods to be most commonly used, or those which the AHJ has performed documented research. This is not intended to be an exhaustive list and depending upon the specifics of the FSE additional factors can be obtained from the code of choice. Additional methodology is presented in the appendix.

2003 Uniform Plumbing Code or Appendix H Sizing Method: Table H-1

$$\text{Grease Interceptor Liquid Capacity} = \left(\frac{\#\text{ of meals}}{\text{peak hour}}\right) \times \left(\begin{matrix}\text{waste}\\ \text{flow rate}\end{matrix}\right) \times \left(\begin{matrix}\text{retention}\\ \text{time}\end{matrix}\right) \times \left(\begin{matrix}\text{storage}\\ \text{factor}\end{matrix}\right)$$

Where:

Waste Flow Rate

With dishwasher	6 gallon (22.7 L) flow
Without dishwasher	5 gallon (18.9 L) flow
Single Service Kitchen	2 gallon (7.6 L) flow
Food Waste disposer	1 gallon (3.8 L) flow

Retention Times

Commercial Kitchen Waste Dishwasher	2.5 hours
Single Service Kitchen Single Serving	1.5 hours

Storage Factors

Fully Equipped Commercial Kitchen	8 hours operation: 1 16 hours operation: 2 24 hours operation: 3
Single Service Kitchen	1.5

2006 & 2009 Uniform Plumbing Code Method

In 2006, the Uniform Plumbing Code was revised to change the sizing methodology from the Appendix H Method above to a sizing method using drainage fixture units (DFU). Data taken from Table 7.3 and additional information from Chapter 7 along with relevant sections of Chapter 10 of the UPC are used by the plumbing engineer and specifying agency to size the interceptor. This method is becoming more common place among AHJs for sizing of precast concrete gravity grease interceptors.

Code language covering precast concrete gravity grease interceptors begins in Section 1014.0 of the 2009 UPC. General scope, application, installation and maintenance language is provided in subsection 1014.1.

In subsection 1014.3.6.1, the 2009 UPC states that sizing the volume of the interceptor shall be determined by using Table 10-3. If drainage fixture units (DFUs) are not known, the interceptor shall be sized based on the maximum DFUs allowed for the pipe size connected to the inlet of the interceptor. Refer to Table 7-5: Drainage Piping, Horizontal.

TABLE 10-3
Gravity Grease Interceptor Sizing

DFUs	Interceptor Volume (2)
8	500 gallons
21	750 gallons
35	1,000 gallons
90	1,250 gallons
172	1,500 gallons
216	2,000 gallons
307	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: 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). Based on 30-minute retention time (ref: George Tchobanoglous and Metcalf & Eddy, Wastewater Engineering Treatment, Disposal and Reuse, 3rd Ed. 1991 & Ronald Crites and George Tchobanoglous, Small and Decentralized Wastewater Management Systems, 1998). Rounded up to nominal interceptor volume.

3) When the flow rate of directly connected fixture(s) or appliance(s) have no assigned DFU values, the additional grease interceptor volume shall be based on the known flow rate (gpm) multiplied by 30 minutes.

TABLE 7-3: Drainage Fixture Unit Values (DFU)

