size and materials as well as the installation alignments, elevations and access requirements for maintenance. Because the size and, therefore, the cost of interceptors are directly proportional to the flow rate, and some waste-water flows not having substances that require removal might have substances that will cause problems in separation; only the waste-water flows having the substances that need to be removed are allowed to be routed through an interceptor (see Commentary Figure 1003.2). The commentary to Section 1003.1 provides information regarding the location of interceptors.

1003.3 Grease interceptors. Grease interceptors shall comply with the requirements of Sections 1003.3.1 through 1003.3.5.

❖ The need for and the performance of grease interceptors have received increased visibility over the years due to costly sewer overflows as a result of congealed grease clogging public sewer lines. Although grease problems in public sewer systems have existed since the first commercial kitchens discharged to public sewers, the extreme attention to preventing grease discharges into public sewers is due largely to the severe fines levied by state environmental health departments for waste-water overflows, which are in violation of the Federal Clean Air and Water Act. Once hot grease enters the sewer system, it cools and congeals in the pipes creating blockages for waste-water flow. Even though sewer system operators are accustomed to routine maintenance cleaning of sewer lines, it is nearly impossible for any reasonable cleaning program to keep sewers free of grease so that overflows do not occur. Therefore, many sewer system operators are establishing severe limits for grease concentration in discharges, extraordinary inspection/reporting requirements and strong enforcement procedures for the producers of grease-laden waste waters in order to attack the problem at the source.

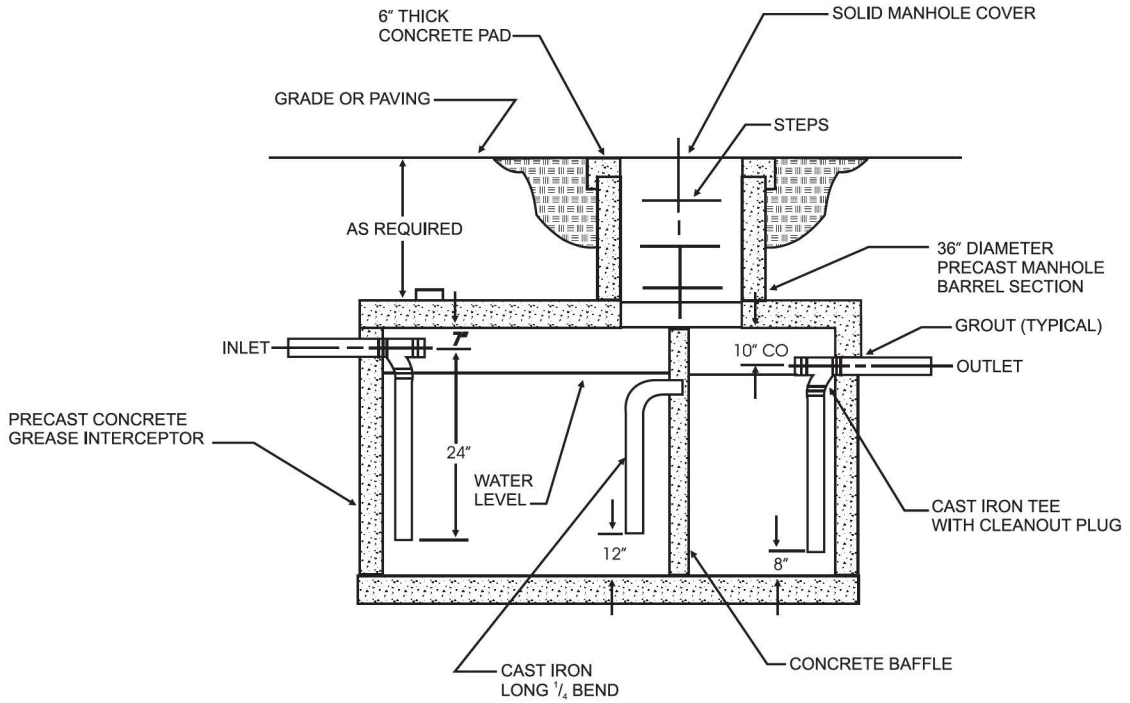
The code does not prescribe grease concentration limits for waste-water discharge or inspection/maintenance requirements for grease interceptors. The only code requirement for the performance of grease interceptors is provided in the applicable referenced standards in Section 1003.3.4. The performance requirements provided in the standards are not a guarantee that any grease interceptor covered by those standards will limit the grease concentration in the waste water to the levels required by local sewer system operators or waste-water discharge enforcement agencies. The designer/manufacturer is responsible for providing a device design that meets customer-specified removal rates for the concentration of grease-laden waste water as specified by the customer.

There are two types of grease interceptors that are commonly used for grease-laden waste-water applications: 1) gravity and 2) hydromechanical. The terms for these two types of grease interceptors have recently come into use because the code-defined term for one of these devices was changed in the 2003 edition. Prior to that edition, gravity-type grease interceptors were called grease interceptors and hydromechanical-type grease interceptors were called grease traps. The term "trap" was changed to interceptor because not all grease trap designs provide a "trap-like" function in so far as preventing sewer gases from backflowing through the device and escaping from untrapped fixture drains. Changing the term "trap" to "interceptor" did not recognize that and in doing so, the distinction between the two types of interceptors was blurred.

The gravity-type grease interceptor is large in size [e.g., at least 500 gallons (1893 L) in volume], and provides for extremely low flow velocity through the unit to allow the grease to collect in a compartment [see Commentary Figure 1003.3(1)]. The hydromechanical-type grease interceptor is small in size [e.g., typically less than 250 gallons (946 L) in volume], of fabricated steel construction and utilizes changes in flow direction along with air-entrainment to cause grease to be retained in the device [see Commentary Figure 1003.3(2)]. Both rely upon gravity as the means of separation. As the code requires all grease interceptors to comply with the referenced standards as stated in Section 1003.3.4, this automatically excludes gravity-type grease interceptors from complying with the code. The code does not reference any standards for gravity-type grease interceptors.

However, gravity-type grease interceptors are sometimes required by jurisdictions instead of what is required by the code simply due to local experience, familiarity and comfort with gravity-type units. In some areas, grease interceptor installations are controlled not by code officials but by departments of health, waste-water system utility operators or environmental discharge departments, none of which are bound by the code. There are few published "standards" for the design of gravity-type grease interceptors. Decades of design experience by credible engineering concerns have resulted in design philosophies and construction criteria that have proven that gravity-type grease interceptors can provide for adequate grease removal from most waste-water flows. However, due to the variety of fats, oils and greases (FOG) produced by some applications and tighter limitations by certain jurisdictions on discharges of FOG, gravity-type grease interceptors alone might not produce the desired results. Hydromechanical devices fitted to the discharge of upstream grease-producing fixtures and equipment might be necessary in addition to gravity-type interceptors in order to attain compliance with local discharge limits of FOG.

Note that an automatic grease removal device is not a third type of grease interceptor but only a variation of the hydromechanical type that offers automatic removal of collected grease to an external container.



For SI: 1 inch = 25.4 mm.

