

MULTI-FLO

MULTI-FLO WASTEWATER TREATMENT SYSTEMS

ENGINEERING MANUAL

Revised April 6, 2010

NOTE:

This manual is applicable for the use of the Enviro-Guard ENV-0.75 and Enviro-Guard ENV-0.75M. The Enviro-Guard is a Multi-Flo FTB-0.75 integrating one specific alternative for pretreatment and flow equalization. Designers may elect to provide different pre-treatment capacity and/or flow equalization techniques as may be needed to address specific design requirements. Please contact the factory if there are any questions concerns, or issues regarding the application of the Enviro-Guard or Multi-Flo.

This manual is a compilation of all manuals and related information provided to design, install, operate, maintain, and pump the Multi-Flo FTB-Series of wastewater treatment devices. Please consult the factory for information not provide in this manual or to address unique issues.

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DESIGN MANUAL

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Multi-Flo -Series Onsite Wastewater Treatment Systems

Introduction

Onsite wastewater treatment refers to the process of treating and disposing, dispersing, or recycling of wastewater at or near its point of generation. Historically, the phrase has been synonymous with “septic system” because that was the only design alternative available. With the advent of different design technologies, septic systems are just one of several available alternatives. Because treated wastewater—effluent—is a valuable resource, owners have the flexibility in how they use this resource. Multi-Flo systems provide owners with options as to how they treat and recycle wastewater.

The suitability and design of septic systems rely upon native soils to treat *and* disperse wastewater. In fact, treatment and dispersal are essentially combined in the same process. For this reason, septic system use is limited to those soils where both functions can be accomplished. Multi-Flo units allow owners to separate treatment and dispersal and address each separately. If soil is the selected dispersal alternative, the design can be based solely upon the ability of the soil to transmit water from the site. Owners may have options, depending on local codes, to use the treated wastewater for beneficial purposes such as recycling into plumbing systems or irrigating gardens and turf. The Multi-Flo series provides owners with alternatives unavailable to those who rely solely upon septic systems.

The Multi-Flo -series are capable of treating typical domestic wastewater daily flows equal to rated capacities, which are shown in Table 1. The Multi-Flo FTB-series design is based on the same principles as many municipal wastewater treatment plants. These design principles have been adapted for the small flows developed by individual residences or small commercial/residential developments.

Model	Rated Flow (gpd)	O ₂ Transfer (Max., lb/day)
FTB-0.5	500	3.6
FTB-0.6	600	3.6
FTB-0.75	750	3.6
FTB-1.0	1000	7.2
FTB-1.5	1500	10.8

This manual serves as a guide to design an onsite wastewater treatment system using Multi-Flo units. The manual includes recommendations for both residential and commercial applications. The recommendations include typical flow data and component suggestions. A failure to consider these recommendations may result in poor unit operation or additional maintenance.

Definitions

The following definitions are critical to understanding the design, installation and operation of Multi-Flo units. These definitions have been purposely simplified so they can be understood by a wide range of readers.

ANSI/NSF Standard 40: A performance certification standard intended for onsite wastewater treatment systems having a flow for between 400 and 1500 gpd (gallons per day) and a single point of discharge.

CBOD₅: The concentration of oxygen (expressed as mg/L) utilized by microorganisms in the non-nitrogenous oxidation of organic matter during a five-day period at a temperature of 20°C.

Clarify: A process of separating from wastewater fats, oils, grease, and floatable materials, which float to the surface; and solids, which sink to the bottom.

Commercial Occupancy: A building used for commerce or industry.

Dispersal: A process for recycling treated wastewater back into the environment.

Dosing: A process for periodic discharge of wastewater to a Multi-Flo unit.

Effluent: The discharge from a treatment component or system.

Flow Equalization: A process for mitigating variations in flow by holding wastewater in a tank and dosing the wastewater into the Multi-Flo unit.

Flow Equalization Tank: A watertight, airtight tank, timer, and pumping system having a detention time of 16-to-24 hours used to capture and retain solids, grit, and scum, and then meter the water into the Multi-Flo unit through periodic dosing.

FOG: Fats, oils, and grease in wastewater.

Frequenter: A visitor to and/or customer of a commercial occupancy.

Grease Trap: A tank for capturing and retaining fats, oil, and grease.

Maintenance: Periodic activities intended to maintain the efficiency and effectiveness of the system.

Mixed Liquor. The contents of the Multi-Flo aeration chamber consisting of, but not limited to, partially treated wastewater and microbial colonies that oxidize the organic material in the wastewater.

Onsite Wastewater Treatment System. A device or combination of devices, which may include tanks, vessels, pumps, aerators, aerators, and other mechanical equipment, intended to treat and disperse wastewater at or near the point of generation.

Pre-aeration: Aeration of wastewater to reduce the CBOD₅ prior to discharge to the Multi-Flo unit.

Pre-Aeration Tank: A tank used to reduce partially the CBOD₅ of the wastewater before the wastewater enters the Multi-Flo unit.

Pretreatment Tank: A watertight, airtight tank having a detention time from 12-to-24 hours used to capture and retain solids, grit, and scum before the wastewater enters the Multi-Flo unit.

Residential Occupancy: A building used to house individuals and families.

Septic System: An onsite wastewater treatment system comprised of a septic tank and soil absorption system.

Septic Tank: A watertight, airtight tank having a detention time of 24-to-48 hours, or more, used to clarify wastewater and capture fats, oil, greases, and inert solids.

Soil Absorption System: A system consisting of trenches and pipes—or equivalent “gravelless” devices—used to disperse water into the soil where additional treatment may occur and the water is dispersed from the site.

Trash Trap: A watertight, airtight tank for capturing and retaining solids.

Seeding: A process for facilitating bacterial growth by providing mixed liquor from another Multi-Flo unit.

TKN (Total Kjeldahl Nitrogen): The quantity of organic nitrogen and ammonia (expressed in mg/L) found in wastewater.

TN: The total quantity of nitrogen (expressed in mg/L-N) that exists in the wastewater. Nitrogen may be in the form of ammonia, TKN, nitrate or nitrite.

TSS: The quantity of solids (expressed in mg/L) that can be readily removed from a well-mixed sample with standard laboratory filtering procedures.

Typical Domestic Wastewater: Wastewater having the characteristics as shown in Table 2:

Constituent	Value
CBOD5	100-300 mg/L
TSS	100-350 mg/L
FOG	30 mg/L
TKN	60 mg/L

Wastewater: Water generated as a result of human activities and containing feces, urine, blood, food byproducts, rinse water, laundry water, process water, and the like.

Design Principles

The goal of wastewater treatment is to return to the environment water that does not pose a public health or environmental threat. The role of the Multi-Flo in this process is to remove from water organic materials and pathogens through biological treatment.

Each model of the Multi-Flo FTB-Series has a specific design rating. Each rating is intended to identify the volume of typical domestic wastewater that the system can treat in a 24-hour period. The flow during this 24-hour period, as tested under ANSI/NSF Standard 40, is shown in Table 3.

Time of Day	Percent of Total Hydraulic Load
6:00 AM-9:00 AM	35
11:00 AM-2:00 PM	25
5:00 PM-8:00 PM	40

Additional treatment may be necessary where the flow regime varies from Table 3 and/or the wastewater does not meet the criteria of typical domestic wastewater.

Typical domestic wastewater may include small quantities of medicines, cleaners, antibiotics, and other substances that, in large quantities, will adversely affect the operation of the system. The water will have a pH of approximately 7.0 and may have minute concentrations of heavy metals. If the pH is above 9.0 or less than 6.0, and/or there are high concentrations of harmful substances and heavy metals, additional treatment will be necessary.

Depending on the occupancy, an additional tank may be installed upstream of the Multi-Flo. This additional component may be a "trash trap," "pretreatment tank," "flow equalization tank," or "pre-aeration tank." The name will vary with the intended function of the tank, and the function of the tank is related to its capacity and components. A trash trap is the smallest of these, and its function is simply to capture and retain large solids such as tampons, disposable diapers, and so forth. No additional treatment or function is expected, and the capacity of the tank may be as small as 250 gallons.

A pretreatment tank is larger than a trash trap, and its function is to capture and retain fats, oils, grease, and smaller solids such as dental floss. The capacity of a pretreatment tank is related to the flow from the occupancy. A flow equalization tank serves as a pretreatment tank, but its primary function is to retain wastewater for periodic dosing into the Multi-Flo. A pre-aeration tank is intended to provide additional oxidation. This tank will contain additional aerators to facilitate a partial digestion of organic material prior to its discharge to the Multi-Flo unit. A pre-aeration tank may also serve as a flow equalization tank.