Plumbing Appliance, Appurtenance, or Fixture	Min. Size and Trap Arm[7]	Private	Public	Assembly
Bathtub or Combination Bath / Shower	1-1/2"	2.0	2.0	
Bidet	1-1/4"	1.0		
Bidet	1-1/2"	2.0		
Clothes Washer, domestic, standpipe5	2"	3.0	3.0	3.0
Dental Unit, cuspidor	1-1/4"		1.0	1.0
Dishwasher, domestic, with independent drain [2]	1-1/2"	2.0	2.0	2.0
Drinking Fountain or Water Cooler	1-1/4"	0.5	.05	1.0
Food-Waste Grinder, commercial	2"		3.0	3.0
Floor Drain, emergency	2"		0.0	0.0
Floor Drain (for additional sizes see Section 702)	2"	2.0	2.0	2.0
Shower, single-head trap	2"	2.0	2.0	2.0
Multi-head, each additional	2"	1.0	1.0	1.0
Lavatory, single	1-1/4"	1.0	1.0	1.0
Lavatory, in sets of two or three	1-1/2"	2.0	2.0	2.0
Wash Fountain	1-1/2"		2.0	2.0
Wash Fountain	2"		3.0	3.0
Mobile Home, trap	3"	12.0		
Receptor, indirect waste [1,3]	1-1/2"		See	Footnote [1,3]
Receptor, indirect waste [1,4]	2"		See	Footnote [1,4]
Receptor, indirect waste [1]			See	Footnote [1]
Sinks				
Bar	1-1/2"	1.0		
Bar[2]	1-1/2"		2.0	2.0
Clinical	3"		6.0	6.0
Commercial with food waste [2]	1-1/2"		3.0	3.0
Special Purpose [2]	1-1/2"	2.0	3.0	3.0
Special Purpose	2"	3.0	4.0	4.0
Special Purpose	3"		6.0	6.0
Kitchen, domestic [2] (with or without food-waste grinder and / or dishwasher)	1-1/2"	2.0	2.0	
Laundry [2] (with or without discharge from clothes washer)	1-1/2	2.0	2.0	2.0
Service or Mop Basin	2"		3.0	3.0
Service or Mop Basin	3"		3.0	3.0
Service, flushing rim	3"		6.0	6.0
Wash, each set of faucets			2.0	2.0
Urinal, integral trap 1.0 GPF [2]	2"	2.0	2.0	5.0
Urinal, integral trap greater than 1.0 GPF	2"	2.0	2.0	6.0
Urinal, exposed trap	1-1/2"	2.0	2.0	5.0
Water Closet, 1.6 GPF Gravity Tank6	3"	3.0	4.0	6.0
Water Closet, 1.6 GPF Flushometer Tank [6]	3"	3.0	4.0	6.0
Water Closet, 1.6 GPF Flushometer Valve [6]	3"	3.0	4.0	6.0
Water Closet, greater than 1.6 GPF Gravity Tank [6]	3"	4.0	6.0	8.0
Water Closet, greater than 1.6 GPF Flushometer Valve [6]	3"	4.0	6.0	8.0

Note: *See footnotes next page*

Table 7.3 Footnotes

1) Indirect waste receptors shall be sized on the total drainage capacity of the fixtures that drain therein to, in accordance with Table 7-4.

2) Provide a two (2) inch (51mm) minimum drain.

3) For refrigerators, coffee urns, water stations, and similar low demands.

4) For commercial sinks, dishwashers, and similar moderate or heavy demands.

5) Buildings having a clothes-washing area with clothes washers in a battery of three (3) or more clothes washers shall be rated at six fixture units each for purposes of sizing common horizontal and vertical drainage piping.

6) Water closets shall be computed as six (6) fixture units when determining septic tank sizes based on Appendix K of this code.

7) Trap sizes shall not be increased to the point where the fixture discharge may be inadequate to maintain their self-scouring properties.

8) Assembly [Public Use (See Table 4-1)].

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Table 7.4: Discharge Capacity in Gallons Per Minute (Liters Per Second)

For Intermittent Flow Only

GPM	**(L / sec)**	
Greater than		Equals 2
7-1/2 to 15	(0.47 to 0.95)	Fixture Units
Greater than		Equals 4
15 to 30	(0.95 to 1.89)	Fixture Units
Greater than		Equals 6
30 to 50	(1.89 to 3.15)	Fixture Units

Note: *Discharge capacity exceeding 50 gallons per minute (3.15 L / sec.) shall be determined by the Authority Having Jurisdiction.*

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TABLE 7-5: Maximum Unit Loading and Maximum Length of Drainage and Vent Piping

Size of Pipe, inches (mm)	1-1/4 (32)	1-1/2 (40)	2 (50)	2-1/2 (65)	3 (80)	4 (100)	5 (125)	6 (150)	8 (200)	10 (250)	12 (300)
Maximum Units											
Drainage Piping[1]											
Vertical	1	2[2]	16[3]	32[3]	48[4]	256	600	1,380	3,600	5,600	8,400
Horizontal	1	1	8[3]	14[3]	35[4]	216[5]	428[5]	720[5]	2,640[5]	4,680[5]	8,200[5]
Maximum Length											
Drainage Piping											
Vertical, feet (m)	45	65	85	148	212	300	390	510	750		
Horizontal (unlimited)	(14)	(20)	(26)	(45)	(65)	(91)	(119)	(155)	(228)		
Vent Piping (See note)											
Horizontal and Vertical											
Maximum Units	1	8[3]	24	48	84	256	600	1,380	3,600		
Maximum Lengths, feet	45	60	120	180	212	300	390	510	750		
(m)	(14)	(18)	(37)	(55)	(65)	(91)	(119)	(155)	(229)		

1) Excluding trap arm.