Figure 1003.3(1)
TYPICAL GRAVITY-TYPE GREASE INTERCEPTOR

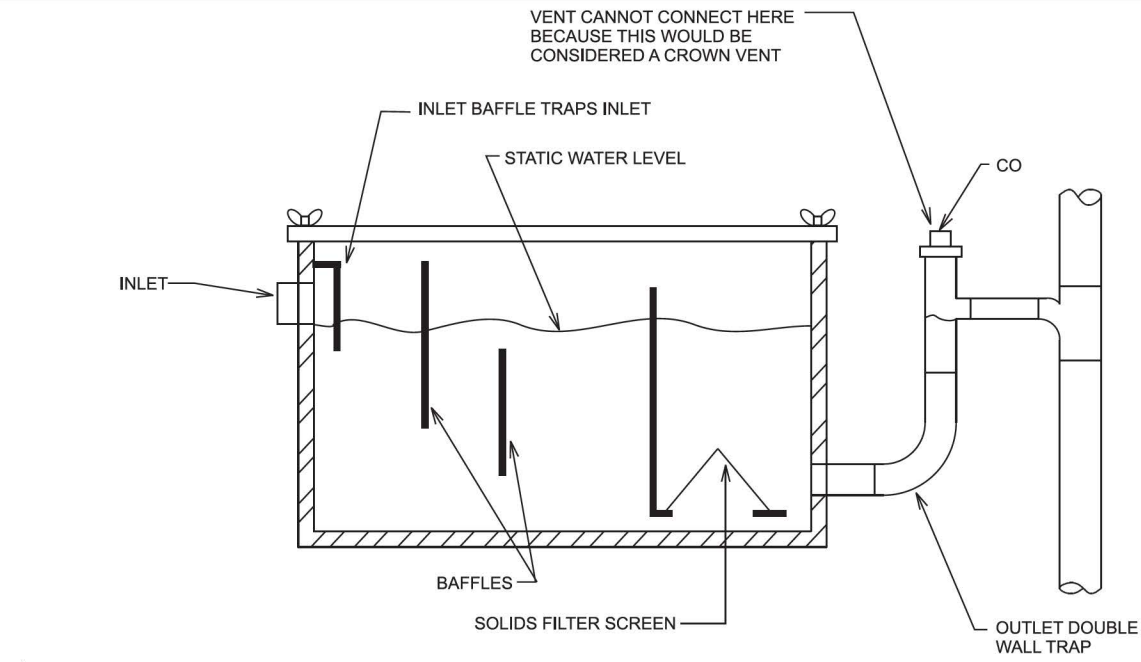


Figure 1003.3(2)
TYPICAL HYDROMECHANICAL GREASE INTERCEPTOR

1003.3.1 Grease interceptors and automatic grease removal devices required. A grease interceptor or automatic grease removal device shall be required to receive the drainage from fixtures and equipment with grease-laden waste located in food preparation areas, such as in restaurants, hotel kitchens, hospitals, school kitchens, bars, factory cafeterias and clubs. Fixtures and equipment shall include pot sinks, prerinse sinks; soup kettles or similar devices; wok stations; floor drains or sinks into which kettles are drained; automatic hood wash units and dishwashers without prerinse sinks. Grease interceptors and automatic grease removal devices shall receive waste only from fixtures and equipment that allow fats, oils or grease to be discharged. Where lack of space or other constraints prevent the installation or replacement of a grease interceptor, one or more grease interceptors shall be permitted to be installed on or above the floor and upstream of an existing grease interceptor.

❖ This section requires grease interceptors for the waste water generated by specific fixtures, equipment and certain floor drains in food preparation areas for occupancy uses where food is commercially prepared. Although the text provides a list of occupancy uses, this list is not all-inclusive but an indication as to the types of facilities that might have a food preparation area. For example, church kitchens, catering kitchens, delis, meat markets and recreation center kitchens could be occupancy uses that could be generators of grease-laden waste waters. The code official has the responsibility to define the fixtures and equipment and their intended uses that constitute the need for grease interception. For example, a bar that only serves beverages in glasses and uses a dishwasher or three-compartment sink to clean only the glasses would not require a grease interceptor. However, a bar that also serves food (if only heated in a microwave or convection oven) on reusable plates with silverware might require a grease interceptor for the three-compartment sink or dishwasher that washes those items.

Only the waste-water flows that require grease interception are allowed to be connected to a grease interceptor. Although this requirement is generally stated in Section 1003.2, it is even a more critical requirement for grease interceptors as cooler waste water, as well as waste-water flows with high concentrations of cleaning chemicals, sugars or acids, can affect the separation efficiency of a grease interceptor (see Commentary Figure 1003.2).

The last line of this section is intended to cover situations where gravity-type grease interceptors cannot be installed or the existing gravity grease interceptor is determined to be too small, where replacement with a larger unit is not possible for a variety of reasons (i.e., not enough space, too costly, etc.). Where these situations are encountered, the code allows grease interceptors (typically hydromechanical type) to be installed upstream of the existing gravity grease interceptor (or where a gravity grease interceptor would normally be located) in order to satisfy the jurisdictional requirements for a gravity grease interceptor [see Commentary Figures 1003.3.1(1) through 1003.3.1(5)].

1003.3.2 Food waste disposers. Where food waste disposers connect to grease interceptors, a solids interceptor shall separate the discharge before connecting to the grease interceptor. Solids interceptors and grease interceptors shall be sized and rated for the discharge of the food waste disposers. Emulsifiers, chemicals, enzymes and bacteria shall not discharge into the food waste disposer.

❖ As the code only recognizes the hydromechanical type of grease interceptors, the intent of this section is to prevent large particles of ground-up food discharged by the food waste disposer from clogging or rapidly filling these types of grease interceptors. Hydromechanical-type grease interceptors have numerous baffles, sometimes with small openings for flow such that food particles could block the flow. Also, the storage capacity for solids in these relatively small units is limited. Without a solids interceptor on the discharge of the food waste disposer, a hydromechanical grease interceptor could become inefficient or blocked within hours of being cleaned. Therefore, a solids interceptor is required for the food waste disposer discharge before connection to a hydromechanical grease interceptor (see Commentary Figure 1003.3.2).

