

Grease Trap Sizing Methodology

Introduction:

Since Dubai is the first city in the Middle East to have a complete Kitchen waste Fat, Oil and Grease management, and Dubai Municipality being the first authority to manage and control this practice having various multinational kinds of foods and kitchens, Dubai Municipality made a new formula for Grease trap sizing and choosing for Dubai Food facilities.

Abstract:

A grease trap (also known as grease interceptor, Separator, collector) is a Tank which is designed to intercept fat, oil, grease and solids before they enter a wastewater disposal systems and Network.

It is used to sustain and preserve the city environment, infrastructure and to cut the cost effect of clogging in the sewage network.

Dubai Sizing Strategy:

Dubai Municipality started the study by researching different formulas and doing trials on different food establishments in Dubai to extract the important factors and create a simple but valid formula which can give a proper sizing to choose a grease trap capacity and model for any new or existing food establishment.

Execution:

New Facilities: On or after the effective date hereof, food service facilities which are newly proposed or constructed or existing facilities which will be expanded or renovated to include a food service facility, where such facility did not previously exist, shall be required to install, operate and maintain a grease trap according to the requirements contained herein. Grease traps shall be installed and permitted prior to the issuance of a certificate of occupancy.

Existing Facilities: For the purpose of sizing and installation of grease traps, all food service facilities existing within the city prior to the effective date hereof shall be permitted to operate and maintain existing grease traps provided that their grease traps are in efficient operating condition.

On or after the effective date hereof, the city may require an existing food service facility to install, operate and maintain a new grease trap that complies with requirements hereof or to modify or repair any existing noncompliant plumbing or trap within thirty (30) days of written notification by the city where any one or more of following conditions exist:

- a. The facility is found to be contributing oils and grease in quantities sufficient to cause line stoppages or necessitates increased maintenance on the wastewater collection system.
- b. The facility does not have grease traps.

- c. The facility has an undersized, irreparable or defective grease trap.
- d. Remodeling of the food preparation or kitchen waste plumbing system is performed which requires a permit to be issued by the city of Dubai.
- e. The existing facility is sold or undergoes a change of ownership.
- f. The existing facility does not have plumbing connections to a grease trap in compliance with the requirements hereof.

Grease Trap Sizing Formula

The formula of sizing will give a score based on equipment criteria, water flow rate and pipe size:

$$GTT = (\text{criteria score}) * \text{flow} * \text{pipe size score}$$

1. Criteria Score

The criteria score is based on the amount of wastewater that is entering the sewage network through sinks and dishwashing machines, type of kitchen and number of hours of operation in a day. To calculate the Criteria Score, we multiply the scores we get for the sinks & fixtures, type of kitchen, hours of operation and number of meals factor.

$$\text{Criteria Score} = \text{Sinks Score} * \text{Type of Kitchen Score} * \text{Hours of Operation Score} * \text{Meals Factor}$$

1.1 Number of sinks/fixtures

The number of sinks and washing equipment in a kitchen will highly affect the amount of waste water entering the grease trap which is measured by the score as per the following table (Table 1.1):

Table 1.1 (Sinks & fixtures score)

Sinks & Fixtures	Score
1 Sink	2
2-4 sinks	3
5-6 sinks	4
More than 6	5
Dishwashing machine	1 for each
Mop sinks	0.5 for each
Hand wash	0.5 for each
Indirect sink	1 for each
Floor drain	0.5 for each
Kettles & Pans	1.5 for each

The overall score is calculated by adding the scores of all sinks and fixtures available including fish, meat and chicken washing sinks. Sinks and fixtures must be connected to grease traps. Kettles and pans are counted and included as per their drain point where they are cleaned.

1.2 Type of kitchen factor

The type of kitchen defines the type of food preparation activities an establishment is practicing which affect the amount of fat, oil and grease it's generating accounted for as per the following table (Table 1.2):

Table 1.2 (Type of kitchen factor)

Kitchen Type	Score	Kitchen Type	Score
Restaurant (Standard)	1.1	Cafeteria	0.7
Restaurant (Fast Food)	1.3	Coffee Shop	0.5
Restaurant (Fine cuisine)	1.2	Public Kitchen/Catering	1.4
Hotel / Mall	1.4	Accommodation	1.6
Hospital	1.4	Bakery /Confectionary	1
Supermarket	0.7	Butchery	0.7

1.3 Hours of Operation

The number of hours a kitchen is operating in a day affect the amount of waste a trap can hold efficiently as per its capacity determined by the score in the following table (Table 1.3):