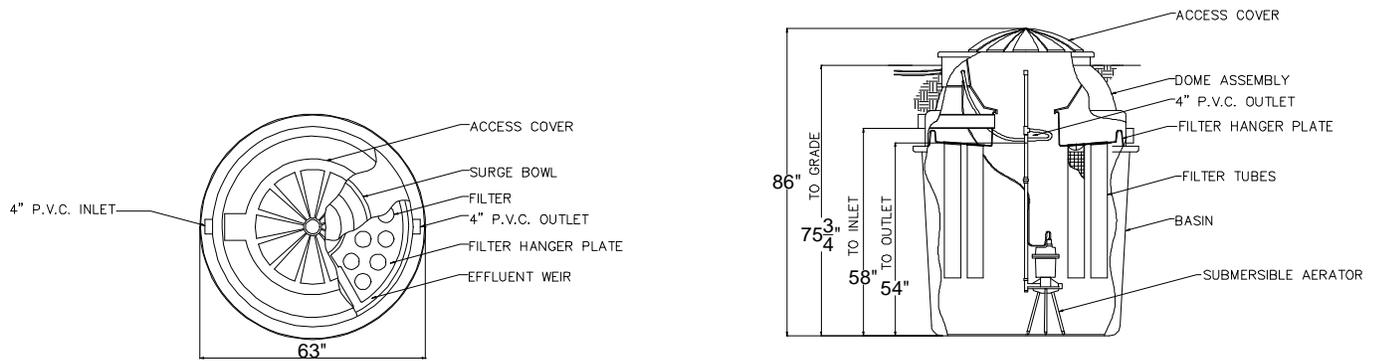


Figure 1—Multi-Flo FTB-0.5

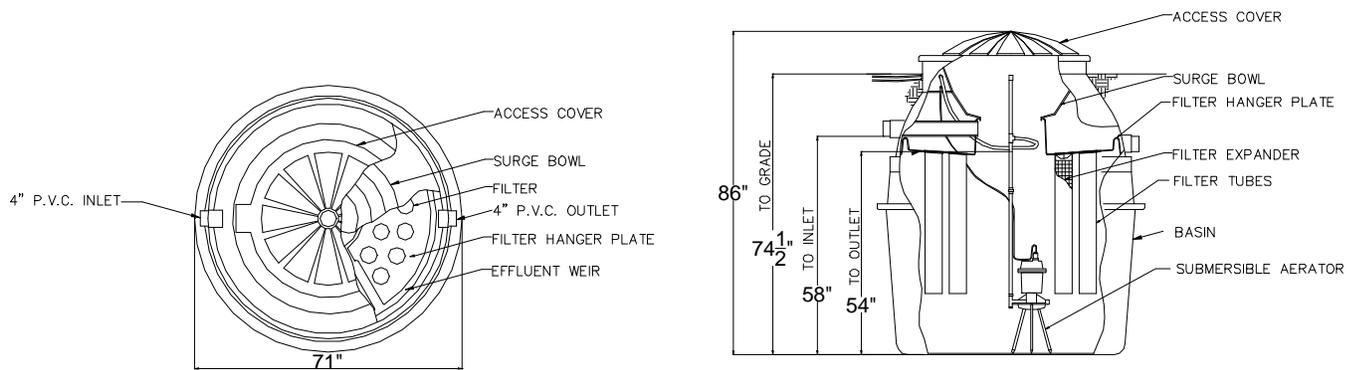


Figure 2—Multi-Flo FTB-0.6

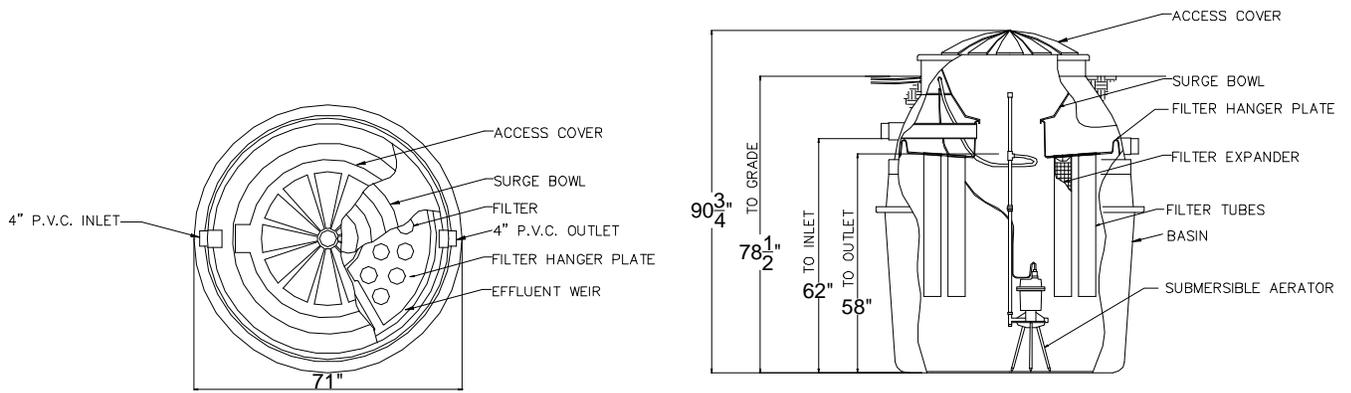


Figure 3—Multi-Flo FTB-0.75

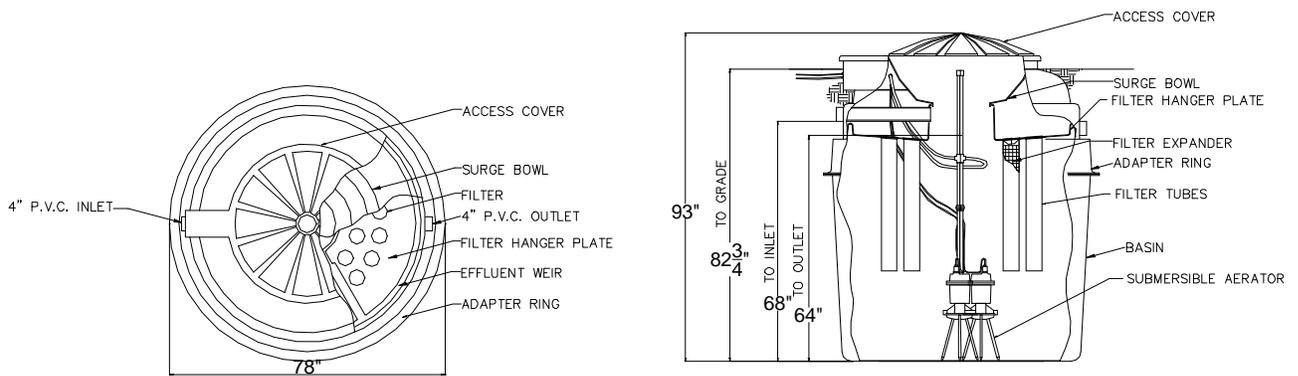


Figure 4—Multi-Flo FTB-1.0

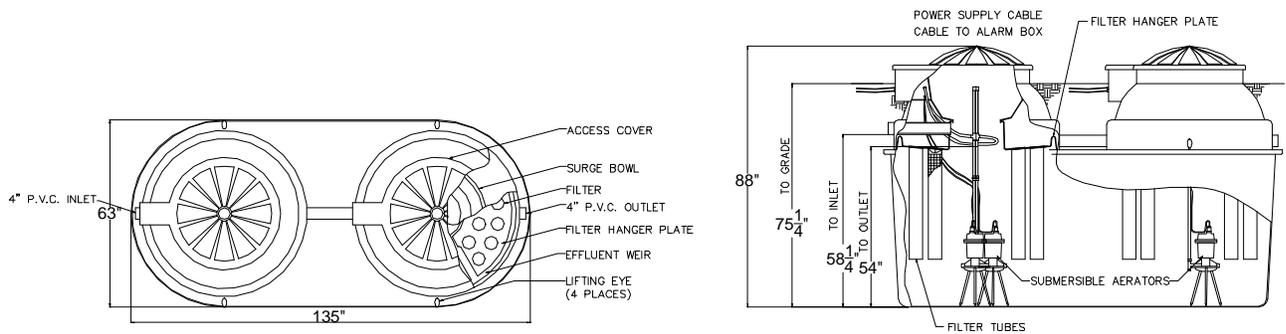


Figure 5—Multi-Flo FTB-1.5

Every county of almost every state regulates the design, installation, operation, and maintenance of onsite wastewater treatment systems. Some counties have few regulations while others maintain comprehensive programs that include licensing, certifications, plan review, and mandatory maintenance. Generally, these regulations mandate residential system sizing, usually based on the number of bedrooms. Commercial occupancies generally use building code parameters to establish design

flow. These parameters are based on number of patrons, square footage of retail space, restaurant seats, and other indicators of potential wastewater generation. Some codes may consider alternative values to establish flow, such as actual water use for similar facilities, but most codes are prescriptive in setting design flows.

Listed in Table 4 are recommended sizing and components for single-family dwellings based on a design flow of 150 gpd/bedroom.

Multi-family occupancies are more susceptible to abuse by tenants, who may be unaware that they are using onsite wastewater treatment. For these occupancies, a pretreatment tank may eliminate maintenance issues related to grease and solids put into the system. Table 5, which is based on a flow of 150 gpd/bedroom, illustrates recommended components, volumes, and ratings for multiple family dwellings.

Number of Bedrooms	Garbage Disposal?	Recommended Size of Pretreatment Tank	Required Capacity of Multi-Flo (gpd)
1-2	No	Optional	500 gpd
1-2	Yes	Optional	500 gpd
3	No	Optional	500 gpd
3	Yes	Optional	500 gpd
4	No	Optional	600 gpd
4	Yes	Optional	600 gpd
5	No	Optional	750 gpd
5	Yes	500 gallon	750 gpd

Number of Bedrooms Served	Recommended Size of Pretreatment Tank if needed, (gal)	Required Capacity of Multi-Flo (gpd)
1	Optional	500
2	500	500
3	500	500
4	500	600
5	500	750
6	750	1000
7	750	1200
8	750	1200
9	750	1500
10	1000	1500

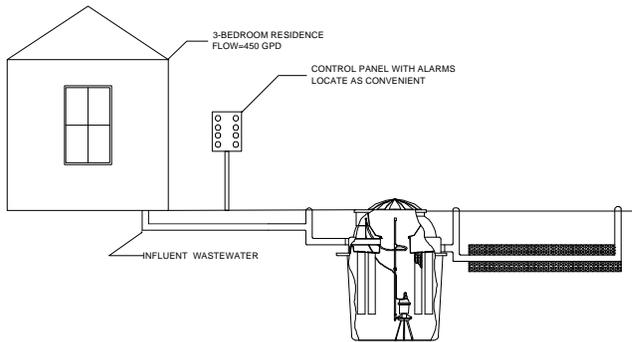


Figure 7 - Basic Multi-Flo Installation

Figure 7 shows a basic installation. In this example, the Multi-Flo FTB-0.5 serves a three-bedroom residence. It receives and discharges flow by gravity. Effluent is dispersed through a drainfield sized in accordance with applicable codes. In this example, the Multi-Flo provides both the storage of a septic tank and wastewater treatment normally associated with the drainfield. The soil acts to “polish” the effluent of residual pathogens, solids, and organic material.

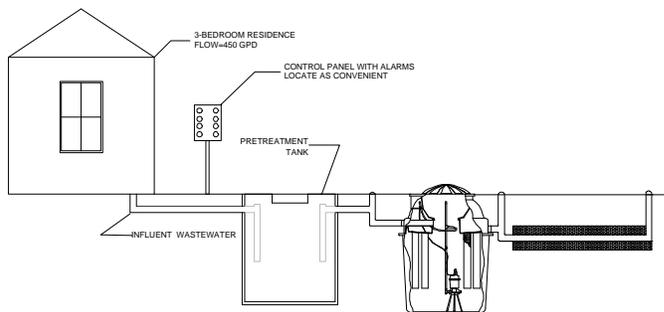


Figure 8 - Multi-Flo Installation With Pre-Treatment

Figure 8 shows a basic Multi-Flo installation with the addition of a pretreatment tank. “Pretreatment” is essential when the wastewater is laden with solids or has other unusual characteristics. Pretreatment accomplishes several functions: capture and storage of solids, homogenization of the wastewater, and partial removal of organic material. Pretreatment may enhance treatment is generally not essential for successful performance.

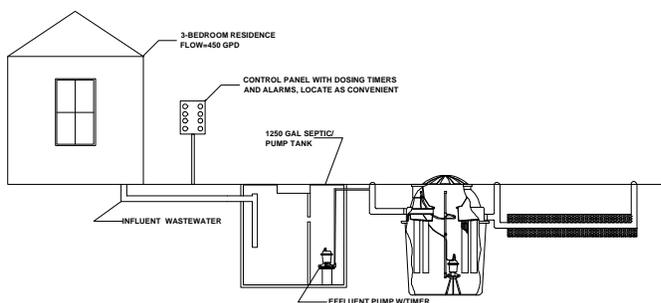


Figure 9 - Multi-Flo Installation With Flow Equalization

Flow equalization may be needed when high variation exists. Such cases arise when much or all of the flow is generated during one or two short periods of a day or week. As an extreme example, flow equalization would help when all wastewater is generated in the morning and evening, there are parties on Friday evenings, and all laundry is washed on Saturdays. Flow equalization provides a method to capture, homogenize, and meter wastewater into the Multi-Flo,

maximizing operational efficiency.

Flow equalization functions by placing a pump on a timer that operates over a 24-hour cycle. The design flow will be divided into 48 or 96 equal doses, each of which will be discharged at 15-to-30 minute intervals, depending on the design. For example, a 500 gpd FTB-0.5 can receive 48 doses of about 10.4 gallons, each dose discharged at 30-minute intervals.

Flow equalization also provides the benefits of pretreatment. As shown in Figure 9, the flow equalization tank is actually a two-compartment septic tank-pump chamber. The septic tank portion acts as a pretreatment tank while the pump chamber holds partially treated water for dosing into the Multi-Flo.

Design Requirements for Commercial Occupancies

Although the Multi-Flo has been used primarily for residential facilities, including both single-family and multiple-family dwellings, Multi-Flo can be effectively used for commercial occupancy including various types of food services. Because of hydraulic surges, grease, use of chemicals and cleaning agents, additional pre-treatment facilities may be required when the Multi-Flo is used for certain types of commercial facilities.

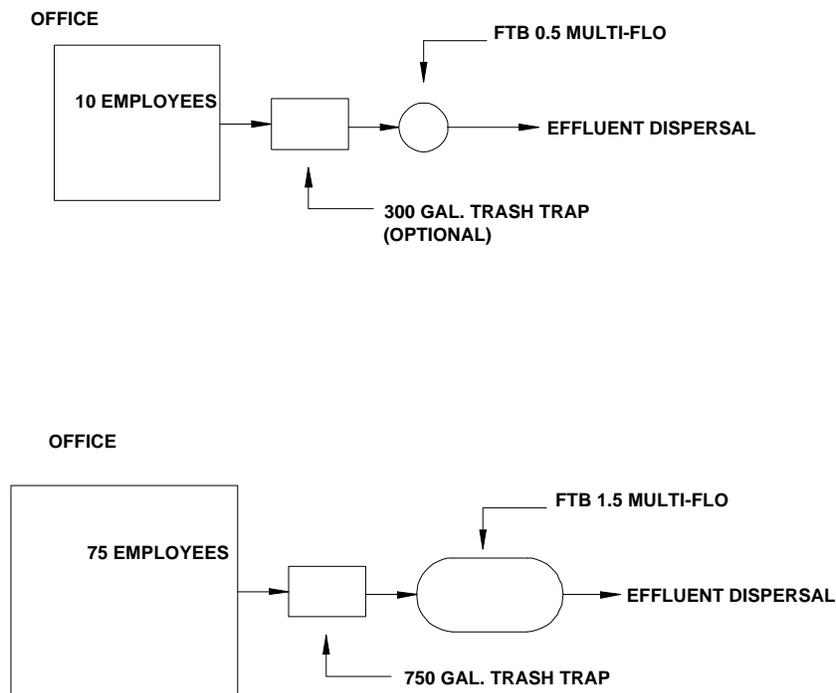


Figure 10—Commercial Occupancy Multi-Flo Installation with Flow Equalization

Design Flow and Loads

Essential to proper design of commercial systems is a characterization of the flow and organic and solids loadings the occupancy will generate. These values may be obtained from several sources. If the facility is existing, meter readings may provide the answers. For new facilities, design values may already be established in plumbing or sanitary codes. Standard engineering texts also provide values. Listed below in Table 6 are typical design values.