2) Except sinks, urinals, and dishwashers – exceeding one (1) fixture unit.

3) Except six-unit traps or water closets.

4) Only four water closets or six-unit traps allowed on any vertical pipe or stack; and not to exceed three water closets or six-unit traps on any horizontal branch or drain.

5) Based on one-fourth 91/4) inch per foot (20.8 mm/m) slope. For one-eighth (1/8) inch per foot (10.4 mm/m) slope, multiply horizontal fixture units by a factor of eight-tenths (0.8).

Note: *The diameter of an individual vent shall be not less than on and one-fourth (1-1/4) inches (32 mm) nor less than one-half (1/2) the diameter of the drain to which it is connected. Fixture unit load values for drainage and vent piping shall be computed from Tables 7-3 and 7-4. Not to exceed one-third (1/3) of the total permitted length of any vent may be installed in a horizontal position. When vents are increased one (1) pipe size for their entire length, the maximum length limitations specified in this table do not apply. This table complies with the requirements of Section 901.2.*

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U.S. EPA Sizing Method

Grease Interceptor Liquid Capacity = (D) x (GL) x (ST) x $\left(\frac{HR}{2}\right)$ *x (LF)*

where:

D = Number of seats in dining area
GL = Gallons of wastewater per meal, normally 5 gallons
ST = Storage capacity factor – minimum of 1.7, onsite disposal, 2.5
HR = Number of hours open
LF = Loading factor

a) 1.25 interstate freeways
b) 1.0 other freeways
c) 1.0 recreation areas
d) 0.8 main highways
e) 0.5 other highways

Reprinted from the EPA Design Manual, Onsite Wastewater Treatment and Disposal Systems.

Interceptor Size Comparisons

It may not be immediately obvious, but a grease interceptor sized according to one standard may need to be sized differently when another standard is applied, even if all the variables are the same. For example, a small restaurant (A), a medium-sized restaurant (B), and a large restaurant (C) have the following characteristics:

Restaurant	Number of Seats	Number of meals per peak hour	Number of Sinks	(D)ouble Sinks or (S)ingle sink	Number of Dishwashers	Dishwasher Capacity (EPA) (gal)	Number Of Floor Drains	Influent Discharge Rate (EPA)	Influent Discharge Rate (UPC)	Total Fixture Units (UPC)
A	20	20	2	S	1	30	1	45	50	12
B	100	100	3	D	2	40	3	140	123	39
C	200	200	6	D	5	75	5	400	275	91

Influent Discharge Calculations for Restaurants A, B, & C

As the table at right shows, the hypothetical influent discharge calculated using the data varies depending on whether the UPC or EPA formulas are used. This will undoubtedly have an effect on the interceptor sized for each restaurant. Moreover, the interceptor size required by each of the sizing methods discussed earlier will also differ for each restaurant. The table calculates the size (in gallons) of the interceptor that would result:

Restaurant	2003 UPC Appendix H	2006 & 2009 UPC Formulas	EPA Formula
A	600	750	680
B	3000	1250	3400
C	6000	2000	6800

To understand the varying sizes presented in the preceding table, it is important to note that individual jurisdictions may require a distinct interior design and baffling system that could affect the minimum required size. The above results give a range of acceptable interceptor sizes proven effective by various AHJs. The effectiveness of each unit is directly related to the amount of grease it receives, the maximum flow rate through it, and the cleaning frequency. When designing to a particular formula, it is important to contact the appropriate jurisdiction for the most recent grease interceptor design criteria and management practices.