Table 1.3 (Hours of operation score)

Hours of Operation	Score
≤ 8	0.7
9-12	1
13-16	1.5
17-24	2

1.4 Number of Meals Factor

The number of meals per day a kitchen is preparing in a day affect the amount of waste generated and entering the trap as per the score in the following table (Table 1.4):

Table 1.4 (Number of meals factor)

Meals/Day	Score
< 200	1
200-500	1.2
501-1000	1.4
1001-2000	1.6
>2000	1.8

2. Flow rate of the Wastewater

The flow rate of the wastewater is important to determine the capacity of trap needed to have enough retention time for the water entering into it. Standard flow of water as per number and size of faucets available in the kitchen in the rate of liters/minute is taken to represent the

wastewater from the same sink attached to each of them (Kindly refer to table 2.1 to calculate the flow for each faucet size):

Table 2.1: (Wastewater flow Qs(A) in liters / minute) from kitchen faucets

Total number of faucets (No.)	Outlet size (inches)		
	DN 15 R 1/2	DN 20 R 3/4	DN 25 R 1
1	13.8	27	46.2
2	18.6	37.2	63
3	22.8	45	76.8
4	25.2	50.4	85.8
5	30	60	102
6	36	72	122.4
7	42	84	142.8
8	48	96	163.2
9	54	108	183.6
10	60	120	204
n > 10	n x 6	n x 12	n x 20.4
Total

The Total Flow is calculated by finding the flow of all faucets from the table above. If multiple faucet sizes were used, the flow of total faucets from each size should be added.

Flow = Total water flow from all faucets

$$= \dots + \dots + \dots + \dots \text{ Etc.}$$

3. Pipe connection score

The pipe score is based on the size of pipe connected to the drainage network which is limiting the amount of wastewater running through it affecting its flow rate and the retention time of the waste in the grease trap. It is determined as per below table (Table 3.1):

Table 3.1 (Pipe size score)

Pipe size (inch)	Score
≤ 2	2
2 – 4	2.5
5 – 6	3
≥ 7	3.5

4. Formula Implementation:

GTT = (criteria score) * flow * pipe size score

After calculating the Criteria Score, Flow Rate and Pipe Size score, we multiply them by each other

= * *

Formula Score =

Depending on the result of the formula score, the required grease trap is specified in the table below (table 4.1) based on a minimum but not limited to twice cleanings per month. Additional cleanings of the trap might be required depending on other factors like busy seasons, events, location, type and quantity of kitchen equipment, which will be determined by inspection visits:

Table 4.1: (GTT Score & Required Grease Trap Capacity)

GTT score	Minimum Recommended GT capacity (Liter)
< 30	60
31-50	110
51 – 100	200
101 – 250	430
251 – 400	600
400 - 650	800
651-850	1300
851-1100	1800
1101-1350	2500
1351-1500	3000
1501-1800	3500
1801-2100	4000
2101-2500	5500
> 2500	6000

Minimum Required Capacity of Grease Trap (liter) =

In case no space was available to install the recommended type of grease trap as per the formula, the kitchen owner must propose to install a smaller grease trap with an undertaking letter to install a flow control device and increase the frequency of cleaning to equal the formula recommended minimum capacity of the trap (this is to ensure that the flow will not exceed the standard of the installed grease trap).

A sample of the undertaking letter is available upon request.

When the fixtures values are not known, the minimum Grease Trap capacity can be determined based on the kitchen wastewater drain pipe size as follows:

Table 4.2: (GT capacity as per pipe size)

Pipe Size (Inch)	Minimum GT capacity (Liter)
3	800
4	2000
> 4	4000 - 9000

For Accommodations, if layout of kitchen is not available, the minimum Grease Trap capacity can be determined based on the number of meals. Number of meals is calculated by number of labors multiplied by number of meals per labor/day. The trap must be approved by the supervisory authority, while the minimum capacity is chosen as per below table:

Table 4.3: (GT capacity as per number of meals)

No. of meals/day	Minimum GT capacity (Liter)
< 100	400
101-300	600
301-600	1200
601-1000	1800
1000-2000	3500
> 2000	> 4000

Example (Labor Camp/Accommodation):

A labor camp has 4 sinks with 4 faucets outlet size of 1/2r, and connected to drainage through a 4-inch pipe. It has 40 rooms with 4 labors in each room serving each labor 1 meal per day. Labors stay 10 hours at the camp.