Table 6—Wastewater Flow and Organic Load			
Type of Facility	Flow Gal/Unit/Day	CBOD₅ mg/L	CBOD₅ lb/DAY/UNIT
Apartment	150 gal/bedroom	240	.30 lb/bedroom
Assembly Hall (no kitchen)	5 gal/seat	240	.01 lb/seat
Bowling Alley (no kitchen)	75 gal/lane	240	.15 lb/lane
Church (no kitchen)	3 gal/sanctuary seat	240	.01 lb/seat
Country Club	50 gal/member	400	.17 lb/member
Country Club	20 gal/employee	240	.04 lb/employee
Drive-In Theaters	5 gal/car space	240	.01 lb/car space
Employee (no showers)	20 gal/employee	240	.04 lb/employee
Employee (showers)	35 gal/employee	240	.07 lb/employee
Food Service			
Ordinary Restaurant	50 gal/seat	600-800	.35 lb/seat
24-Hour Restaurant	75 gal/seat	600-800	.50 lb/seat
Freeway Restaurant	100 gal/seat	600-800	.70 lb/seat
Tavern (limited food)	30 gal/seat	400	.10 lb/seat
Carry-out (single-service)	50 gal/100 sq.ft./floor sp.	600-800	.70 lb/100 sq.ft./fl. sp.
Carry-out	20 gal/employee (add'l)	240	.04 lb/employee
Fast Food Chain	100 gal/seat	1000	.80 lb/seat
Hospital (not incl. Personnel)	200 gal/bed	400	.70 lb/bed
Hospital personnel (additional)	20 gal/employee	240	.04 lb/employee
Laundry (coin-operated)	400 gal/machine	600	2.00 lb/machine
Mobile Home Park	200 gal/space	240	.40 lb/space
Motel and Hotel, regular	150 gal/room	240	.30 lb/room
Resort hotel, cottage	75 gal/room	240	.15 lb/room
Add for self-service laundry	400 gal/machine	600	2.00 lb/machine
Nursing Home (not incl. Kitchen or laundry)	100 gal/bed	400	.30 lb/bed
Office Building (per 8-hr shift)	20 gal/employee	240	.04 lb/employee
Service Station	250 gal/water closet	240	.50 lb/fixture
Schools			
Day/type	15 gal/student	240	.03 lb/student
Add for showers	5 gal/student	240	.01 lb/student
Add for cafeteria	5 gal/meal	600	.03 lb/meal
Add for school employees	15 gal/employee	240	.03 lb/employee
Boarding school	75 gal/student	240	.15 lb/student
Shopping Center (no food)	100 gal/1000 sq.ft./floor sp	400	.30 lb/1000 sq.ft.fl.sp.

Type of Facility	Flow Gal/Unit/Day	CBOD₅ mg/L	CBOD₅ lb/DAY/UNIT
service or laundry)			
Travel Trailer or RV Park			
W/out water/sewer hook-up	75 gal/space	400	.25 lb/space
With water/sewer	100 gal/space	400	.30 lb/space

Four flows must be considered during the design: maximum month average daily flow, minimum monthly average daily flow, peak daily flow, and peak hourly flow. Each of these will be different, and the combination of these flows is essential developing the most efficient design. Typically, the Multi-Flo unit will be sized to treat the maximum month average daily flow. If there are multiple Multi-Flo units operating in parallel, they will be placed into service depending on how the flow varies over a year's time. Flow equalization must be sized to hold the peak daily flow. And if the peak hourly flow is high, flow equalization must be sufficient to hold this additional flow above the peak daily flow.

Ideally, flow should be spread over a 24-hour period. The minimum effective capacity of the treatment tank should be two-thirds the peak daily flow. Churches and meeting halls may have only one or two days each week during which they are in use. Flow equalization may spread the large single-day flows over two or three days, depending on the maximum month average daily flow.

When flow equalization is used, a separate trash trap is generally not needed. For greater efficiency, a two-compartment septic tank should be considered for use as the flow equalization tank

The size and pumping frequency of the pump depends upon the volume of wastewater to be treated. Typically, an 11-gallon dose is given over a five-minute interval. Such low loading minimizes the need for larger pumps. The following table gives recommended pumping frequency and volume/dose:

Flow (gal/day)	Doses/Day	Gal/Dose
250	24	11
500	48	11
750	72	11
1000	96	11
1500	96	16

For food service occupancies, grease traps will also be required. The capacities of these grease traps may be set in local plumbing codes. Generally, the minimum capacity is 750 gallons. When the required capacity exceeds 1000 gallons, two or more tanks located in series should be considered. Only plumbing fixtures located in the kitchen should be connected to the grease trap.

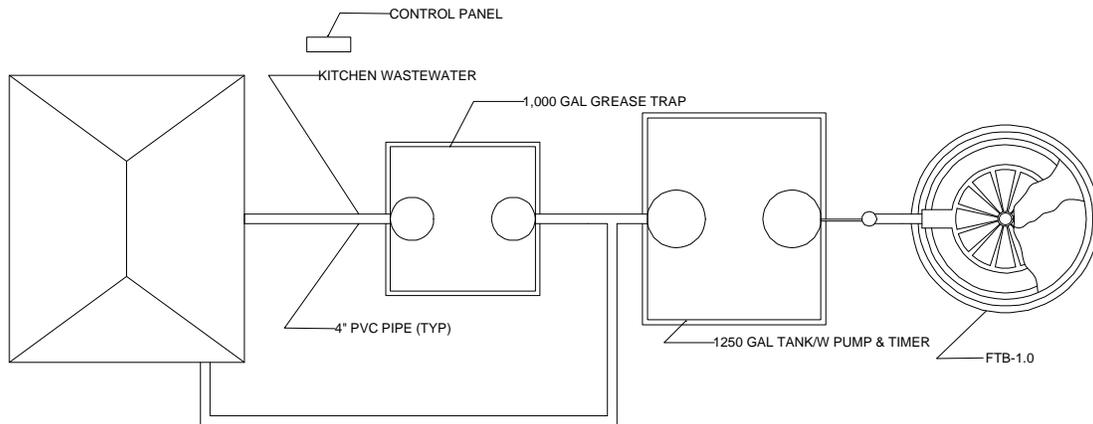


Figure 11—Plan View Showing Grease Trap

Even if flow equalization and a grease trap are not required, a trash trap is recommended to capture fats, oil, grease, and other material from entering the Multi-Flo. Such material includes, but is not limited to, tampons, sanitary napkins, cleansing pads, contraceptives, dental floss, and so forth.

The following recommendations address designs for different applications:

- **Single Family Residence:** A trash trap is not recommended unless a garbage disposal is installed. If a trash trap is provided, it should have a capacity of 300-to-500 gallons.
- **Rental Housing, Multiple Family or Mobile Home Parks:** A trash trap having a capacity of 50 percent of the average daily flow should be provided.
- **Offices and Public Buildings without Kitchen Facilities:** A small trash trap with a capacity of 25-to-50 percent of the daily average flow should be provided. Although such facilities do not have a grease problem, they do frequently experience problems with paper towels and sanitary napkins. It may be advisable for the owner to use wall-mounted hand dryers or cloth towel dispensers.
- **Gas Stations, Garages or Auto Repair Shops:** A trash trap having a capacity of 50 percent of the average daily flow should be provided. Under no circumstances should wash bays, floor drains or oil separators be connected to the Multi-Flo.
- **Campgrounds:** A trash trap with a capacity of 50 percent of the daily flow should be installed. It is not advisable to discharge the contents of the dump station into the Multi-Flo since there is usually a large amount of bacterial retardants and other chemicals that may kill off the bacteria in the Multi-Flo.
- **Weekend Cottages or Winter Homes:** Facilities with small daily flows, intermittent or seasonal usage should not have a trash trap installed.

- **Restaurants, Hospitals, Nursing Homes or Schools:** Facilities having kitchen and laundry facilities require trash traps or grease traps. Contact your Multi-Flo representative for specific recommendations on the design of systems to serve the above types of facilities.
- **Facilities Served By Two Or More Multi-Flo Plants in Parallel:** Provide a trash trap before a distribution box if the flow is to be split between two or more Multi-Flo units.

The treatment capacity of each Multi-Flo unit is based upon the oxygen requirements necessary to treat typical domestic wastewater. The Multi-Flo aerator is designed to treat a minimum of 1.5 lb-CBOD₅/day. Where wastewater has a higher organic concentration, additional oxidation capacity will be required. Often this additional capacity is provided by adding aeration to the pretreatment tank. For example, foodservice wastewater frequently has a CBOD₅ greater than 1000 mg/L due to soluble grease, cleaning agents, etc. Because of the higher oxygen demand, a longer retention in the aeration stages is required. Pre-aeration meets the additional oxygen requirements. Pre-aeration can usually be accomplished by installing one or more Multi-Flo aerators in either the grease trap or trash trap.

Pre-aeration provides benefits beyond oxidation. Some chemicals may be volatilized or directly oxidized by exposure to oxygen. Air aids in cooling and emulsifying fats, oil and grease so that they float to the surface. Generally, the wastewater will be homogenized so that the Multi-Flo does not experience sudden changes in wastewater character.

The microbes that perform the wastewater treatment occur naturally. When started, these bacteria take from six-to-eight weeks to acclimate themselves to the wastewater and colonize in sufficient concentration that measurable treatment occurs. "Seeding" can be used to eliminate this start-up performance lag. Seeding is accomplished by obtaining about 50 gallons of mixed liquor from another Multi-Flo unit. The already-acclimated, concentrated colony should experience no delay in acclimating to the new unit so that a performance lag may be circumvented.

Cellular activity varies with the temperature. Microbes are less active in the winter, so seeding is essential for winter-time startup.

Table 8 should be used to determine the minimum hydraulic capacity of Multi-Flo systems to serve commercial facilities that do not have kitchen or laundry wastes. In some cases, pretreatment facilities may be required if average wastewater strength exceeds 300 mg/L CBOD₅ or if large volumes of wastewater are generated during peak periods. Whenever the daily wastewater flow is great enough to require more than one Multi-Flo unit, flow splitting should be used for even flow between or among units. Multi-Flo are not operated in series, nor should the flow be split between or among units of different capacities.

Please contact our local factory representative to determine if additional facilities may be required.

Average Daily Flow	Recommended Size of Pretreatment-Tank	Multi-Flo Unit(s)
0 – 500 gpd	300 gallon	FTB-0.5
501 – 600 gpd	300 gallon	FTB-0.6
601 – 750 gpd	500 gallon	FTB-0.75
751 – 1000 gpd	500 gallon	FTB-1.0
1001 – 1200 gpd	750 gallon	Two FTB-0.6
1201 – 1500 gpd	1000 gallon	FTB-1.5
1501 – 2000 gpd	1000 gallon	Two FTB-1.0
2001 – 2250 gpd	1000 gallon	Three FTB-0.75
2251 – 3000 gpd	1500 gallon	Two FTB-1.5
3001 – 4500 gpd	2000 gallon	Three FTB-1.5
4501 – 6000 gpd	2000 gallon	Four FTB-1.5

In designing a system for a commercial occupancy, the designer should consider the following:

- Maximum Month Average Daily Flow
- Minimum Month Average Daily Flow
- Peak Daily Flow
- Peak Hourly Flow
- Concentration and Mass of CBOD₅ for Flows
- Concentration and Mass of TSS for Flows

Operation And Maintenance Procedures For Seasonal Or Intermittent Use Facilities

Frequently, Multi-Flo systems are installed on facilities that are used intermittently or seasonally. Because of the reduced or sporadic loading that these installations receive, the routine service and maintenance requirements are different from that normally expected of a year-round residence. The following recommendations are for the operation and maintenance of both residential and commercial systems that will not be operated on a full-time basis.

Seasonal Facilities are characterized by regular usage for several consecutive months, followed by several months during which no flow enters the unit. If the periods of non-use exceed three months, the Multi-Flo should be shut down and “winterized” by the following procedures:

- 1) Disconnect the unit at the breaker box and unplug alarm.
- 2) Completely pump out all sludge and liquids from the basin.
- 3) Flush and clean effluent filters, if installed, and Multi-Flo filter “socks.”
- 4) Fill unit with clean water.

- 5) Take the aerator out of the unit and clean it by lightly coating it with oil to prevent rusting. Store the aerator upright until the next season operation resumes.

Upon resuming normal use, install the aerator, plug in the alarm, re-connect the unit at the breaker box, and seed the unit. Winterizing and start-up should be performed by an authorized Multi-Flo distributor to insure proper operation of the system.

Intermittent use facilities are characterized by periodic occupancy followed by periods of vacancy. Typically, the vacancy will not last longer than three months. If the unit will be unused for less than three months, timed aeration may be better. Timed aeration consists of connecting the aerator to a timer that limits aeration operation at from two-to-four hours daily. Timed aeration will prevent anaerobic conditions and reduce the power consumption.

- 1) Weekend use: If the system will be used for short periods but on a regular basis (i.e., every weekend throughout the year), timed aeration may be provided during periods of non-use.
- 2) Vacation homes: If the system will be used for several weeks followed by several months of vacancy, the Multi-Flo may be shut off during vacancies. Pumping is generally unnecessary. If possible, the Multi-Flo should be allowed to run a few days after flow has stopped to oxidize any remaining organic material. As a part of start-up, the Multi-Flo distributor should check the unit to insure that the system is operational.

During periods of occupancy, the Multi-Flo unit must be operated in accordance with the manufacturer's recommendations and NSF certification.

During start-up, units may be prone to "sudsing," which is the production of foam from laundry detergents. Laundering should be limited during this period.