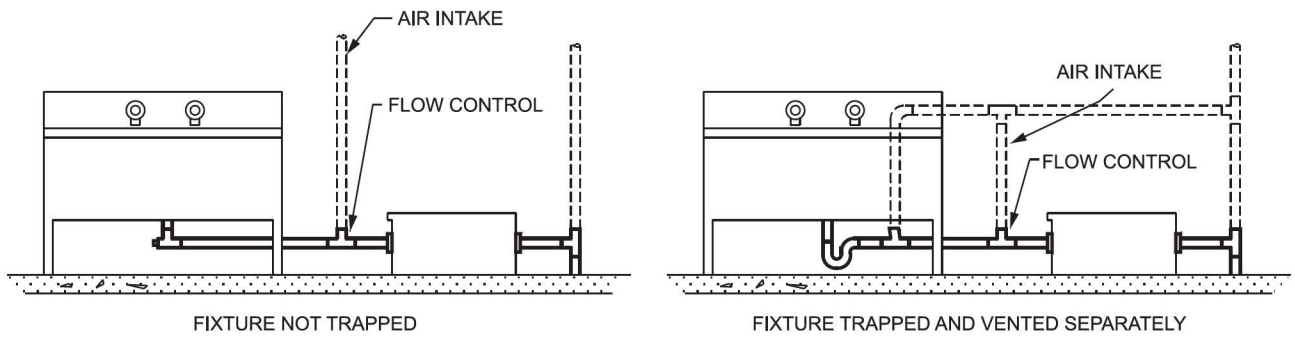


Figure 1003.3.1(1)
TYPICAL SINGLE-FIXTURE INSTALLATIONS

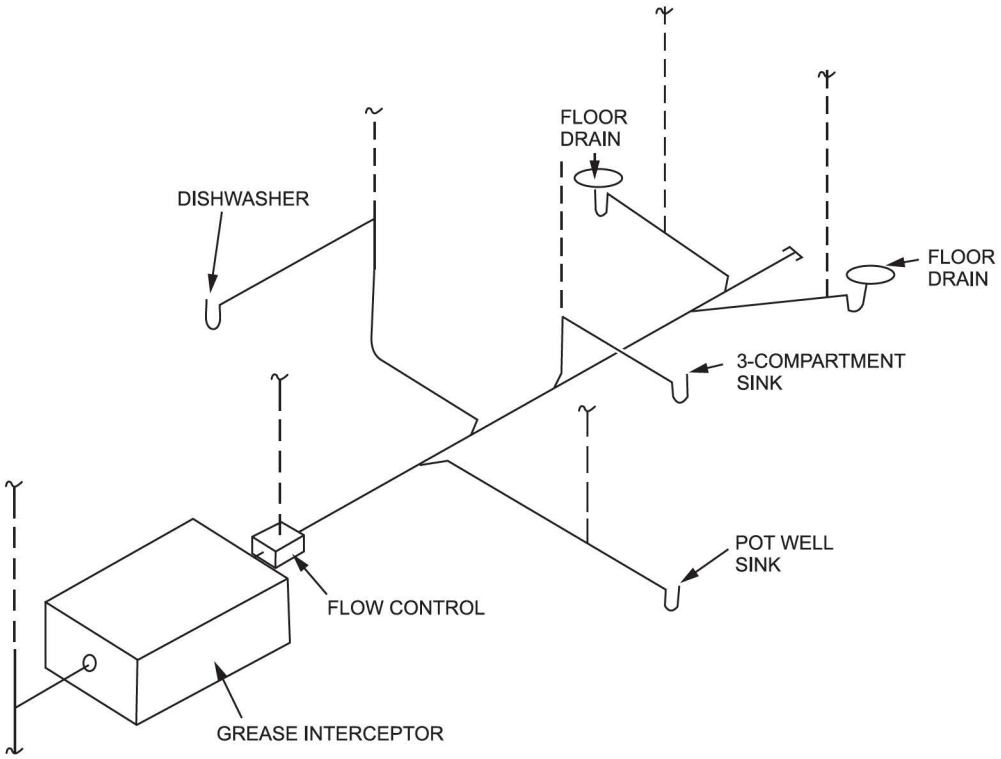


Figure 1003.3.1(2)
GREASE INTERCEPTOR FOR FIXTURES

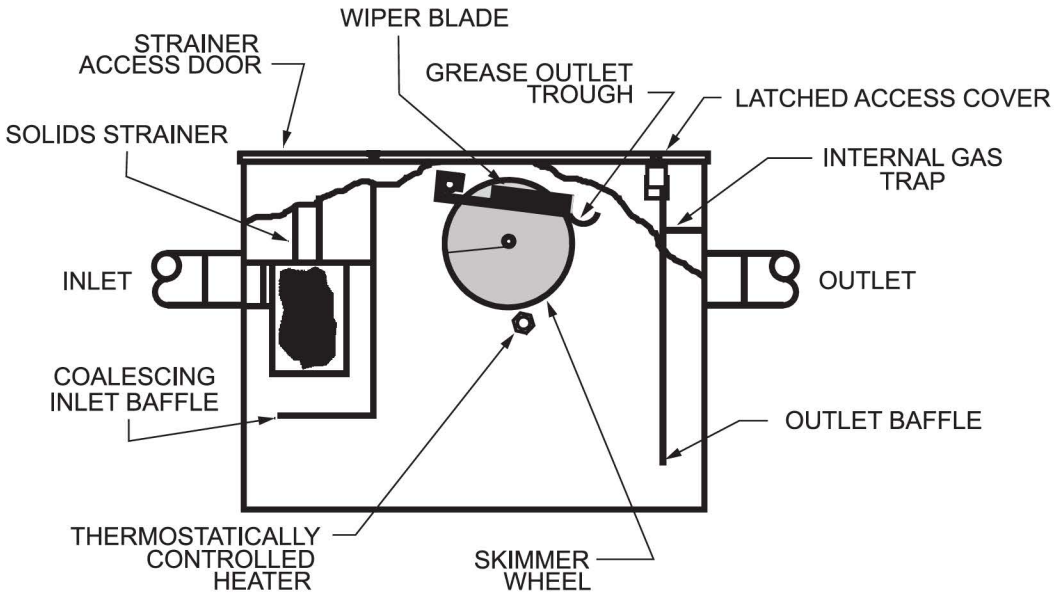


Figure 1003.3.1(3)
AUTOMATIC GREASE INTERCEPTOR

Even though a solids interceptor "filters out" large particles of ground-up food, there is still a grease and flow load that must be accommodated by the grease interceptor. The specifier of the interceptor must include this information on the request for the interceptor or provide for an interceptor somewhat larger than the size selected to accommodate all other flows to provide for more storage capacity.