(Camp Kitchen layout is available):

Criteria Score = Sinks Score * Type of Kitchen Score * Hours of Operation Score * Meals Factor

Sinks Score: The labor camp has 4 sinks (score 3). So, overall sinks score is 3= 3

Type of Kitchen Score: it is an accommodation, so the score for it is 1.6 as given in the table.

Hours of Operation: Labors stay for 10 hours which falls under the score of 1

Meals per day is 160 which falls under the score factor of 1

So, the Criteria Score = $3 * 1.6 * 1 * 1 = 4.8$

Second, we calculate the flow rate of the waste water:

The labor camp kitchen has 4 faucets with ½-inch which result in a flow of 25.2 as per the table 2.1

Third we get the pipe size score which is connected to the grease trap.

The camp has a 4-inch pipe which falls under the score of 2

Finally, we implement the formula

$$\text{GTT Score} = (\text{criteria score}) * \text{flow} * \text{pipe size score}$$

After calculating the Criteria Score, Flow Rate and Pipe Size score, we multiply them by each other

$$= 4.8 * 25.2 * 2.5 = 302.4$$

Formula Score =

302.4

As per the GTT Score table, the grease trap required is: **600 Liter** (e.g. type "C")

(Camp Kitchen layout is not available):

Number of meals per day = $40 * 4 * 1 = 160$

Minimum GT capacity as per table 4.3 for 160 meals/day is **600 liters** (e.g. type "C")

Example (Restaurant):

A restaurant has 2 sinks and 1 mob sink with 3 faucets outlet size of 1/2r, and connected to drainage through a 2-inch pipe. It is preparing 100 meals/day and operating for 12 hours.

First, we calculate the criteria score

$$\text{Criteria Score} = \text{Sinks Score} * \text{Type of Kitchen Score} * \text{Hours of Operation Score} * \text{Meals Factor}$$

Sinks Score: The restaurant has 2 sinks (score 3) and 1 mob sink (Score 0.5). So, overall sinks score is $3 + 0.5 = 3.5$

Type of Kitchen Score: it is a restaurant, so the score for it is 1 as given in the table.

Hours of Operation: it's working for 16 hours which falls under the score of 1.5

Meals per day is 120 which falls under the score factor of 1

$$\text{So, the Criteria Score} = 3.5 * 1 * 1.5 * 1 = 5.25$$

Second, we calculate the flow rate of the waste water:

The restaurant has 3 faucets with 1/2-inch which result in a flow of 22.8 as per the table 2.1

Third we get the pipe size score which is connected to the grease trap.

The restaurant has a 2 inch pipe which falls under the score of 2

Finally, we implement the formula

GTT Score = (criteria score) * flow * pipe size score

After calculating the Criteria Score, Flow Rate and Pipe Size score, we multiply them by each other

$$= 5.25 * 22.8 * 2 = 239.4$$

Formula Score =

239.4

As per the GTT Score table, the grease trap required is: **430 Liter** (e.g. type "B")

1. Collecting Project/Facility details

Kindly provide below information of the facility to calculate the size of grease trap required:

1.1 Project General Information

Name:	Consultant:
Location:	Contractor:
Phone:	Contact Person:
Email:	Mobile No.:

1.2 Facility type

<input type="checkbox"/> Restaurant (Standard)	<input type="checkbox"/> Restaurant (Fast Food)	<input type="checkbox"/> Restaurant (Fine cuisine)
<input type="checkbox"/> Catering/ Public Kitchen	<input type="checkbox"/> Cafeteria	<input type="checkbox"/> Coffee Shop
<input type="checkbox"/> Bakery/Confectionary	<input type="checkbox"/> Public Kitchen	<input type="checkbox"/> Butchery
<input type="checkbox"/> Supermarket	<input type="checkbox"/> Mall	<input type="checkbox"/> Hospital
<input type="checkbox"/> Hotel	<input type="checkbox"/> Accommodation	

1.3 Time of operation

Daily operation: hours/day	Weekly Operation: Days/week
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1.4 Sinks & Fixtures

No. of sinks:	No. of Dishwashing Machines:
No. of indirect sinks:	No. of hand wash sinks:
No. of Mop sinks:	No. of Floor Drain:
No. of Kettles & Pans:	

1.5 Faucet quantity & size:

No. of Faucets: Size:	No. of Faucets: Size:
No. of Faucets: Size:	No. of Faucets: Size:
No. of Faucets: Size:	No. of Faucets: Size:

1.6 Drain Pipe size:

Size of inlet pipe Grease Trap: inch
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