Hampton Roads Regional Technical Standards
Sizing of Grease Control Devices

An element of the Special Order of Consent is the use of the Management, Operations, and Maintenance (MOM) program to reduce Sanitary Sewer Overflows (SSOs). Within the MOM program is the Fats Oils and Grease (FOG) component. FOG has been shown to be a significant source of SSO occurrence, and the reduction of FOG in a sanitary sewer system has typically resulted in a corresponding reduction of sewer blockages and SSOs.

The reduction of FOG in a system can be accomplished by the use of Best Management Practices (BMPs) for kitchens and by the use of Grease Control Devices (GCDs) in Food Service Establishments (FSEs). GCDs have been required in FSEs by plumbing codes since the 1940s, however, there has not been a satisfactory method for determining the size of the grease control device. Similarly, the cleaning frequency of the device has not been established other than by rules of thumb such as the commonly used 25% rule, i.e., when the combined depth of grease and solids within the tank, floating and settled, reaches 25% of the total liquid depth, the tank should be cleaned. Obviously, the tank size is important, with a smaller tank becoming a candidate for more frequent cleaning than a larger tank in the same situation. Given the lack of guidance on tank sizing, the purpose of this document is to establish a methodology that when used produces a reasonably-sized tank, consistent with other methods, and one that can produce duplicable results throughout the region.

Fixture Requirements

Unless otherwise approved by the HRSD, all fixtures, equipment, and drain lines located in the food preparation, alcohol service, clean-up and food service areas of an FSE/property shall be connected to a grease interceptor. Fixtures required to connect to a grease interceptor shall include but are not limited to pot sinks, pre-rinse sinks, hand sinks, prep sinks, dishwashers, soup kettles, braising pans, wok ranges, mop sinks, floor sinks, floor drains, and wastewater generated from exhaust fan hood cleaning operations.

Food waste disposers/garbage grinders (FWD) are prohibited.

Gravity Grease Interceptors (GGI)

Unless otherwise approved, GGIs shall not be installed. When approved for installation (see Appendix B: Alternate Grease Interceptor Approval Request Form), GGIs shall be made from materials that are compatible with a pH of 3. GGIs made from materials that are subject to corrosion such as concrete or steel, shall be lined or coated with a durable material approved by the City that is compatible with a pH of 3 and that cannot be easily penetrated, scraped away or removed. Acid Resistant Enamel (A.R.E) coatings are not acceptable.

The required capacity of gravity grease interceptors in total liquid volume, shall be determined by multiplying the peak drain flow into the interceptor in gallons per minute by a retention time of 30 minutes using pipe diameter and a one-minute drainage period.

Automatic Grease Removal Units (AGRU)

When approved for installation (see Appendix B: Alternate Grease Interceptor Approval Request Form), AGRUs must be designed and tested in accordance with ASME A112.14.4 and/or CSA B481.5. Sizing shall be in accordance with Hydromechanical Grease Interceptor Sizing Step 1: Size by Flow Rate. Step 2: Size by Grease Production shall not apply to AGRUs.

Sizing and Selecting Hydromechanical Grease Interceptors (HGI)

The following two-step sizing methodology for hydromechanical grease interceptors regardless whether the unit will be installed indoors or outdoors shall apply:

Step 1: Size by Flow Rate

The minimum flow rate for a passive HGI may be calculated by either using pipe diameter or fixture volume using either a one-minute or two-minute drainage period. Use a one-minute drainage period when the interceptor is installed within 20 feet of directly connected fixtures and/or has indirectly connected fixtures. When the interceptor will be installed exterior to the building beyond 20 feet of the connected fixtures use a two-minute drainage period.