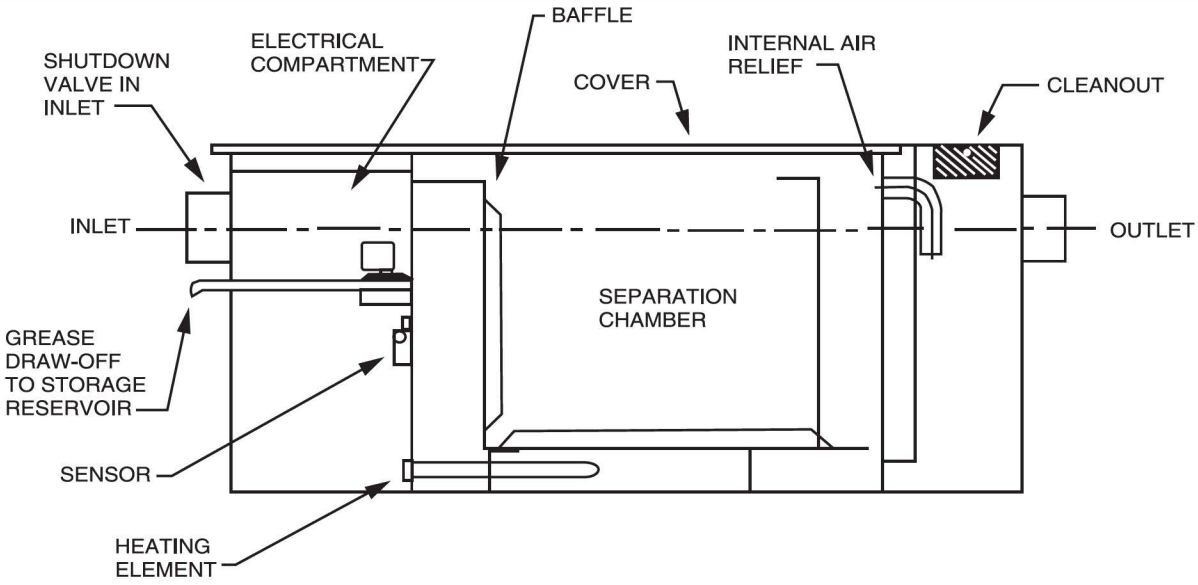


Figure 1003.3.1(4)
SENSOR-CONTROLLED GREASE RECOVERY DEVICE

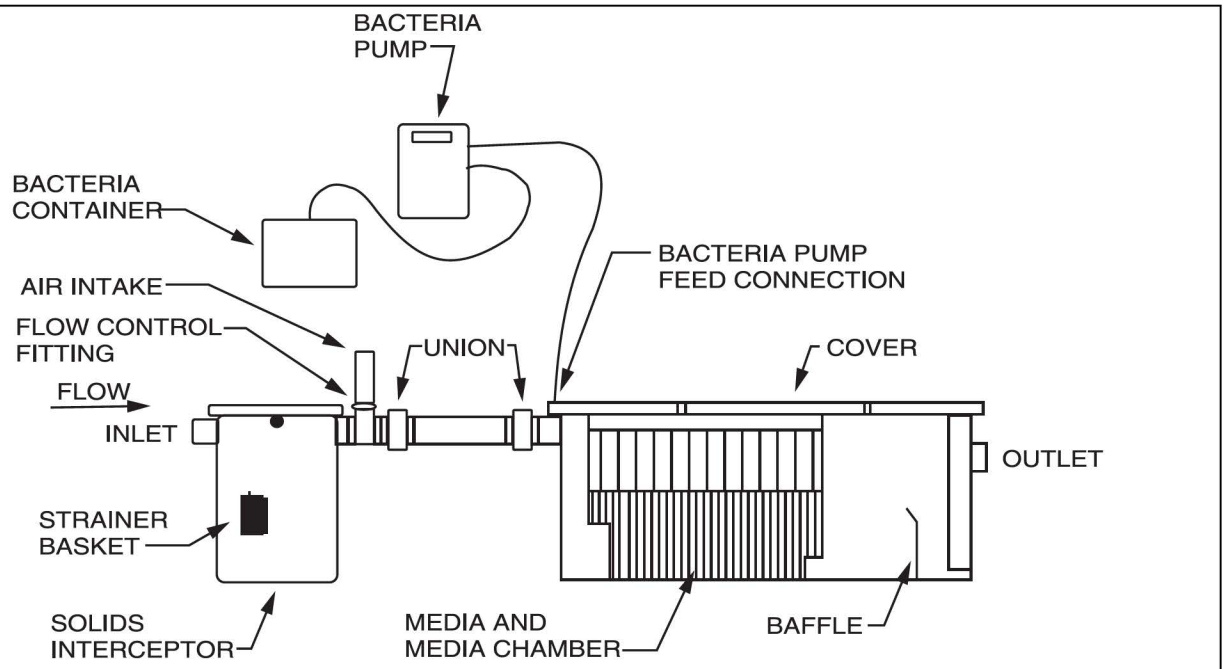


Figure 1003.3.1(5)
BIOREMEDIATION GREASE INTERCEPTOR

This section does not require that flow from a food waste disposer be routed through a grease interceptor. The code does not prohibit the discharge from a food waste disposer from connecting downstream of a grease interceptor (either of the hydromechanical type or of the gravity type). There are mixed opinions concerning where food waste disposer discharges should be connected. Because studies have indicated that dishwasher prerinse (food scrap) sinks are a significant source of grease waste water and that many food waste disposer installations receive the waste from prerinse sinks, the disposer discharge should go

through the grease interceptor. However, since a food waste disposer operates best with a cold water flow and chops the food waste (and the grease contained within) into solidified particles, the particles will readily flow in the sewer system without the congealing problems associated with hot or warm grease-laden wastewater discharges. Manufacturers of food waste disposers understandably find the requirement for a solids interceptor for the disposer discharge illogical, especially where jurisdictions require them for gravity-type grease interceptors. Ultimately, the code official or the public sewer system operators will make the decision on where food waste disposer will be connected.

As reducing problems associated with grease clogging in plumbing piping systems as well as the cost of interceptor cleaning is a marketable concept, many producers of emulsifiers, chemicals, enzymes and bacteria products offer products that are marketed to aid in the reduction of grease. While the effectiveness of these products is beyond the discussion of this commentary, the manufacturers of hydromechanical grease interceptors are certain that the addition of these products to the flow stream and into the grease interceptor are detrimental to the operation of the interceptor. Thus, this code section, with the assumption that the grinder is discharging to a hydromechanical grease interceptor, prohibits the addition of these products to a food waste grinder. The intent of the prohibition has no relevance to the protection of food waste grinders nor is it intended to apply to food waste grinders discharging only to gravity-type grease interceptors.

Note that for gravity-type interceptors with large pathways for internal flow, limited number of baffles and significant storage capacity, clogging and solids buildup due to food waste disposer discharge is usually a nonissue unless maintenance cleaning (usually on a weekly or monthly basis) is ignored.

1003.3.3 Grease interceptors and automatic grease removal devices not required. A grease interceptor or an automatic grease removal device shall not be required for individual dwelling units or any private living quarters.

❖ The volume and concentration of grease in the wastewater discharge from a dwelling unit or private living quarters are usually not a significant source of grease discharged to public sewer systems. Therefore, the complications with installation and the resulting expense (initially and ongoing) of a grease interceptor are not warranted. However, this does not mean that users and owners of individual or private living quarters should not be encouraged to "can the grease (cooking oils and fats)" rather than pour such waste down the drain. Many public sewer system operators realize that even small quantities of grease from many locations can result in sewer system problems. With advance techniques in real-time grease monitoring and the ease of camera inspection of sewer lines, users who are chronic dumpers of fats, oils and greases into the public sewer system or even clandestine commercial kitchen operations might be identified for enforcement follow-up.

1003.3.4 Hydromechanical grease interceptors, fats, oils and greases disposal systems and automatic grease removal devices. Hydromechanical grease interceptors; fats, oils, and greases disposal systems and automatic grease removal devices shall be sized in accordance with ASME A112.14.3, ASME 112.14.4, ASME A112.14.6, CSA B481.3 or PDI G101. Hydromechanical grease interceptors; fats, oils, and greases disposal systems and automatic grease removal devices shall be designed and tested in accordance with ASME A112.14.3, ASME 112.14.4, CSA B481.1, PDI G101 or PDI G102. Hydromechanical grease interceptors; fats, oils,

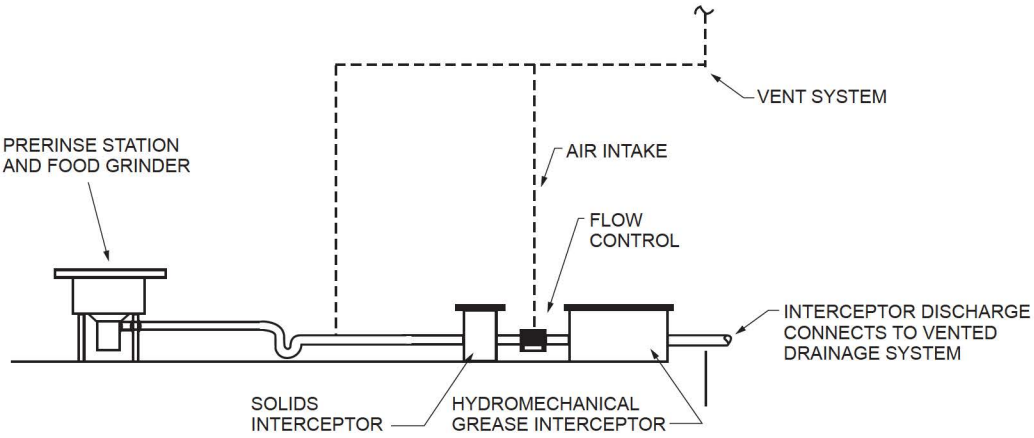


Figure 1003.3.2
FOOD WASTE GRINDER CONNECTING TO GREASE INTERCEPTOR

and greases disposal systems and automatic grease removal devices shall be installed in accordance with the manufacturer's instructions. Where manufacturer's instructions are not provided, hydromechanical grease interceptors, fats, oils, and greases disposal systems and automatic grease removal devices shall be installed in compliance with ASME A112.14.3, ASME 112.14.4, ASME A112.14.6, CSA B481.3 or PDI G101.

❖ The referenced standards PDI G101 and ASME A112.14.3 are nearly identical and describe the testing and certification ratings (flow-through and grease retention) for a specific manufacturer's design of a (hydromechanical) grease interceptor. The CSA B481.3 standard is a similar testing standard for hydromechanical) grease interceptors. These standards do not specify any construction requirements other than the use of standard pipe threads for any external threaded connections. ASME A112.14.4 is the standard for automatic grease removal devices, an "automatic purging" variation of hydromechanical grease interceptors (see Commentary Figure 1003.3.4).