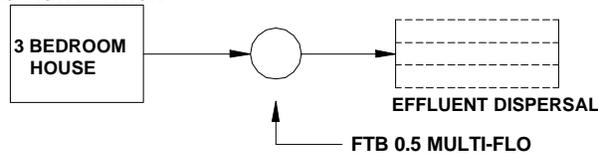
Where freezing is a danger, the Multi-Flo should be pumped during vacancies. Where uplift is a possibility, the uplift restraint must be provided.

Design Examples

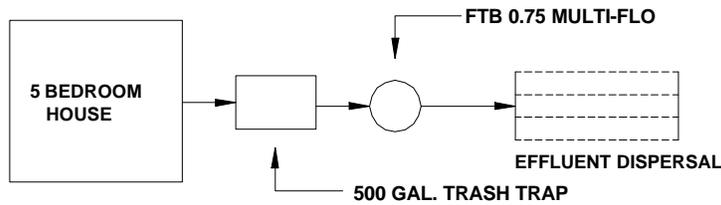
Examples 1, 2, and 3: Residential Occupancies—Residential occupancies are generally designed based on the number of bedrooms, the daily flow assigned for each bedroom. Figure 12 shows typical layouts for single- and multiple-family dwellings. A trash trap is generally optional for single-family, owner-occupied dwellings. A trash trap is advisable for all rental property.

SINGLE FAMILY

BASIC INSTALLATION



INSTALLATION WITH TRASH TRAP OR PRE-TANK



MULTIPLE FAMILY INSTALLATION

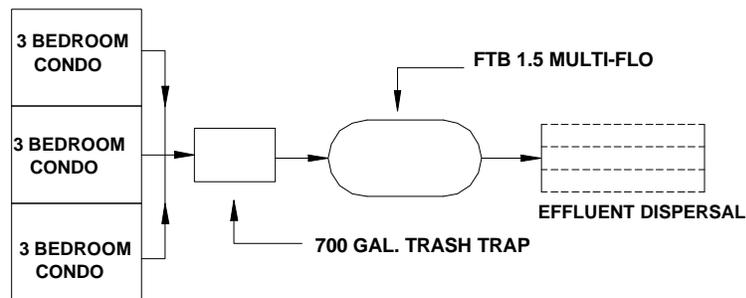


Figure 12—Examples 1, 2, & 3

Example 4: Commercial Occupancy, Office Buildings—Office buildings are designed based on the number of employers, frequenters, and based upon the presence of foodservice facilities. Figure 13 shows a layout of an office building that does not possess foodservice facilities. In designing a system for an office building, consideration must be made for the fact that the design flow may be generated within an 8-to-10 hour period. Thus, flow equalization may be essential to address surges into the Multi-Flo unit. Figure 13 illustrates two typical office building layouts.

Table 10—Example 4 Information	
Parameter	Value
Hydraulic Loading	20-25 Gal/Employee 20-25 Gal/Parking Space
Organic Loading	.04 Lb CBOD ₅ /Employee (240 mg/L CBOD ₅)
Grease Trap	Not Required
Trash Trap	500 Gallon
Pre-Aeration:	Not Required
Flow Equalization	Recommended

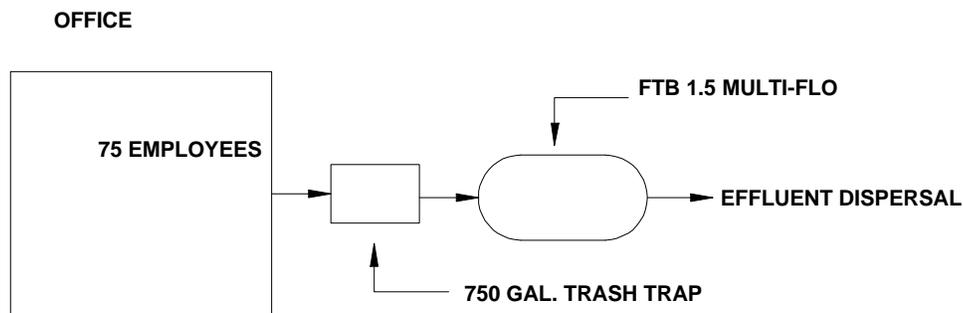
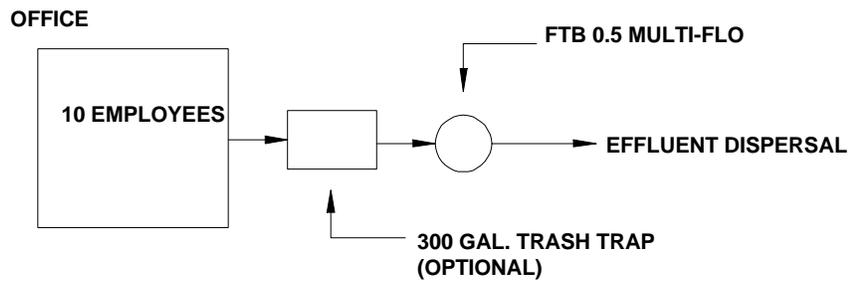


Figure 13—Example 4

Example 5: Commercial Occupancy, Retail Shopping Center Without Foodservice—Retail space wastewater flow is generally calculated based on the number of employees and number of frequenters. Often, the number of frequenters is estimated from the area of retail space.

Table 11—Example 5 Information	
Parameter	Value
Hydraulic Loading	(Retail Sales) 0.1 gal per sq. foot (Office Space) 20-25 gal per employee
Organic Loading	Retail Sales: .3 lb BOD per 1000 sq ft of floor space Office Space: .04 lb BOD per employee
Grease Trap	Not Required
Trash Trap	750 Gallon
Pre-Aeration:	Not Required
Flow Equalization	Recommended

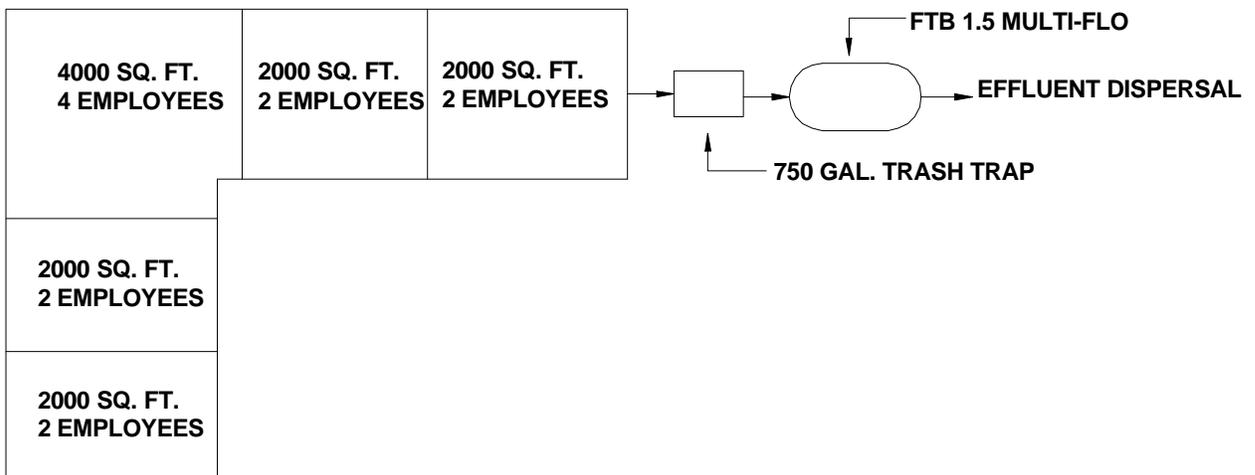


Figure 14—Example 5

Example 6: Commercial Occupancy, With Retail Shopping Plaza With Food Service/Laundry—It is important to provide adequate treatment (and pre-treatment) capacity for this type of facility. The initial design should indicate whether or not a food service or laundromat is proposed so that the Multi-Flo system can be properly designed. Failure to properly design the treatment system will probably result in a system failure when the food service or laundromat is added.

Table 12—Example 6 Information		
Parameter	Value	Total
Hydraulic Loading	20,000 sq. ft. @ 0.1 gal/sq.ft.	2000 gal.
	20 seat restaurant @50 gals/seat	1000 gal.
	6 machine laundromat @ 400 gal/machine	2400 gal.
		5400 gal/day
Organic Loading	BOD of 600-800 mg/L for new facility	
Example	20,000 sq.ft.@0.03 lb/BOD/1000 sq.ft.	6.0 lb BOD
	20 seats(restaurant) @0.35 lb BOD/seat	7.0 lb BOD
	washing machines @ 2.0 lb BOD/machine	12.0 lb BOD
		24.4 lb/day
Grease Trap	required	
Trash Trap	required: min. capacity of 2700 gal.	
Anticipated Service Requirements	routine inspection	1-2 months
	pumping	6-12 months
	filter cleaning	3-12 months

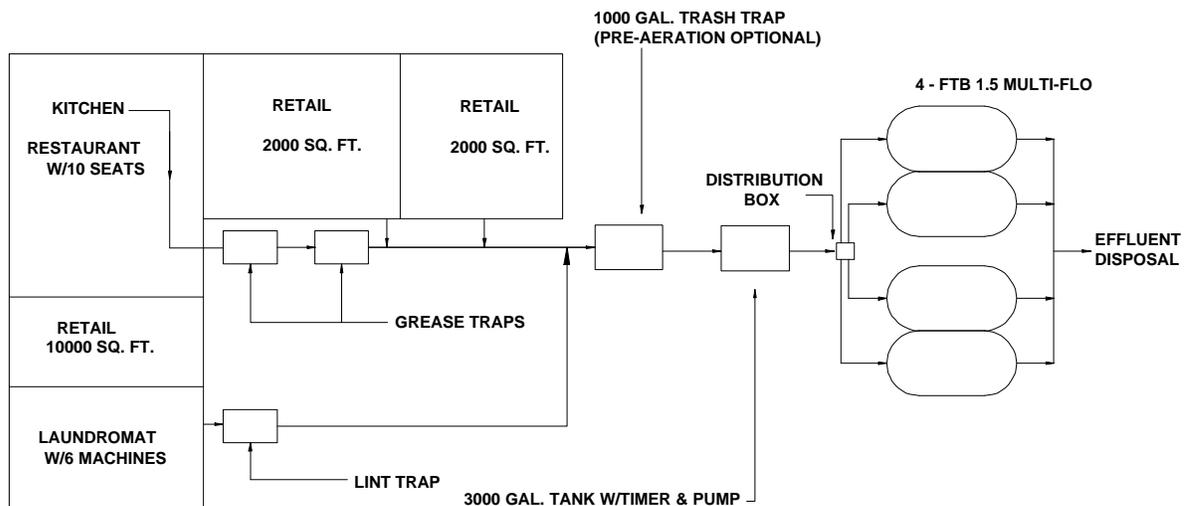


Figure 15—Example 6

Example 7: Commercial Occupancy—Mobile Home Park—Mobile home parks are usually characterized by relatively low (100 – 200 gpd) wastewater flows from each mobile home. For this reason, it is advisable, as well as cost effective, to group several mobile homes on one Multi-Flo system.