Structural Design Considerations

The following two facts help determine placement of an interceptor:

- Grease interceptors are large, heavy and contain a wide variety of contaminants. Consequently, interceptors should be located outdoors of an establishment, especially food preparation establishments.
- Grease-laden water should flow to the interceptor driven by gravity. Consequently, the interceptor should be placed at an elevation lower than the establishment.

For those reasons, it is most effective to bury an interceptor outdoors, which means that an interceptor must be designed to sustain not only the pressures of the liquids within it, but also the earth pressures around and over it. The interceptor should be buried close to the establishment, which frequently means that it will be in an area of vehicular traffic. When this is the case, the interceptor will need to have a structural traffic rating.

When considering the structural needs for burial, it should also be noted that access to the interceptor for cleaning will be required. These access points should be readily available to maintenance personnel and may also need to be traffic rated. Frequently, the best solution for these access points is a steel or cast iron frame and 6cover.

Structural design requirements for gravity grease interceptors can be obtained using the nationally recognized standard from ASTM International C1613, "Standard Specification for Precast Concrete Grease Interceptor Tanks." Minimum requirements for structural design covering traffic ratings, inserts, concrete strength, openings and lifting equipment can be found in Section 6 of the C1613 standard. Additional structural design requirements can also be found in the IAPMO/ANSI Z1001 standard on "Prefabricated Gravity Grease Interceptors."

Interior Design of an Interceptor

It is generally accepted that a grease interceptor should allow sufficient retention time for separation and settling and should have storage capacity. The ASTM C1613 standard states in Section 7 that the liquid depth should be between 30 inches and 72 inches, and that the tank length should be greater than the tank width.

Additional internal design considerations include a definition for the number of compartments, multiple tanks and associated plumbing, inlet and outlet piping and access openings.

Other important factors in the design of an interceptor are partitioning and baffling. Various regulations and studies discuss the need for one or two partitions and their effect on grease removal. What is clear is that there should be at least one partition wall in an interceptor to keep floating grease away from the outlet.

There should also be an inlet baffle designed to divert incoming flows from a straight-line path to the outlet. An outlet baffle keeps grease that gets past the partition from escaping out of the interceptor. Studies have shown that performance can be further enhanced with the use of effluent filters on the outlet. This is of particular significance where additional protection is desirable for the on-site disposal situations.

All components should be made of durable materials.

Following the guidance of nationally recognized standards, your local code requirements will insure adequate retention time and proper design.

Venting and Odor Control

Odor issues with outdoor interceptors can be eliminated with a properly designed grease interceptor and the associated building's plumbing/venting system. Most building codes require the interceptor be vented back through the inlet plumbing and to a roof vent.

In most cases odor problems are caused by improper venting of the building's plumbing system. This causes the gases to build up in the interceptor where they can escape, leading to odor problems. Proper building ventilation and interceptor design along with gas-tight manhole covers will prevent odors from escaping the interceptor and allow them to escape through the roof vents.

CONCLUSIONS

There are many important factors in effective FOG removal from wastewater flows. Not all studies or AHJs agree on all these factors or on their order of importance, but there are enough similarities to draw a number of conclusions

The effectiveness of a precast concrete gravity interceptor is directly related to the amount of grease it receives, the maximum flow rate through it, and the cleaning frequency. When designing to a particular formula, it is important to contact the appropriate jurisdiction for the most recent grease interceptor design criteria and management practices.

When no other code or sizing model is specified or provided, the 2003 UPC-Appendix H Method is the most widely specified method for sizing a precast concrete gravity grease interceptor in the United States.

Precast concrete gravity grease interceptors are the best method for AHJs to pre-treat kitchen waste. Most independent studies regarding interceptor performance conclude that precast concrete gravity interceptors provide a superior level of FOG separation. These studies were all conducted by agencies with maximum allowable discharge requirements.

Precast concrete gravity interceptors provide maintenance accountability because of their reliance on third party maintenance contractors. When maintenance is provided by a third party, the invoicing process creates a paper trail that can be followed by the AHJ to indicate that maintenance is occurring. This assurance does not exist for self-maintained grease traps.

Finally, outdoor interceptors provide a level of health safety that indoor traps cannot provide. By physically removing the collection, maintenance and disposal of grease outside the kitchen area, outdoor interceptors eliminate the health concerns created by providing these functions in the same workspace as food preparation.