The standard ASME A112.14.6 covers FOG disposal systems. The acronym "FOG" stands for "fats, oils and greases." This is a somewhat recent plumbing system solution that processes grease-laden waste into gray water so that FOG doesn't create problems in public sewer systems, waste-water treatment facilities and private sewage disposal systems. Rather than having a grease interceptor that needs frequent periodic cleaning (and the subsequent waste disposal) to comply with a jurisdiction's limitations on grease discharge to the sewer, these systems bioremediate the FOG at the source. Although these systems might have higher initial costs, in the long run, such systems could have lower operational costs while providing better effluent quality (lower grease concentrations) that some jurisdictions have mandated.

The standards do not provide any mandatory sizing methods for hydromechanical grease interceptors or automatic grease removal devices. Some of these standards provide a sizing method in a nonmandatory appendix of each standard. Sizing methods for grease interceptors have been debated for decades. Although there is most likely a point at which a grease interceptor that is too small does reduce the removal efficiency under ideal conditions (i.e., just cleaned), there is no penalty (other than initial cost) for the selection of a unit larger than required. A larger unit than "required by the numbers" might cost only slightly more, with the benefit of less frequent cleanings (cleaning being a cost as well). Note that when choosing any interceptor, coordination of the outlet connection size with the drainage piping downstream of the interceptor is critical. Larger inceptors might have a larger (standard) outlet connection than what is planned for the facility. Section 704.2 prohibits the reduction in pipe size in the direction of flow. Ultimately, the performance of any grease interceptor is directly related to adherence to an appropriate maintenance schedule for actual loading conditions. Maintenance schedules are usually developed after

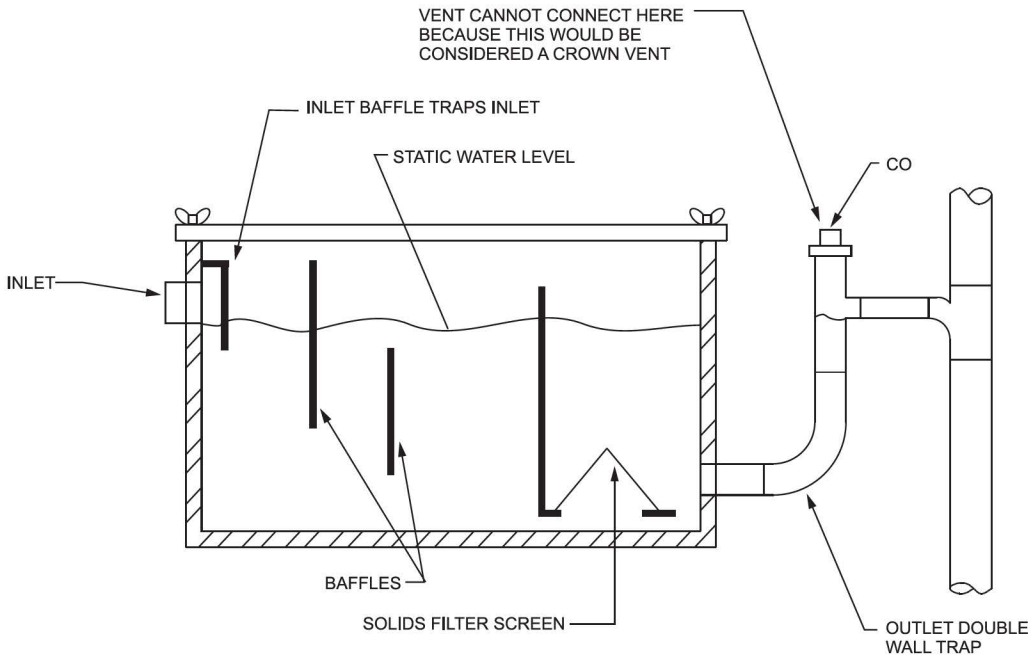


Figure 1003.3.4
TYPICAL HYDROMECHANICAL GREASE INTERCEPTOR

monitoring grease collection amounts over numerous cleanings to determine an optimum cleaning frequency. However, local jurisdictions might require that cleanings occur at intervals no less than weekly or monthly (regardless of whether the cleaning is actually needed or not) based upon their experience with the type of facility operation. Although a discussion of a "best" method for sizing grease interceptors is not within the scope of this commentary, the following discussion of sizing methods is provided for informational purposes only. Grease interceptor manufacturers might also provide sizing methods for their interceptor design. The authority having jurisdiction is responsible for providing or approving the methods used for sizing grease interceptors.

Generally, there are four sizing methods that are used in the prefabricated grease interceptor industry (both gravity and hydromechanical types): 1) the PDI method; 2) the 1980 USEPA "seats" method; 3) the 1980 USEPA "meals" method and 4) the "dfu" method. Some jurisdictions use methods similar to these but have added other requirements or changed the "constants" used in the equations. Others have developed completely different methods that will not be discussed in this commentary. Grease interceptor designs can also be "engineered." There are no consensus standards for the sizing of grease interceptors. The authority having jurisdiction must provide or approve the sizing method to be used.

The PDI method

This method is published in the nonmandatory Appendix A of the Plumbing and Drainage Institute's (PDI) standard PDI G101. This method derives a gallon-per-minute (gpm) flow-through rate for selecting a hydromechanical grease interceptor.

Sample Problem 1: A delicatessen has a three-compartment sink for washing utensils, pots and pans used for preparing meats and other deli products for sale. Each compartment of the sink is 24 inches wide by 24 inches long by 18 inches deep (610 mm by 610 mm by 457 mm) (maximum water depth). The three-compartment sink will be directly connected through a flow control located at the same elevation as the inlet to the interceptor. The highest water elevation in the sink will be no greater than 6 feet (1829 mm) above the inlet to the grease interceptor. Determine the required grease interceptor size

Problem Approach

Calculate the total water holding volume of the sink in gallons, assume a drain time for the sink and choose a "certified" size from Table 1003.3.4.1. Check with the manufacturer to determine if special flow-control orifice size is required for the elevation difference between the water level and the interceptor inlet.

Solution

Total sink volume = [3 × (24 × 24 × 18)]/231 cubic inches per gallon

Total sink volume = 134 gallons

Consider the fact that the actual water capacity in the sink will be no greater than approximately 75 percent of the sink due to the volume taken up by the items being washed and the typical fill levels. Therefore,

Actual sink volume = (75/100) × 134 gallons

Actual sink volume = 101 gallons

Consider the fact that the time to drain the sink is not critical. Therefore, assume a 2-minute drain time. (To be more conservative, a 1-minute drain time could be assumed). Therefore,

Flow rate through interceptor = 101 gallons/2 minutes
= 51 gallons per minute

Refer to Table 1003.3.4.1 to determine that a 75 gpm flow-through rating exceeds the required 51 gallons per minute. Although a 50-gpm unit is technically not large enough for the application, use of a 50-gpm-rated interceptor (with a 50-gpm flow control) would be suitable as the only drawback would be that the drain time for the sink would be slightly greater.

Sample Problem 2: Determine the required grease interceptor size for a hotel restaurant kitchen having the following fixtures. The grease interceptor(s) will be located in the floor of the one-level kitchen:

One three-compartment sink for washing cooking utensils, pots and pans. Each compartment of the sink is 24 inches wide by 24 inches long by 18 inches (610 mm by 610 mm by 457 mm) deep (maximum water depth).