<u>Fixture Volume Sizing</u>

Use the following formula for sizing fixtures by volume with a 75% fill factor:

$$\left[\frac{L \times W \times H}{231}\right] \times 0.75 = \text{Fixture Capacity Gallons}$$

Fixture Capacity Gallons x 1 = one-minute drainage period (GPM)
Fixture Capacity Gallons x 0.5 = two-minute drainage period (GPM)

Example: three-compartment sink with each compartment being 18 x 24 x 12 inches

18 x 24 x 12 = 5184 cubic inches (in^3)
5184 / 231 = 22.44 fixture capacity gallons
22.44 x 3 = 67.3 total fixture capacity gallons (three bowls)
67.3 x 0.75 = 50.4 total fixture capacity after loading factor (75%)
50.4 x 1 = 50 GPM one-minute drainage period / 50.4 x 0.5 = 25 GPM two-minute drainage period

To determine the minimum required flow rate for the HGI, calculate the capacity of each fixture that will be connected and add the volumes together and use the appropriate drainage period. An appropriate HGI must be certified to meet the minimum flow rate as calculated. Multiple HGIs may be used separately or combined to meet the flow rate requirement.

It is advisable to use a one-minute drainage period when the HGI will be installed in the kitchen area near the fixtures being serviced. It is essential to use a one-minute drainage period when indirectly connected fixtures are connected to the grease interceptor. A two-minute retention time

assumes only directly connected fixtures are routed to the interceptor. A two-minute drainage period will negatively affect the total time for draining fixtures and is often a complaint of owners.

Pipe Diameter Sizing

When the final configuration of kitchen fixtures in an establishment is unknown or to allow for the addition of fixtures in the future, the minimum interceptor volume may be determined by the diameter of the drainage pipe leading from the establishment according to Table 1:

Table 1

Pipe Size (inches)	Full-Pipe Flow (GPM)[1]	One-minute drainage period (GPM)	Two-minute drainage period (GPM)
2	20	20	10
3	60	75	35
4	125	125	75
5	230	250	125
6	375	400	200

1. 1/4 inch per foot based on Manning's formula with friction factor N = 0.012

When using pipe diameter sizing and the interceptor is installed inside the kitchen near the fixtures being serviced, it is advisable to use a one-minute drainage period to ensure the drainage time is not a nuisance. When installed in the kitchen near the fixtures being serviced and there is an indirectly connected fixture it is essential to use a one-minute drainage period. When installed exterior to the building, where the developed length of piping can be quite long, a two-minute drainage period will provide a satisfactory result in drainage times.

Step 2: Calculate Grease Capacity

Once the minimum flow rate has been established in Step 1, calculate the minimum grease storage capacity for the HGI required for the desired pump-out frequency as follows:

Grease Factor from Table 2 **X** Meals or Customers per day **X** Days between pump-outs **=** Grease Capacity Required

To determine the correct grease factor, using Table 2, select the menu type (1 through 30), then the correct column (A through D) for whether there is a fryer and whether the establishment uses disposable or washable plates, glasses, knives, forks and spoons (flatware).