Table 13—Example 7 Information		
Parameter	Value	Total
Hydraulic Loading	1400 gal./day	
Organic Loading	0.40 lb BOD per space per day	
Pre-aeration	not required	
Flow equalization	not required unless there is a separate laundry building	
seeding for start-up	not required	
Anticipated Service Requirements	routine inspection	3-6 months
	pumping	1-2 years
	filter cleaning	1-2 years

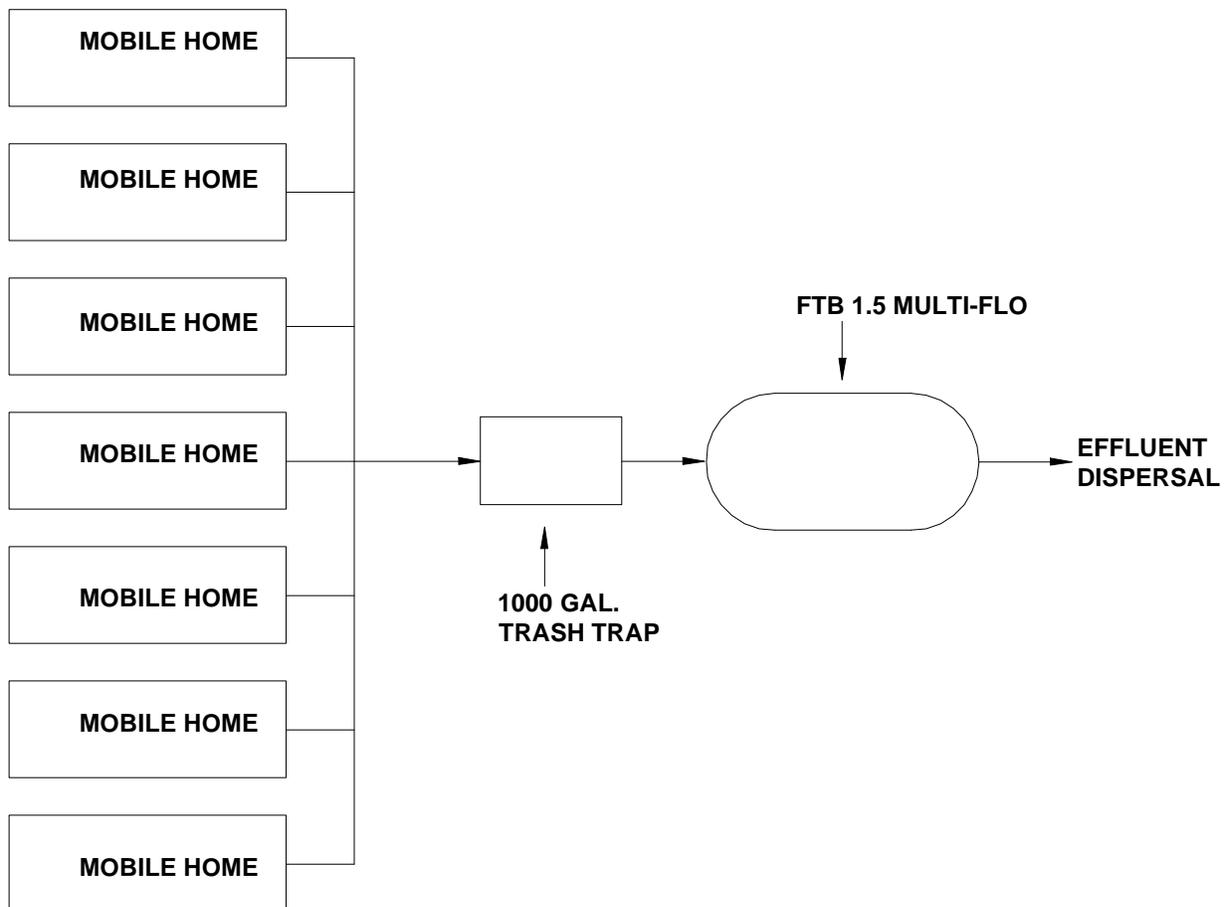


Figure 16—Example 7

Example 8: Commercial Occupancy—Institution—Institutional facilities present several problems that must be addressed in the total design. Depending upon the type of facility involved, consideration must be given to possible food service, laundry facilities, showers, as well as high water usage and heavy peak flow periods.

Parameter	Value	Total
Hydraulic Loading	hospital	200 gal/bed
	nursing home	100 gal/bed
	school	15 gal/student
	employee	20 gal/person
	kitchen	5 gal/person
	showers	5 gal/student
	laundry	400 gal/machine
Organic Loading	hospital	0.7 lb BOD/day per bed
	nursing home	0.3 lb BOD/day per bed
	school	0.03 lb BOD/day per student
	employee	0.04 lb BOD/day per employee
	kitchen	0.03 lb BOD/day per meal
	showers	0.01 lb BOD/day per student
	laundry	2.0 lb BOD/day per machine
grease trap	required	
trash trap	required	3,000 gal.
Pre-aeration	required if oxygen requirements exceed the capacity of the Multi-Flo unit	
Flow equalization	"	
seeding for start-up	"	
Anticipated service	routine inspection	monthly
requirements	pumping	6-12 months
	filter cleaning	6-12 months

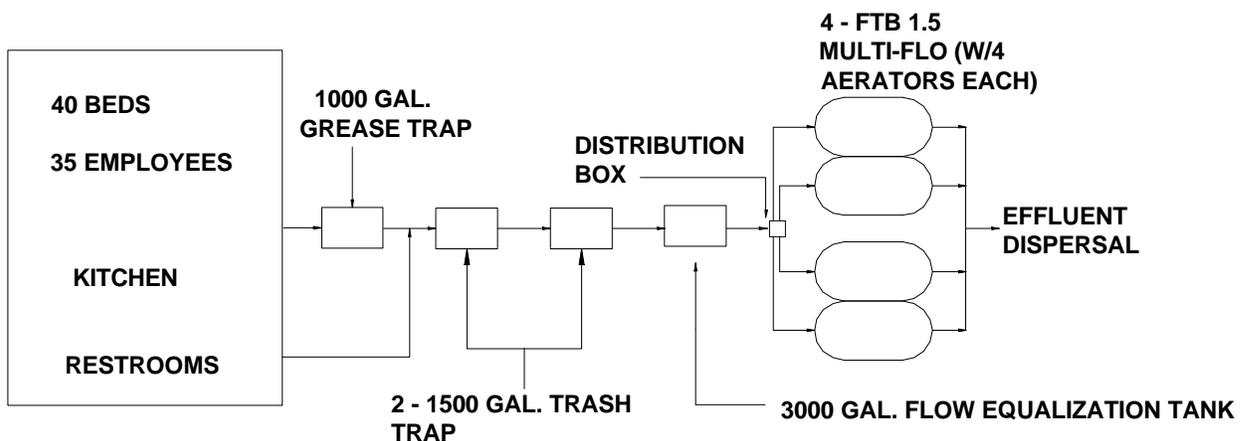


Figure 17—Example 8

MULTI-FLO

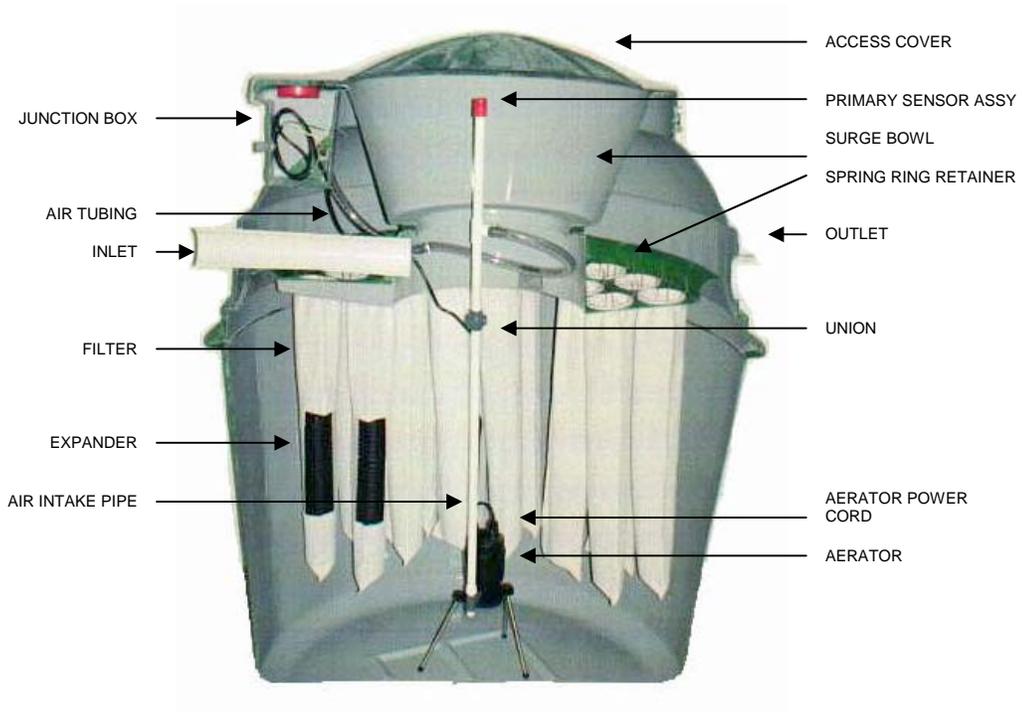
WASTEWATER TREATMENT SYSTEMS

PROCEDURES FOR ASSEMBLY AND INSTALLATION

**A Division of Consolidated Treatment Systems, Inc.
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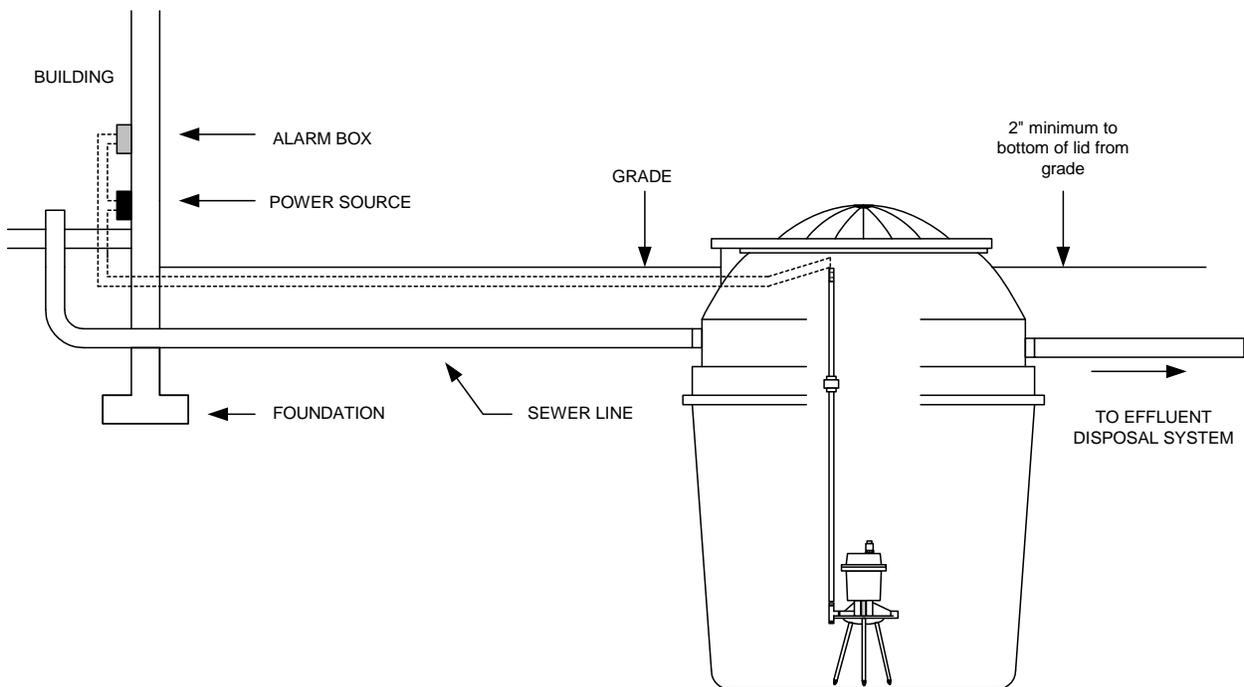
MULTI-FLO TANK COMPONENTS

Fig. 1.1



TYPICAL INSTALLATION (Cross Section)

Fig. 1.2



MULTI-FLO
Procedures for
Assembly and Installation

Unless otherwise noted, the instructions within this manual may be used for all models (FTB 0.5, FTB 0.6, FTB 0.75, FTB 1.0 and FTB 1.5) of the **MULTI-FLO** wastewater treatment unit.

The installation must comply with state and local regulations

SECTION 1.0 SITE PREPARATION

1.10 LOCATION

1.11 **An accurate, detailed site plan is essential for successful installation of *MULTI-FLO* units.** The site plan should show the locations and elevations of the wastewater treatment unit and effluent disposal system. Check to make sure the site plan accurately reflects the conditions actually existing at the site and that all required set-backs (i.e., to property lines, wells, etc.) are being met.

1.20 GRADE AND GROUND CONTOUR

1.21 Position the wastewater treatment unit in accordance with the plan. Confirm the accuracy of the elevations shown in the plan.

SURFACE WATER MUST NOT ENTER THE SYSTEM AROUND THE ACCESS COVER OR FROM THE DISCHARGE PIPE.

1.30 COVER EXPOSURE

1.31 The access cover must be exposed at all times to permit the system to function properly and to allow for routine maintenance. There should be a minimum of two (2) inches between the bottom of the lid and the finished grade (refer to Fig. 1.2).

1.40 BUILDING SEWER LINE

1.41 Make sure that the sewer pipe from the building has the proper slope to meet the inlet invert of the **MULTI-FLO** and maintain the grade requirements for the exposure of the cover.

1.50 EXCAVATION PREPARATION

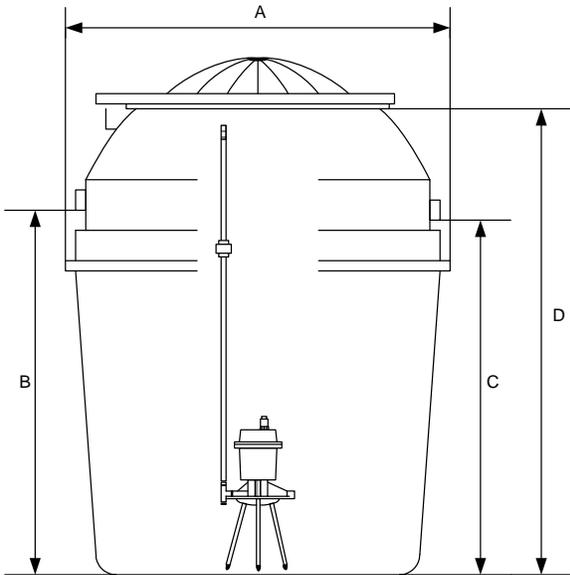
1.51 Mark off an area at least one foot larger than the dimensions of the **MULTI-FLO** and maintain the grade requirements for the exposure of the cover.