One two-compartment sink for food preparation. Each compartment of the sink is 24 inches wide by 24 inches long by 18 inches (610 mm by 610 mm by 457 mm) deep (maximum water depth).

One one-compartment sink for food preparation. The sink compartment is 24 inches wide by 24 inches long by 12 inches (610 mm by 610 mm by 304.8 mm) deep (maximum water depth).

One steam kettle with a 60-gallon capacity.

One dishwasher with a 30-gpm rating for washing plates, bowls and silverware.

One glassware washer with a 20-gpm rating for washing glasses and cups.

One prewash station (no food waste grinder) with 1.6 gpm.

All of the above fixtures (and compartments of sinks) will be individually indirect connected to the drain system.

Three hand sinks.

One mop (service sink).

Three floor drains.

Problem Approach

Eliminate fixtures that do not produce a grease load from the calculations, calculate the total water holding

volume of the sinks in gallons, assume a drain time for the sinks, add equipment discharge rates, add up all the discharge rates and choose a "certified" size from Table 1003.3.4.1.

Solution—Part I

The glassware washer, hand sinks, mop sink and floor drains are not significant grease contributors and therefore are eliminated from the computation. The drain piping from these fixtures must not discharge to the grease interceptor.

Solution—Part 2

Three-compartment sink:

Total sink volume = [3 × (24 × 24 × 18)]/231 cubic inches per gallon

Total sink volume = 134 gallons

Consider the fact that the actual water capacity in the sink will be no greater than approximately 75 percent of the sink due to the volume taken up by the items being washed. Therefore,

Actual sink volume = (75/100) × 134 gallons
= 101 gallons

Because the discharge of the sink compartments is individually indirect connected into floor sinks, the draining of the sink will be rapid. Assuming a 1-minute drain time:

Flow rate from entire sink = 101 gallons/1 minute
= 101 gallons per minute

Two-compartment sink:

Total sink volume = [2 compartments × (24 × 24 × 18)] / 231 cubic inches per gallon

Total sink volume = 90 gallons

Consider the fact that the actual water capacity in the sink will be no greater than approximately 75 percent of the sink due to the volume taken up by the items being washed and necessary "freeboard" space above the waterline. Therefore,

Actual sink volume = (75/100) × 90 gallons

Actual sink volume = 68 gallons

Because the discharge of the sink compartments is individually indirect connected into floor sinks, the draining of the sink will be rapid. Assuming a 1-minute drain time:

Flow rate through interceptor = 68 gallons/1 minute
= 68 gallons per minute

One-compartment sink:

Total sink volume = [1 compartment × (24 × 24 × 18)]/231 cubic inches per gallon
= 45 gallons

Consider the fact that the actual water capacity in the sink will be no greater than approximately 75 percent of the sink due to the volume taken up by the items being washed and necessary "freeboard" space above the waterline. Therefore,

Actual sink volume = (75/100) × 45 gallons
= 34 gallons

Because the discharge of the sink compartments is individually indirect connected into floor sinks, the draining of the sink will be rapid. Assuming a 1-minute drain time:

Flow rate through interceptor = 45 gallons/1 minute
= 45 gallons per minute

Solution—Part 3

The following equipment discharge rates are identified:

Dishwasher: 30 gpm

Steam kettle: 60 gallons (assume a drain time of 2 minutes) = 30 gpm

Prerinse station: 1.6 gpm

Total flow rate from all sinks and equipment = 101 + 68 + 45 + 30 + 30 + 1.6
= 276 gpm

Because the total flow rate exceeds 100 gpm (the maximum allowable flow rate for a certified grease interceptor), several grease interceptors will be required. The following example is one of many possible ways to configure the drain system for this kitchen.

Grease interceptor No. 1: 100-gpm rating with 100-gpm flow control to accommodate the three-compartment sink.

Grease interceptor No. 2: 100-gpm rating with 100-gpm flow control to accommodate the two-compartment sink, the dishwasher and the prerinse station.

Grease interceptor No. 3: 75-gpm rating with 75-gpm flow control to accommodate the one-compartment sink and the steam kettle.

The "seats" method for restaurants

In 1980, the U.S. Environmental Protection Agency (EPA) released the *Design Manual: Onsite Wastewater Treatment and Disposal Systems* (U.S. EPA document no. 625/1-80-012). The derived interceptor volume (in gallons) is intended for choosing a gravity-type grease interceptor. Note that the interceptor is not sized for a flow-through rating (gallons per minute). Section 8.2 of the manual offers the following formula for deriving the size of a gravity-type grease interceptor for a restaurant:

Grease interceptor size, gallons[1] = $D \times GL \times ST \times (HR/2) \times LF$

where:

D = number of seats in dining area

GL = gallons of waste water per meal, normally 5 gallons

ST = storage capacity factor, minimum value = 1.7
maximum value = 2.5

HR = number of hours open
LF = loading factor,
1.25 for interstate freeway locations
1.0 for other freeways
1.0 for recreational areas
0.8 main highways
0.8 other highways

Note 1: minimum volume is 750 gallons.

The "meals" method for hospitals, nursing homes and other types of commercial kitchens

This method was also published in the 1980 U.S. EPA's *Design Manual: Onsite Wastewater Treatment and Disposal Systems* (U.S. EPA document no. 625/1-80-012). The derived interceptor volume (in gallons) is intended for choosing a gravity-type grease interceptor. Note that the interceptor is not sized for a flow-through rating (gpm). Section 8.2 of the manual offers the following formula for deriving the size of a gravity-type grease interceptor for commercial kitchens other than a restaurant kitchen:

Grease interceptor size, gallons[1] =

$$M \times GL \times ST \times 2.5 \times LF$$

where:

M = number of meals served per day
GL = gallons of waste water per meal, normally 4.5 gallons
LF = loading factor,
1.25 for kitchens with food waste grinders and dishwashing
1.0 for kitchens without food waste grinders but with dishwashers
0.75 for kitchens with food waste grinders but without dishwashers
0.5 for kitchens without food waste grinders and dishwashers
ST = storage capacity factor, minimum value = 1.7
maximum value = 2.5

Note 1: minimum volume is 750 gallons.

The "dfu" method

This method provides a table that equates the number of drainage fixture units (dfu) for the total drainage flow requiring grease interception, to the required interceptor capacity. Separate tables are often provided to size hydromechanical and gravity-type grease interceptors, respectively. Although some tables are developed by arbitrary assignments of sizes to flows, other tables are developed by converting the number of dfu (as assigned by the adopted plumbing code) to a gpm flow. The choice of a hydromechanical grease interceptor is straightforward whereas, for a gravity-type interceptor, sizing is based upon providing at least a 30-minute retention time through the grease interceptor vessel. Because dfu assignments vary between model codes, the reader is cautioned about applying one code's dfu assignments to another model code's interceptor sizing tables.

1003.3.4.1 Grease interceptor capacity. Grease interceptors shall have the grease retention capacity indicated in Table 1003.3.4.1 for the flow-through rates indicated.

❖ Table 1003.3.4.1 comes directly from the PDI G101 and ASME A112.14.3 standards. Note a is not included in the standard's table but was added to the code in the 2006 edition. The minimum grease retention capacity for a hydromechanical grease interceptor provides for a "reasonable" interceptor cleaning interval for an "average" concentration of grease within the waste water at the interceptor's rated flow. The minimum grease retention capacity was determined by extensive testing long ago and establishes a performance baseline for all manufacturers to comply with. Because the grease concentration in grease-laden waste water varies widely, the actual cleaning interval necessary for the maximum desired grease concentration at the outlet of the interceptor is determined by observation or testing.