Table 2

Type	Menu	Grease Factor ->	without Fryer without flatware A	without fryer with flatware B	with fryer without flatware C	with fryer with flatware D
1	Bakery		0.025	0.0325	0.035	0.0455
2	Bar and Grille		0.005	0.0065	0.025	0.0325
3	Barbeque		0.025	0.0325	0.035	0.0455
4	Breakfast Bar - Hotel		0.005	0.0065	0.025	0.0325
5	Buffet		0.035	0.0455	0.058	0.075
6	Burger and fries, fast food		0.025	0.0325	0.035	0.0455
7	Cafeteria		0.025	0.0325	0.035	0.0455
8	Caterer		0.005	0.0065	0.025	0.0325
9	Chinese		0.035	0.0455	0.058	0.075
10	Coffee shop		0.025	0.0325	0.035	0.0455
11	Convenience Store		0.005	0.0065	0.025	0.0325
12	Deep fried Chicken / seafood		0.035	0.0455	0.058	0.075
13	Deli		0.005	0.0065	0.025	0.0325
14	Family Restaurant		0.005	0.0065	0.025	0.0325
15	Frozen Yogurt		0.005	0.0065	0.025	0.0325
16	Greek		0.005	0.0065	0.025	0.0325
17	Grocery Bakery		0.005	0.0065	0.025	0.0325
18	Grocery Deli		0.025	0.0325	0.035	0.0455
19	Grocery Meat Department		0.025	0.0325	0.035	0.0455
20	Ice Cream		0.025	0.0325	0.035	0.0455
21	Indian		0.005	0.0065	0.025	0.0325
22	Italian		0.025	0.0325	0.035	0.0455
23	Mexican, fast food		0.025	0.0325	0.035	0.0455
24	Mexican, full fare		0.035	0.0455	0.058	0.075
25	Pizza		0.025	0.0325	0.035	0.0455
26	Religious Institution		0.005	0.0065	0.025	0.0325
27	Sandwich shop		0.005	0.0065	0.025	0.0325
28	Snack Bar		0.005	0.0065	0.025	0.0325
29	Steak and seafood		0.035	0.0455	0.058	0.075
30	Sushi		0.005	0.0065	0.025	0.0325

Example: Fast food burgers and fries, with fryer, with disposable flatware, serving 300 meals per day

Grease factor from Table 2: _6C_ = 0.035 pounds per meal
Meals per day = 300
Days between pump-outs* = 90
Grease storage capacity required is 0.035 x 300 x 90 = 945 pounds

*FSEs that are not open every day, may calculate the number of days actually open in a 90-day period and use that to calculate the total amount of grease capacity required.

The correctly sized and selected grease interceptor will have the minimum flow rate determined in Step 1 and the minimum grease storage capacity calculated in Step 2. When approved by HRSD, multiple grease interceptors may be installed to satisfy the minimum flow rate requirement, the minimum grease storage capacity, or both.

Approved grease interceptors must be certified by ASME A112.14.3 and or CSA B481. A valid test report must be submitted to HRSD for review that includes the incremental test results. No grease interceptor without validated efficiency and grease storage capacity will be approved. Only validated grease storage capacities may be used for sizing and selecting grease interceptors in accordance with this document.

Grease Control Devices must be submitted for approval by submitting a Grease Interceptor Sizing and Selection Worksheet (Appendix A) along with a specification sheet of the grease interceptor being submitted for approval.

When project conditions may not allow for a hydromechanical grease interceptor, the Alternate Grease Interceptor Approval Request (Appendix B) must be submitted for consideration.

Unless otherwise approved by HRSD, grease interceptors shall be maintained by a certified professional Grease Hauler. Food service establishments that want to clean out their own interceptors must submit the Appendix C: Alternate Maintenance Approval Request Form and upon approval shall comply with all of the requirements contained therein.

Appendix A: Grease Interceptor Sizing and Selection Worksheet

1. ☐ Interior Installation ☐ Exterior Installation
2. Are there indirectly connected fixtures routed to the HGI? ☐ Yes ☐ No
3. Will the HGI be installed within 20 feet of the fixtures? ☐ Yes ☐ No

Note: for interior installations, if the answer to either question 2 or 3 is YES, use a one-minute drainage period, otherwise use a two-minute drainage period. For exterior installations use a two-minute drainage period.

Step 1: Calculate Flow Rate

1. Total Fixture Volume: _____ Flow Rate GPM (one or two-minute): _____, OR
2. Pipe Diameter (Table 1): _____ Flow Rate GPM (one or two-minute): _____

Step 2: Calculate Grease Capacity

1. Grease Factor (Table 2):_____
2. Average meals per day = _____

Grease Storage Capacity Calculation	Daily*	90 days
Grease Produced (lbs)		

*multiply average meals per day times the number of days open per period times the grease factor for grease produced per period

Note: The correctly sized and selected HGI(s) will have the minimum required flow rate determined in Step 1 and the minimum calculated grease storage capacity determined in Step 2.