1.60 EXCAVATION (refer to Fig. 1.3)

1.61 Prepare the excavation. The opening should follow the area laid out in Section 1.51. Determine the required depth of the excavation based upon the elevation of the invert of the inlet sewer line (B) or the elevation of the finished grade (D), both of which should conform with the site plan. These dimensions are given for each model in Figure 1.3. NOTE: If the distance from the finish grade elevation to the bottom of the excavation exceeds the dimension (D) shown in Figure 1.3, a riser will be required (refer to Section 2.40). If digging in soil containing large rocks or clods of dirt, it may be necessary to remove an extra 6" to allow for bedding material (refer to Item 1.63).

MULTI-FLO TANK DIMENSIONS

Fig. 1.3



MODEL NUMBERS	DIMENSIONS			
	A	B	C	D
FTB 0.5	63	58	56	76
FTB 0.6	71	58	56	75
FTB 0.75	71	65	63	79
FTB 1.0	78	65	63	83
FTB 1.5	135 x 63	58	56	76

- A = OUTSIDE DIAMETER
- B = INLET INVERT FROM BOTTOM OF EXCAVATION
- C = OUTLET INVERT FROM BOTTOM OF EXCAVATION
- D = FINAL GRADE FROM BOTTOM OF EXCAVATION

1.62 Level the floor of the excavation.

1.63 If bedding material is required, place at least six inches of sand, pea gravel or other similar, suitable granular material on the bottom and smooth out evenly. If ground water is present, use pea gravel or class 2 river rock to build a base for the system. In all cases, the bottom should be level and well compacted. **Note: Localized soil and groundwater conditions may require specialized procedures to assure proper installation.**

SECTION 2.0 INSTALLATION OF THE TANK

2.10 PLACING THE WASTEWATER TREATMENT UNIT INTO THE EXCAVATION
(Refer to Fig. 2.1)

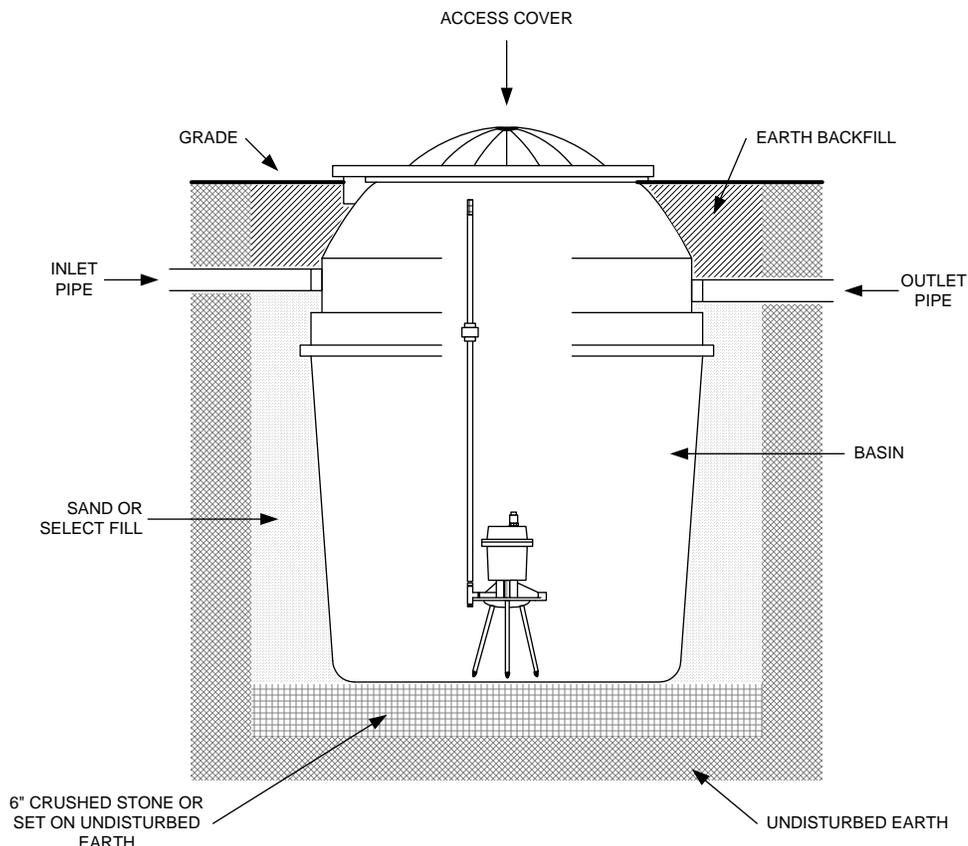
2.11 Rig the tank to lift. See unit specifications for actual weights. Except for the FTB 1.5, ropes can be attached to the inlet and outlet. Note: The FTB 1.5 has lifting hooks that must be used.

2.12 Slowly lower the tank into the hole, setting it carefully on the bottom.

2.13 Position the unit, so that the inlet (higher four inch pipe) is aligned with the sewer line from the building. (See Fig. 1.3)

BACKFILLING PROCEDURES

Fig. 2.1



2.20 LEVELING THE WASTEWATER TREATMENT UNIT

CAUTION: The system must be level. A tilted system will not work.

2.21 Place a level across the center tower in several directions. Adjust the tank until it is level. Leveling can be accomplished by shifting the bedding materials. Bedding materials must be evenly distributed to support the weight of the filled tank. **DO NOT USE WEDGES OR OTHER DEVICES TO LEVEL THE TANK.**

2.22 An alternative to using a mechanical level is to plug the outlet pipe with a four inch plastic pipe cap. Fill the area outside of the circular weir with water. As noted in 2.21, adjust the unit until it is perfectly level.

2.30 FILLING THE TANK WITH WATER

CAUTION: To avoid damage from floatation always fill the tank.

2.31 Fill the tank with clean water. Do not fill with water from a pond, river or ground water in the excavation because this water will contain silt or sediment.

2.32 While filling, check frequently to make certain that the tank remains level. If the tank shifts or seems to settle unevenly, discontinue filling and make the necessary corrections to level the tank.

2.33 When the water begins to flow over the weir, stop filling the tank.

2.40 BACKFILLING THE TANK (Fig. 2.1)

2.41 Once the tank has been leveled and has been filled with at least two (2) feet of water, backfilling can begin.

2.42 Using sand, pea gravel or other selected fine material carefully begin backfilling (by hand) until there is approximately 2-3' of compacted fill around the tank.

2.43 After checking the tank to insure it is level, place the access lid on the tank and carefully backfill to the bottom of the outlet pipe. Care should be taken with the backfilling procedures to prevent damaging the tank with rocks or clods of dirt, especially if the original soil is used for backfilling.

2.44 Glue and firmly insert the inlet and outlet sewer pipes (4" Sch. 40 PVC) into their respective fittings. **CAUTION: To prevent any damage to the inlet or outlet pipes due to settling or backfilling, make sure that both the inlet and outlet pipes are set on undisturbed or firmly packed fill material prior to final backfilling.**

2.45 Finish backfilling to a level approximately 2 inches below the access lid. When landscaping is completed, the access lid should be at, or above, finished grade level.

2.46 If the final elevation of the **MULTI-FLO** is below grade so that surface water can enter the access opening of the plant, (1) a dosing pump can be installed prior to the **MULTI-FLO**; or (2) a riser (not exceeding 20") can be provided on the **MULTI-FLO**. **CAUTION: The addition of a riser will make access for service more difficult.**

2.50 INSTALLATION OF FILTER BAGS AND EXPANDERS

2.51 Carefully place an expander into the bag and slide it to the bottom. Be careful not to rip or tear the bag. Even the smallest opening will cause the unit to malfunction.

2.52 Insert the closed end of the filter bag into one of the holes in the hanger plate.

2.53 Continue this process until all filters and expanders are installed. All holes in the hanger plate must have a filter and an expander.

2.60 INSTALLATION OF SPRING FASTENERS

2.61 All filters and expanders must be installed.

2.62 Grasp the spring fastener. (See Fig. 2.2)

2.63 Squeeze the arms of the fastener together until it will slip into the filter bag up to the grooves. (See Fig. 2.3)

2.64 Release the spring, so that the top of the groove in the fastener is on top of the ring that is inside the filter. The bottom of the groove should be in contact with the underside of the hanger plate. The fastener is now holding the filter to the hanger plate. (See Fig. 2.4)

2.65 Place a second spring fastener in the filter at a right angle, so that it lies across the first fastener.

2.66 Continue until each filter has two fasteners in place.

SPRING FASTENERS INSTALLATION

Fig. 2.2



Fig. 2.3



Fig. 2.4

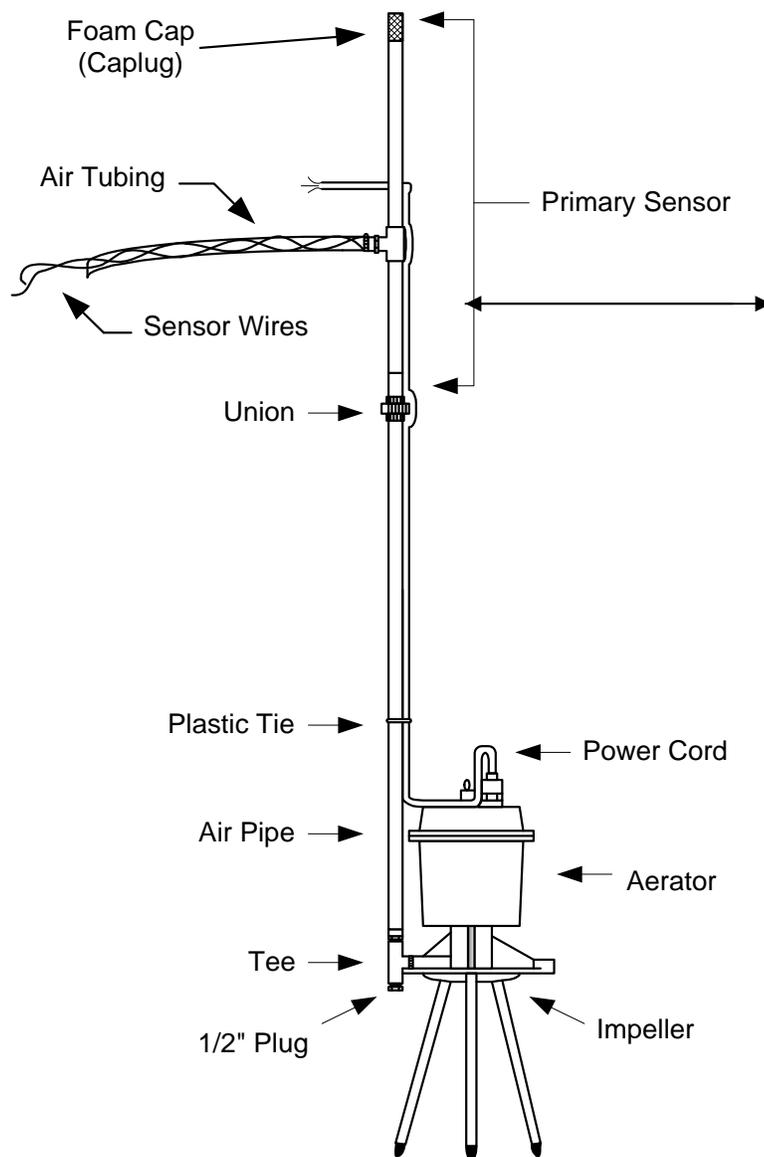


2.70 AERATOR ASSEMBLY AND INSTALLATION

- 2.71 Remove all parts of the aerator from the box. This should include: aerator, legs (3), tee, 1/2" plug, 1/2" nipple, and the owner's manual.
- 2.72 Screw the three (3) legs into the angular threaded holes in the bottom of the aerator cross-shaped piece. Make sure the leg is screwed all the way into the cross.
- 2.73 A plastic cap should be on the plain end of each leg.
- 2.74 Turn the aerator on its side and spin the impeller by hand several times. **THIS STEP IS IMPORTANT.**
- 2.75 With the aerator in the position shown (See Fig. 2.5) assemble the plastic tee to the nipple on the aerator.
- 2.76 Screw the one-half inch plug into the bottom of the tee.
- 2.77 Screw the threaded end of the air intake pipe into the top of the tee.