The PDI G101 and ASME A112.14.3 standards only provide for testing and certification for flow-through ratings of up to 100 gpm. Because some interceptor manufacturers produce designs having flow-through ratings greater than 100 gpm, Note a was added to Table 1003.3.4.1 to extend the same baseline of performance to these larger designs. However, since the standards do not provide for testing of these larger units, hydromechanical grease interceptor designs over 100 gpm must be submitted for approval under Section 105.2 since they cannot meet the testing and certification requirements of Section 1003.3.4.

TABLE 1003.3.4.1
CAPACITY OF GREASE INTERCEPTORS[a]

TOTAL FLOW-THROUGH RATING (gpm)	GREASE RETENTION CAPACITY (pounds)
4	8
6	12
7	14
9	18
10	20
12	24
14	28
15	30
18	36
20	40
25	50
35	70
50	100
75	150
100	200

For SI: 1 gallon per minute = 3.785 L/m, 1 pound = 0.454 kg.

a. For total flow-through ratings greater than 100 (gpm), double the flow-through rating to determine the grease retention capacity (pounds).

❖ Table 1003.3.4.1 indicates the standard "sizes" (flow-through ratings) of hydromechanical grease interceptors to which numerous manufacturers have designed, tested and certified their units to meet the requirements of PDI G101 and ASME A112.14.3. The use of standard sizes allows for manufacturers to produce a tested and certified unit without having to test and certify the actual unit being constructed for a customer. This allows for faster delivery times and allows manufacturers to build frequently purchased sizes in advance of customer orders. While it might be possible to order a "nonstandard" size, the delivery time and cost for special testing and certification of such a unit will most likely be substantially more than if the next larger size of standard unit was ordered. This is not to say that a nonstandard unit could not be ordered, but given that most projects have significant time and financial constraints, ordering standard sizes should offer the best economy.

The grease retention capacity for each of the standard interceptor sizes is the minimum required capacity. Larger grease retention capacities offer the advantage of decreased cleaning frequency; however, if the local jurisdiction requires a cleaning interval of not less than a certain frequency, the additional grease capacity might never be used.

1003.3.4.2 Rate of flow controls. Grease interceptors shall be equipped with devices to control the rate of water flow so that the water flow does not exceed the rated flow. The flow-control device shall be vented and terminate not less than 6 inches (152 mm) above the flood rim level or be installed in accordance with the manufacturer's instructions.

❖ A hydromechanical grease interceptor is designed for a maximum flow-through rate to allow for gravity separation to occur and so that velocities within the unit do not cause excessive turbulence, which might cause "carryover" of grease to the outlet. The rate of discharge from an individual plumbing fixture varies depending on the "head" (height of water) in each receptor (sink compartment), the number of sink compartments discharged at once and the configuration of the compartment outlets and the drain piping. The probability of simultaneous discharge of multiple plumbing fixtures along with other equipment (e.g., dishwashers, kettles) also varies. The selection of a grease interceptor size might be predicated on only certain combinations of fixtures discharging simultaneously in order to optimize interceptor sizing for the most probable flow condition. Note that the sample problems for the PDI sizing method provided in the commentary for Section 1003.3.4 include assumptions for the drain times of sinks. In reality, sinks could drain faster than the assumed time and more fixtures/equipment could discharge simultaneously than was considered in the selection of the interceptor size. Therefore, the interceptor must be provided with a flow-control device to limit flow rate to the interceptor (see Commentary Figure 1003.3.4.2).

Although an interceptor might be sized to accommodate the maximum possible flow rate of all plumbing fixtures and equipment (i.e., simultaneous discharge), the flow control is still required as it also serves to entrain air into the waste flow to aid in the grease separation process. Entrained air in the waste causes the grease, oils and fats to become more

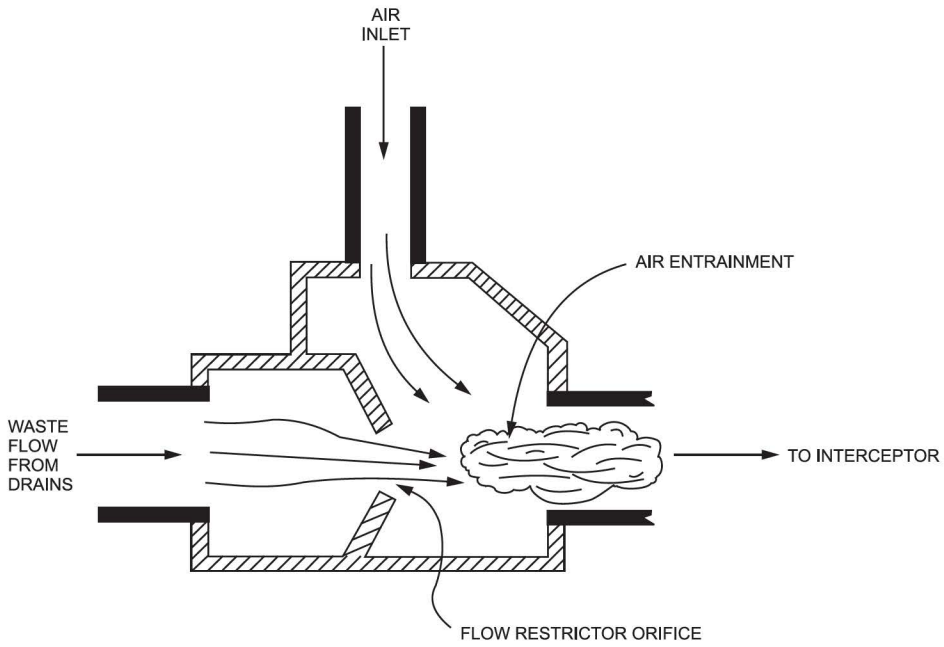


Figure 1003.3.4.2
FLOW CONTROL DEVICE

buoyant in order to more readily rise to the retention area within the interceptor.

The requirement in the second sentence in this section for the flow control to be "vented" ensures that the flow control will be installed with a means to readily obtain air for entrainment into the waste flow. The requirement for the air intake to terminate (with the same room as the fixture) no less than 6 inches (152 mm) above the flood level rim of the fixture applies only to a specific fixture/interceptor arrangement as follows: The grease interceptor must be capable of serving as a fixture trap for a single fixture or combination sink of no more than three compartments and must be within a specific proximity to the fixture (see Exception 3 of Section 1002.1). Terminating the flow control vent 6 inches (152 mm) above the fixture flood level rim prevents waste overflow through the vent should the grease interceptor become clogged. Otherwise, all fixture and equipment drains must be trapped and vented as required by Chapter 9 and the flow control air intake must be connected to the sanitary drain vent system or must terminate outdoors in accordance with the requirements for vent terminations in Chapter 9.

The manufacturer's installation instructions will indicate whether the grease interceptor can serve as a trap for a single fixture or combination sink and might require additional vent connections to the interceptor as well.

The code does not prohibit a grease interceptor from being indirectly connected to a sanitary drainage system through a waste receptor. For example, where a grease interceptor serves an adjacent untrapped single-fixture or multicompartment combination sink (as allowed by Exception 3 of Section 1002.1), the interceptor could discharge, through an air break, into a waste receptor such as a floor sink. This is especially useful where a change in kitchen configuration requires the addition of a floor-mounted interceptor for a new or relocated fixture. Note that in this arrangement, if a vent is required for the interceptor, it must vent to the room or to the outdoors. The vent must not connect to the sanitary vent system.

1003.3.5 Automatic grease removal devices. Where automatic grease removal devices are installed, such devices shall be located downstream of each fixture or multiple fixtures in accordance with the manufacturer's instructions. The automatic grease removal device shall be sized to pretreat the measured or calculated flows for all connected fixtures or equipment. Ready *access* shall be provided for inspection and maintenance.