RECOMMENDATIONS

- NPCA recommends that AHJ specify precast concrete gravity grease interceptors that are manufactured in compliance with ASTM C1613, "Standard Specification for Precast Concrete Grease Interceptor Tanks."
- NPCA recommends that AHJs specify in their FOG ordinance/rules that the FSE shall have a documented and formalized maintenance schedule for all grease removal devices for the applicable facility.
- NPCA recommends that AHJ consider adopting the NPCA Operation and Maintenance Manual and Installation Manual for Precast Concrete Grease Interceptors (available online) for its own FOG ordinance/rules.
- NPCA recommends that AHJ consider adopting applicable content of this document for its FOG ordinance/rules.
- NPCA recommends that AHJ use the 2003 UPC-Appendix H Method for sizing precast gravity grease interceptors when no other code is specified or provided.

GLOSSARY

Access Opening: A hole in the top slab used to gain access to the inside of the tank for the purposes of cleaning and removal of grease without having to enter the tank.

Baffle: A device installed after construction of built into the interceptor used to modifythe wastewater flow pattern.

Clear space: Volume of liquid within an interceptor that is free of FOG and solids.

FOG: Animal and vegetable fats, oils and grease used for the preparation of and resulting from the cooking of food. Its composition is principally complex manufactured vegetable oils with smaller proportions of fish oils and animal fats. Also present are food particles, detergents, suspended solids, and emulsified grease particles. The FOG produced by cooking, such as chicken fat and animal fats from frying hamburgers solidify in the piping network at lower temperatures and may be solely responsible for the sewer stoppages.

Fixtures: Pot sinks, preparation sinks, and dishwashers

Flow rate: Amount of wastewater flow

GPM: Gallons per minute; flow rate unit

Grease interceptor: A containment structure installed outside a building and specifically designed to trap food related suspended grease and solids before discharging into the sanitary sewer system. They are usually constructed of precast concrete.

Grease trap: A small containment structure designed to withhold portions of suspended grease and solids produced by food facilities before they enter the building plumbing. These are located inside facilities near the grease source.

Influent: FOG-laden wastewater discharged into the interceptor from food preparation areas.

Invert: The bottom, inside of a pipe

Loading level: The average concentration of FOG in one gallon of wastewater discharging into the interceptor.

Loading rate: The frequency in which FOG-laden wastewater enters the interceptor

Pumpout: To completely empty a grease interceptor, to include the scraping of the sidewalls

Retention time: The amount of time wastewater spends in the interceptor from the instant it leaves the inlet pipe to the time it enters the outlet pipe.

UPC: Uniform Plumbing Code

Wetted capacity: The total volume of liquid measured from the top of the sludge accumulation on bottom to the top of the liquid line.

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ASTM C1613

IAPMO/ANSI Z1001

CSA B481

APPENDIX

Additional sizing formulas found in the research:

City and County of Honolulu

V (min) = F x R x S

where:

V(min) = Minimum Grease Interceptor Operating Volume, gallons

F = Flow Rate (maximum), gallons per minute

R = Retention Time = 30 minutes

S = Storage Factor = 25 percent

therefore:

V (min) = F x 30 x 1.25 and:

Drainage Fixture Units (DFU) less than or equal to 40:

F = (0.7 x DFU)

Drainage Fixture Units (DFU) greater than 40:

F = (0.2 x DFU) + 20

Washington Suburban Sanitary Commission

(Max flow rate) x (Diversity factor) x (Retention time)

In this sizing formula, the maximum flow rate is defined as the sum total flow rate calculated by individual fixture discharge sizes. The diversity factor and retention time are as follows:

Diversity Factor = 0.2 for light grease

0.3 for moderate grease

0.4 for heavy grease

Retention time = 24 minutes standard (to be no shorter than 8 minutes)

Austin Texas

[(Total fixture units value) x 7.5 x (12 minutes)] / 2.5

Here, the total fixture units refers to the UPC calculation based on the number of sinks, dishwashers, etc., 12 minutes refers to retention time.

Stockton, California

(Total maximum flow) x (10 minutes)

The total maximum flow in this formula refers to the total gallons per minute of grease-laden water discharged to the tank.

Questions?

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