AERATOR ASSEMBLY

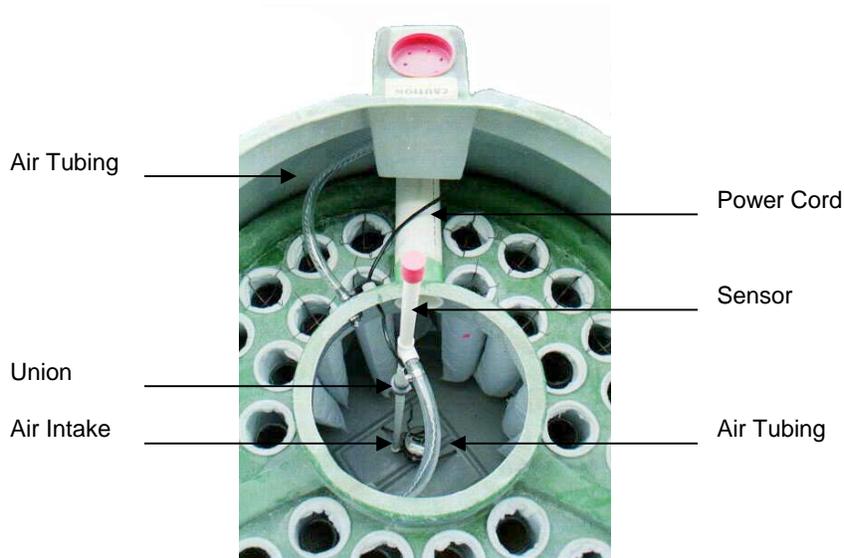
Fig. 2.5



- 2.78 Attach the sensor assembly (Fig. 2.6) with the union to the air intake pipe. Tighten as much as possible by hand. **NOTE:** Be sure that the O ring seal is in the union half of the assembly.
- 2.79 Tie the aerator power cord to the air intake pipe with the plastic ties. **CAUTION: Do not pull or stretch the power cord. To facilitate removal, a nylon rope or chain can be attached to the lifting ring on the top of the aerator.**
- 2.80 By grasping the air intake pipe, carefully lower the aerator assembly through the center of the tank opening to the bottom. **CAUTION: Be sure to keep the air tubing from crimping which will prevent air flow.**

SENSOR ASSEMBLY

Fig. 2.6



- 2.81 Run the aerator power cord through the fittings as shown in figure 2.6 and into the junction box. **CAUTION: Use care when running the power cord through the fittings. Damage to the cord will void the warranty.**

SECTION 3.0 ELECTRICAL CONNECTIONS (ALARM AND AERATOR) (Refer to specific sheet of direction for each model)

SECTION 4.0 START-UP PROCEDURES

4.10 CHECKING THE AERATOR

- 4.11 Once the aerator and alarm have been installed, and all electrical work is completed, power should be supplied to the aerator and alarm.
- 4.12 Check the aerator to insure proper operation. If no air bubbles are observed coming from the aerator, immediately disconnect the power source. Refer to Items 1A, 1B, and 1C of the Trouble-Shooting Checklist for corrective action.

4.20 CHECKING THE FILTERS

4.21 Once the aerator is running, check each filter to see if any air bubbles are escaping under the filter ring. If so, remove the clips, re-adjust the filter and re-install the clips. Some adjustment may be necessary to eliminate the bubbles.

4.30 CHECKING THE ALARM

4.31 With the power being supplied to the aerator and alarm, press the “test” button to activate the alarm. Note: YOU MUST HOLD THE TEST BUTTON DOWN FOR 6-to-7 SECONDS BEFORE THE ALARM ACTIVATES.

4.32 Shut the power off to the aerator and check if the alarm is activated. Again, allow 6-to-7 seconds for the alarm to sound.

4.33 If the alarm is not activated during these tests, refer to Items IIA and IIC of the Trouble-Shooting Checklist for corrective action.

4.34 If the alarm activates after 10-15 minutes of operation, reverse the white and black sensor wires in the alarm.

4.40 UNIT START-UP

4.41 Once the aerator and alarm have been checked and are operational, the unit is ready to receive sewage flows.

4.42 Normally, it is not necessary to add any chemicals or enzymes to facilitate unit start-up. It is helpful, however, to restrict the discharge of excessive amounts of gray water from showers and laundry during the initial 6-to-8 weeks of use.

4.43 If the **MULTI-FLO** system exhibits a gray dishwater appearance in the aeration chamber, or has a noticeable odor, contact the factory or the local authorized representative for the proper procedure to follow to attain normal operation.

SECTION 5.0 USE OF A PRETREATMENT TANK (Fig. 5.1)

MULTI-FLO has been designed and certified to function without the use of pre-treatment tank. However, installation of a pre-treatment tank, if used to address local requirements or to reduce maintenance problems, will not adversely affect unit performance if it is properly sized and installed.

If a pre-treatment tank is installed, the liquid capacity of the pre-tank should be between 50-to-100 percent of the treatment capacity of the **MULTI-FLO**. Slightly larger tanks can be used with the FTB 0.5 and FTB 0.6. Please refer to the **MULTI-FLO** Design Guide for details.

MULTI-FLO

WASTEWATER TREATMENT SYSTEMS

MANUAL FOR OPERATION, MAINTENANCE AND TROUBLE-SHOOTING

A Division of Consolidated Trmt. Systems, Inc.
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I. BASIC OPERATION AND MAINTENANCE REQUIREMENTS

The following is a description of the normal maintenance required to insure continuous satisfactory operation of the **MULTI-FLO** systems:

START UP:

Allow 6-to-8 weeks for sufficient bacteria to provide proper treatment in the **MULTI-FLO**. During this period, there may be sudsing from laundry wastes. *Sudsing can be reduced by limiting the volume of laundry washed daily and by using a low-sudsing detergent.* In situations where excessive laundry water is expected, "seed" the **MULTI-FLO** with "mixed liquor" from another unit. To prevent short-term hydraulic overloads, spread out laundry washing.

PUMPING EXCESS SOLIDS:

Periodic pumping is necessary to remove excess bacteria and other solids. For a typical single-family dwelling, the **MULTI-FLO** will require pumping at 2-to-4 year intervals. **MULTI-FLO** representatives can advise customers when their **MULTI-FLO** should be pumped.

FILTER CLEANING:

Filters should be cleaned whenever a **MULTI-FLO** is pumped. Filters may need to be laundered if the aerator is shut off for extended periods or they are plugged by grease, soap, residue or solids.

AERATOR REPLACEMENT:

The average life expectancy of the aerator is 3-4 years. New and replacement have a two-year warranty.

ALARM:

MULTI-FLO alarm systems indicate both aerator failure and filter plugging. Although the homeowner will not normally experience immediate filter plugging, the **MULTI-FLO** service representative should be notified as soon as the alarm is activated.

SERVICE CONTRACT:

MULTI-FLO units require periodic maintenance. With the purchase of each **MULTI-FLO**, every owner receives a two-year service contract, which provides a warranty on all parts service, including a minimum of two inspections of the unit each year. After the initial two years of operation, owners are urged to maintain their service contracts to insure regular inspection and service of the **MULTI-FLO** system. **NOTE: The warranty does not include misuse or abuse of the system.**

REPLACEMENT PARTS/SERVICE:

Contact the factory for the name of the closest sales/service representative.

SUMMARY OF MAINTENANCE REQUIREMENTS (Residential)

Start up period.....6-to-8 weeks after sewage first enters unit

Pumping frequency.....every 2-to-4 years

Filter cleaning.....every 2-to-4 years

Aerator replacement3-to-4 years

Routine inspection frequencyevery 6 months (minimum)

NOTE: Due to differences in wastewater strength, increased user abuse, and hydraulic surges, additional treatment facilities and/or increased maintenance may be required. Please check with your **MULTI-FLO** representative.

II. EQUIPMENT AND MATERIAL ESSENTIAL FOR SERVICING MULTI-FLO UNITS

100' garden hose with spray nozzle

100' extension cord

1/3 hp submersible pump (little giant) with outlet made of flex pipe.

Small utility pump with 1/2 - 5/8" garden hose (6') on inlet and outlet (Teal model IP 579E,
Simer Minivac Model M40 or equal.)

Pliers - standard with insulated handles

Pliers - channellock

Caulking gun

Caulking, silicone

Hammer

Electrical tape

Wire nuts

Knife

Screwdriver

Replacement parts:

- aerator

- filter bag expanders

- filter bags

- stainless steel spring clips

- pressure switches (for old style units)

- alarm

- latch assembly

Wiping rags

Gasket material

Adhesive for gasket

Volt ohm amp meter

Sample collection jars (1 quart capacity)

III. SERVICING PROCEDURES

- Note: During all service procedures, be sure to observe good hygiene practices, including wearing gloves and proper hand washing.
- Step 1 Layout garden hose, wiping cloths, tools, electrical tape, utility pumps, and extension cord.
- Step 2 Turn off electrical power to **MULTI-FLO**.
- Step 3 Remove lid to **MULTI-FLO**. Check surge bowl for signs of high water or foaming. Check the area around the **MULTI-FLO** for signs of previous overflow.
- Step 4 Wash the inside of the lid and surge bowl of **MULTI-FLO**.
- Step 5 Remove the surge bowl and check the gasket on both the bottom and top. If it is loose, re-glue it; if it is damaged, replace it with *new gasket material*.
- Step 6 Check the filters for possible plugging by running water into the center chamber and check for a quick, noticeable rise in the water level inside of the tower. If filters are plugged, follow procedures outlined under "Filter Cleaning."
- Step 7 Collect a sample of the mixed liquor for a settleable solids test.
- Step 8 Using the utility pump, vacuum the top of the weir to remove accumulated solids. Follow procedures outlined in this manual under "Cleaning the Hanger Plate and Weir: Procedure." Check for sludge build-up in the bottom of the filter bags. If the solid accumulation on top of the weir is excessive (greater than 1/2" thick) or appears to noticeably be more concentrated in one area, check for a torn filter(s), improper placement of clips, thin filter material, or a gap between the hanger plate and the ring on the top of the filter. Make appropriate corrections.
- Step 9 Remove aerator and check for accumulation of foreign material wrapped around impeller.
- Step 10 Replace aerator and check the intake tube to insure that it does not have any blockage. On newer units, check to ensure the clear plastic tube is not twisted or kinked. Kinks in the hose will cut off aeration to the treatment tank and allow septic conditions to develop. The plastic line on pressure switch unit must not kink.
- Step 11 Reinstall the surge bowl. **Make sure that the flat surface of the surge bowl is placed next to the electrical box or that the black marking stripes align properly.**
- Step 12 Close lid to **MULTI-FLO**. Make sure the lid is properly secured with a tamper-proof bolt, padlock or other approved locking device.
- Step 13 Turn on the electrical power to the **MULTI-FLO**.
- Step 14 Check out alarm system.
- Step 15 After appropriate settling time (possibly 24 hours) check settleable solids reading to determine if the **MULTI-FLO** should be pumped before the next routine service call. Advise homeowner accordingly.
- Step 16 **Be sure to leave the owner notice of the inspection/service call, inspection results, service provided, and recommendations.**

IV. PUMPING

Bacteria and other microorganisms present in the wastewater use soluble organic material as a food source, converting it into more microorganisms (biomass), water, and carbon dioxide. As the colony matures, the numbers of microorganisms increase until they exceed the supply of organic material to maintain them. Due to the resulting starvation, organisms will begin to die and then be metabolized as new organisms are formed. Metabolized organisms reduce the overall solids (or “sludge”) volume.

There will be a gradual increase in solids) due to the accumulation of inert remains of dead organisms and non-degradable material in the wastewater. As the solids increase, the mixed liquor becomes thicker, reducing the scouring effect on the filters. Periodically, the solids must be pumped from the **MULTI-FLO** to prevent filter plugging and maintain adequate aeration within the system.

PUMPING FREQUENCY:

The rate of solids accumulation—and resultant pumping—is dependent upon the quantity and strength of wastewater entering the plant, i.e.; the greater the waste load, the more frequently the **MULTI-FLO** should be pumped. Normally, residential systems should be pumped every 2-to-4 years. Units serving commercial occupancies may need to be pumped every 1-2 years, depending on the waste load.

DETERMINING PUMPING FREQUENCY:

Trained service personnel can help owners establish a pumping frequency by performing a 24-hour settleable solids test of the mixed liquor during semi-annual service:

Procedure

1. Mark a quart jar into 10 equal portions
2. While aerator is running, fill the jar with mixed liquor suspended solids by lowering the jar into the center aeration chamber.
3. Measure the percent of the original volume occupied by the sludge after it has settled for 24 hours.

The optimum level of settleable solids (24 hours) is normally between five and 50 percent. Whenever the percent of settled sludge exceeds 50%, the unit should be pumped.

PROCEDURE FOR PUMPING THE MULTI-FLO:

1. Shut off the **MULTI-FLO** and allow solids to settle for 30-60 minutes.
2. Remove access cover and the surge bowl.
3. Lower the hose into the center aeration chamber. *Care should be taken to avoid knocking or damaging the aerator, air intake tubing or power cord. Be careful with the older model FTB 0.75 because the aerator sits on a platform.*
4. Pump solids from the bottom. If the filters are not to be removed, be sure to hose down the filters and the bottom of the hanger plate.