❖ Automatic grease removal devices serve the same function as grease interceptors except that the unpleasant task of removing the grease is performed by automated internal means such as a pump or skimmer that discharges the collected grease to a container outside of the interceptor. The container, when full, is replaced with an empty one. Although ASME A112.14.4 is the standard for automatic grease removal devices, the standard requires that grease removal devices comply with the ratings and grease retention capacities required by ASME A112.14.3 for hydromechanical grease interceptors.

Note that this section requires ready access for grease removal devices so that maintenance and repairs can be properly performed.

1003.3.6 Gravity grease interceptors and gravity grease interceptors with fats, oils, and greases disposal systems. The required capacity of gravity grease interceptors and gravity grease interceptors with fats, oils, and greases disposal systems shall be determined by multiplying the peak drain flow into the interceptor in gallons per minute by a retention time of 30 minutes. Gravity grease interceptors shall be designed and tested in accordance with IAPMO/ANSI Z1001. Gravity grease interceptors with fats, oils, and greases disposal systems shall be designed and tested in accordance with ASME A112.14.6 and IAPMO/ANSI Z1001. Gravity grease interceptors and gravity grease interceptors with fats, oils, and greases disposal systems shall be installed in accordance with manufacturer's instructions. Where manufacturer's instructions are not provided, gravity grease interceptors and gravity grease interceptors with fats, oils, and greases disposal systems shall be installed in compliance with ASME A112.14.6 and IAPMO/ANSI Z1001.

❖ Gravity grease interceptors remove grease from waste-water flows by reducing the waste-water flow velocity so that the grease floats and solids settle to the bottom of the tank. Waste water between these two layers is allowed to pass into the sewer system. Gravity grease interceptors are usually located outside a building or under a parking lot or driveway so that there is ease of access for the pumping truck that must come periodically to remove the accumulated grease (see Commentary Figure 1003.3.6).

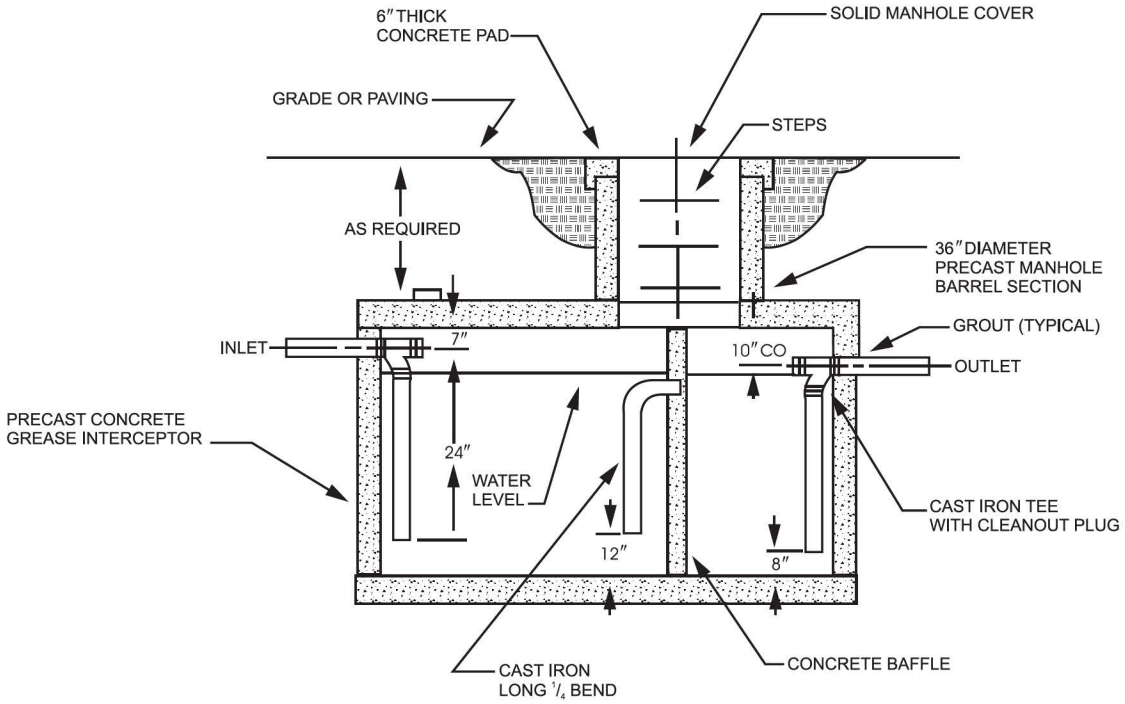
Gravity grease interceptors can be fitted with a fats, oils and greases (FOG) disposal system so that grease material can be reduced into a gray water form, thus extending the required cleaning intervals for the tank (see Section 1003.3.4).

1003.3.7 Direct connection. The discharge piping from a grease interceptor shall be directly connected to the sanitary drainage system.

❖ Although it may seem like common sense, grease interceptors must not indirectly connect to the sanitary drainage system. The discharge can be extremely unpleasant, especially where the interceptor is located inside of a building.

1003.4 Oil separators required. At repair garages where floor or trench drains are provided, car washing facilities, factories where oily and flammable liquid wastes are produced and hydraulic elevator pits, oil separators shall be installed into which oil-bearing, grease-bearing or flammable wastes shall be discharged before emptying into the building drainage system or other point of disposal.

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



For SI: 1 inch = 25.4 mm.

Figure 1003.3.6
TYPICAL GRAVITY-TYPE GREASE INTERCEPTOR

Such alarm systems shall not terminate the operation of pumps utilized to maintain emergency operation of the elevator by fire fighters.

❖ Readers of this section must remember the overall intent of Section 1003 (see Section 1003.1), which is to prevent oil, grease and other harmful substances (e.g., flammable liquid wastes) from being discharged to a public sewer or a private sewage disposal system. As the scope of the code covers the installation of plumbing fixtures including floor and trench drains, all of which would ultimately be connected to the building's drainage system (leading to the sewer), the concern of this section is only for situations where fixtures will exist and those fixtures are likely to "capture" the subject detrimental wastes. For example, consider an automotive repair shop with a toilet (or bath) facility but without floor drains or trench drains in the vehicle service area. Simply because work in the facility could cause oil, grease or flammable liquid wastes to be generated does not mean that an oil separator is required for the facility. There has to be a likely method for those materials to enter the drainage system. Is it likely that the toilet (or bath) facility will be capturing significant detrimental wastes? Probably not. However, if the repair area has floor or trench drains, then it is very likely that an oil or fuel spill could occur at some point (or the floor be "hosed down," flushing the detrimental wastes into floor or trench drains), such drains would need to be connected to an oil separator in the drain piping system before that drain piping is connected to the building drainage system (or building sewer).

The same is true for factories that produce oily or flammable liquid wastes and car-washing facilities. A separator is only required for those types of facilities that have a likely method, such as floor or trench drains, for the wastes to enter the drainage system. Most car-washing facilities will require floor or trench drains for the simple reason that wash/rinse water must be recycled to minimize operational costs and to comply with local and state environmental regulations (that typically would not allow wash water into storm sewers or onto the ground). Whether or not the oil or flammable liquid wastes-producing factory will have floor or trench drains is a decision made by the designer of the facility.

This section does not require that the indicated facilities have floor or trench drains installed so that an oil separator can be installed.

A question often asked is whether any plumbing fixture, other than floor or trench drains, might be likely to capture oil, grease and other harmful substances. In other words, could someone pour waste oil into a water closet? Certainly, anything might be possible, but is it likely to happen? And if there was concern about a water closet used for that purpose, how could an oil separator function without clogging because the separator would eventually plug with human wastes?