3. Make and model of the HGI selected: _____
4. Is the material of construction compatible with a pH of 3? ☐ Yes ☐ No
5. If the answer to number 4 is "no", what material is the tank lined or coated with*:

   _____

   *must provide evidence that the liner or coating is compatible with a pH of 3 and that it cannot be easily penetrated, scraped off or removed. Acid Resistant Enamel Coatings (A.R.E) are not allowed.
6. Flow rate (GPM): _____ Validated grease capacity* (lbs): _____

*Grease capacity must be validated by a certified test report complete with incremental test data.

Please submit the completed Grease Interceptor Sizing and Selection Worksheet to HRSD for approval along with a specification sheet for the device being submitted for approval.

Applicant Name: _____ Phone: _____

Company: _____ Email: _____

Name of Establishment: _____

Signature of Applicant: _____Date: _____

Appendix B: Alternate Grease Interceptor Approval Request

Gravity Grease Interceptor (GGI)

1. Peak flow rate for connected fixtures (Worksheet, Page 1): _____
2. Size of GGI* (gallons): _____

   *multiply peak flow rate of connected fixtures times 30 minutes
3. What material is the GGI made from? _____
4. Is the material compatible with a pH of 3? ☐ Yes ☐ No
5. If the answer to number 4 Is "no", what material is the tank lined or coated with*:

_____

*must provide evidence that the liner or coating is compatible with a pH of 3 and that it cannot be easily penetrated, scraped off or removed. Acid Resistant Coatings (A.R.E) are not allowed.

Reason for request: _____

_____

_____

Automatic Grease Removal Unit (AGRU)

1. Describe the fixtures to be connected: _____

   _____

   _____
2. Total Fixture Volume (Table 5): _____ Flow Rate GPM (one minute): _____
3. Make and Model of the AGRU proposed: _____

Reason for request: _____

_____

_____

Please submit the completed Grease Interceptor Sizing and Selection Worksheet to the Utility for approval along with any other required documents.

Applicant Name: _____ Phone: _____

Company: _____ Email: _____

Name of Establishment: _____

Signature of Applicant: _____Date: _____

Appendix C: Alternate Maintenance Approval Request

Self-cleaning by the owner and/or operator of an establishment is not allowed unless approved by the City. Only hydromechanical grease interceptors (HGI) with a liquid volume of less than 100 gallons may be considered for self-cleaning. When approved, the owner and/or operator of an establishment shall comply with the following requirements for maintenance on a weekly basis, at minimum, or more often as necessary as required by the City:

- Remove cover(s)
- Remove all fats, oils, and grease (FOG), solids, food debris, and wastewater
- Scrub and spray off all internal surfaces from the build-up of FOG or other residual materials
- Place all removed materials in garbage bag or other sealable container (not glass) along with an absorbent material (i.e. kitty litter) and dispose of in trash receptacle
- Inspect all internal components, replace anything missing or broken and ensure flow control device is installed
- Refill with fresh water
- Replace cover(s)
- Enter the required information on the maintenance log

At least once per quarter, the grease interceptor(s) shall be cleaned by a scavenger waste hauler, documented by a manifest, reported in the maintenance log, and all records maintained for the previous three (2) years.

Make and model of HGI: _____

Flow Rate: _____ Grease Storage Capacity: _____

Grease Factor (Table 2): _____ Average Meals per day: _____

Grease Produced per day*: _____ Cleaning frequency**: _____days
*multiply Grease Factor times Average Meals per day
**Divide HGI grease storage capacity by Grease Produced per day

Reason for request: _____

_____

_____

Please submit the completed Grease Interceptor Sizing and Selection Worksheet to the Utility for approval along with any other required documents.

Applicant Name: _____ Phone: _____

Company: _____ Email: _____

Name of Establishment: _____

Signature of Applicant: _____Date: _____