5. Pump down the tank, until the liquid level is at the top of the aerator. This will leave sufficient seed material to allow start-up conditions to develop.
6. *In areas with a high water table, immediately refill the **MULTI-FLO** with clear water to prevent shifting or flotation.*

V. FILTER CLEANING

Under normal operating conditions, the filters in the **MULTI-FLO** do not require manual cleaning or backwashing. The extent of the bacterial buildup on filter surfaces is limited by the constant scouring from the aeration and sloughing of the solids.

The biomat that develops on the surface of the filter enhances filtration. Therefore, *cleaning of the filters is not recommended unless actual plugging is occurring.* The following conditions may cause plugging of the filters to occur:

1. Excess buildup of solids in the **MULTI-FLO** (see Pumping Procedures).
2. Extended septic conditions (see Aerator Replacement). Normally, the filters will not plug unless septic conditions exist for a period more than 7-to-10 days.
3. Excessive grease entering the **MULTI-FLO**. This may become a problem at a food service facility or in a home with a garbage disposal.
4. Hydraulic overload. (See Troubleshooting Guide for remedies.)
5. Organic overload. (See Troubleshooting Guide.)

CLEANING PROCEDURE (Standard Procedure):

1. Remove spring ring retainer from filter.
2. Without removing the filters, grasp the filter by the ring at the top and move it up and down in the weir to scrape off the accumulated solids and biomat.
3. Check the interior of the filter. If there is an accumulation of sludge in the bottom, remove the filter and pour the sludge into the aeration chamber.
4. Replace the filter in weir and push back in place. Replace the spring ring retainer.
5. If the water fills up the filter as fast as it is being pushed down through the weir, no further cleaning is required. Follow the same procedure with the remaining filters. **NOTE: This procedure is only recommended when done during routine pumping. If the above procedure does not adequately cleanse the filters, or if the plugging resulted from other causes perform the following procedures:**
 - a. Replace the existing filters with a clean set.
 - b. Launder the old filters on gentle cycle and allow them to air dry (do not use a heated dryer as this will damage filters). Add bleach with the detergent (or during the rinse cycle) to enhance the cleaning of the filters and provide personal health protection.

Do not attempt to clean the filters by washing them with a garden hose or pressure washer. This can damage the filters or leave a residue within the fabric which will cause the filters to plug prematurely.

Hydraulic or organic overloads should be considered if filters plug frequently (i.e., less than 12 month intervals), or shortly after the unit goes into operation. Contact the **MULTI-FLO** distributor or factory representative for assistance.

VI. CLEANING THE HANGER FILTER PLATE AND WEIR

Often, "pin floc" (less than 0.03 inches in diameter) forms as a result of over-oxidation of the sludge. Pin floc is observed in units with low hydraulic loads and long retention times, which allow digestion of the bacterial cells to occur. These fine, mostly inert, solids may pass through the filter fabric, especially if an inadequate biomat has formed on the filter surface. Pin floc may occur in new units though hydraulic surges (laundry, showers, etc.) may also force some of the small particles through the filters.

Pin floc usually settles to the bottom of the filters. However, some of the particles may be carried upward through the filters and settle on the upper surface of the hanger filter plate. It will be necessary periodically to remove the settled solids from both the hanger plate and inside of the filters to prevent solids from being carried over the weir.

PROCEDURE:

1. pump the settled solids off the top of the hanger plate using a 1/2 to 5/8 inch garden hose for an intake and discharge,. Place the discharge end into the center chamber.
2. If there is a significant amount of settled sludge in the bottom of the filters, pump the sludge out using a 4 foot section of 3/4 inch PVC pipe attached to the end of the intake hose. If there is no access to a pump, remove the filter and pour the sludge into the center aeration chamber. If surface discharge of the effluent is used it is good policy to plug the 4 inch discharge line until cleaning is completed.

CLEANING FREQUENCY:

Under ordinary conditions, the top of the hanger and weir should be cleaned during each routine inspection (every 6 months). Sludge should be removed from the interior of the filters whenever it exceeds 6 inches in depth or if clumps of floc float at the top of the filter (approximately once every 12 months).

It is not advisable to remove or clean the filters more than is necessary. Unnecessary cleaning will wear or damage filters and expanders.

VII. AERATOR REPLACEMENT

PROCEDURE:

1. Turn off the electricity before working on aerator.
2. Remove the three wire nuts and disconnect the aerator electrical cord from the main power cable.
3. Loosen the pressure fitting in the center tower and gently pull the power cord through so that the aerator is free.
4. Grasp the air intake tube and raise the aerator until the upper union (located in the middle of the air intake tube) is visible.
5. Disconnect the sensor (upper) portion of the intake and lay it back on the hanger plate. The aerator is now free and can be moved from the **MULTI-FLO**.

6. Change aerators and replace in the *MULTI-FLO* by following the above procedure in reverse.

VIII. ALARM REPLACEMENT

PROCEDURE:

1. Turn off the electricity before working on the alarm.
2. Unplug the alarm or disconnect the power cord.
3. Unscrew the face plate of the alarm.
4. Remove the two wire nuts and disconnect the green and white sensor wires.
5. Remove the alarm box from the wall or mounting bracket and replace with a new alarm.
6. Reconnect the sensor wires (white to white; black to black).
7. Replace the face plate; plug in the alarm and restore power.
8. Check alarm by pressing test button.

IX. SAMPLE COLLECTION

MULTI-FLO units produce an effluent exceeding the performance requirements of NSF Standard 40 (Class I) for aerobic treatment plants: 30 day average of <25 mg/l CBOD and <30 mg/l TSS. Local health agencies may require periodic sampling to confirm this performance. If this is necessary, the following procedure should be followed.

To collect samples from the *MULTI-FLO*, care must be taken to get a reliable and uncontaminated samples as **effluent is discharged from the unit**.

1. Provide a suitable port on the outlet of the *MULTI-FLO* (see Fig. 1). The port should be at least 6" in diameter, with a minimum depth of 8" below the effluent line.
2. Using a clean cloth, wipe the interior of the effluent line, where it enters the sampling port, to remove any debris that may have accumulated.
3. Drain water into the cleanout before the *MULTI-FLO*, to generate a flow through the unit. Allow the flow to continue for approximately one (1) minute to flush the line.
4. Shut off the water and dip the water out of the sampling port. Discard this water.
5. Turn on the water and collect a sample as effluent flows into the sampling port. Do not collect water that has accumulated in the sampling port. Take care to avoid catching dirt or other debris while collecting the sample

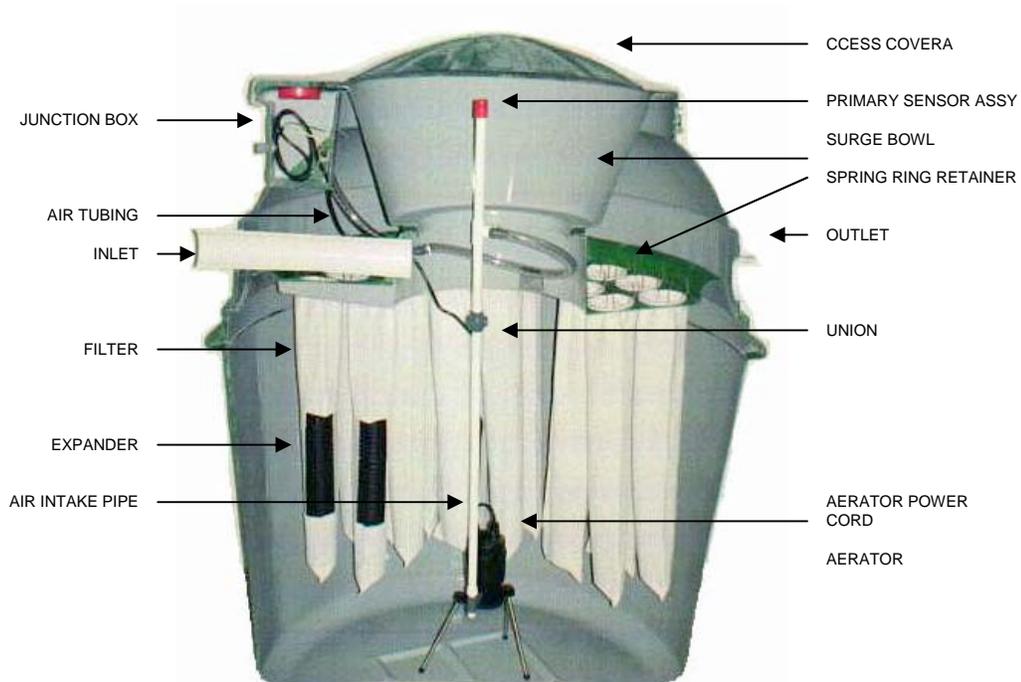


**MULTI-FLO WASTE TREATMENT SYSTEM
OPERATIONAL CONTROL CHART**

OPERATION CONDITION	COLOR: AERATION TANK	ODOR	PERCENT SETTLABLE SOLIDS	EFFLUENT QUALITY	FILTER CONDITION	POSSIBLE PROBLEM	CORRECTIVE ACTION
Plant start-up 0-6 weeks	Clear to light brown; White suds	None	< 5%	Clear	No signs of plugging	None: Normal start-up condition	No action required Re-check in 6 months
Plant start-up 0-6 weeks	Clear to light brown; Heavy whites suds periodically overflow under lid, mostly during laundry.	None	< 5%	Clear	No signs of plugging; possible grey growth on filter hanger plate	Light loading to plant; insufficient food for organisms sudsing due to hydraulic overload during laundry	Reduce frequency of laundry to 2- 3x a day. Refer to Troubleshooting Section IV-A
Normal operation: typically less than 2 years of use since last pumping	Light brown to medium brown	None	5 – 30%	Clear	No signs of plugging	None: typical operation condition	No action required; re-check in 6 months
Normal operation: 2-3 years of use since last pumping	Medium brown to dark brown	None	20 – 50%	Clear	No plugging or slight plugging observed	No immediate problem. May require pumping in the next 6 months	None; re-check in 6 months (routine) Pumping may be recommended if not on service contract (refer to Troubleshooting Section IV, Pumping)
Normal operation: typically 3 – 5 years of use since last pumping	Very dark brown with heavy brown foam. Possible foaming problems (refer to Troubleshooting Section V)	Slight	> 50%	Clear	Slight to moderate plugging. Water level surges when flow enters the plant.	Plant needs to be pumped	1. Pump sludge from tank 2. Replace filters if plugging is observed (i.e., water level remains elevated in surge bow)
Plant in operation for more than 3 months: poor treatment	Grey, minimal turbulence	Slight to moderate septic odor	< 5%	Turbid to bluish grey	Possible plugging within 3 – 4 months	Insufficient aeration	Refer to Troubleshooting Section I: Aerator
Plant in operation for more than 3 months: poor treatment	Bluish grey, similar to dishwater; white soap suds with overflow of white suds under lid. Good turbulence observed.	Slight	< 5%	Turbid, cloudy	Plugging with 2 – 3 months.	Organic overload	Refer to Troubleshooting Section VI – D
Previous plant operation has been normal. Sudden unexpected development of poor treatment and operation	Grey to black	Strong, may be septic or from some type of chemical	0 – 50%	Turbid to bluish grey	Possible plugging, greyish slime observed on filter hanger plate	Discharge of toxic materials into plant	1. Identify source of toxic material 2. Eliminate above source 3. Pump plant and re-start. Contact factory.

MULTI-FLO

WASTEWATER TREATMENT SYSTEMS



PROCEDURE FOR PUMPING THE **MULTI-FLO**:

1. Shut off the **MULTI-FLO** and allow solids to settle for 30-to-60 minutes.
2. Remove access cover and the surge bowl.
3. Lower hose carefully into the center aeration chamber. Care should be taken to avoid knocking or damaging the aerator, air intake tubing or power cord. Be especially careful with the old style FTB 0.75 as the aerator sits on a platform.
4. Pump solids from the bottom. If the filters are not removed, be sure to rinse the filters and the bottom of the hanger plate.
5. In areas with a high water table, immediately re-fill the tank with clear water to prevent shifting or floatation. In all instances, re-fill the tank to a level that covers the aerator. **To prevent the motor from overheating, do not allow the aerator to run unsubmerged.**

MULTI-FLO

MULTI-FLO WASTEWATER TREATMENT SYSTEMS

OWNER'S MANUAL

Revised August 8, 2002

**Consolidated Treatment Systems, Inc.
1501 Commerce Center Drive
Franklin, OH 45005
937-746-2727
www.multi-flo.com**

THE MULTI-FLO ONSITE WASTEWATER TREATMENT SYSTEM

CONGRATULATIONS! You are the owner of a complete wastewater treatment system that combines aeration and filtration in one compact unit. Your system is tested and certified under NSF, International, ANSI/NSF Standard 40, as a Class I system. The Multi-Flo system meets the needs for onsite wastewater treatment beyond the capabilities of septic tanks. Like all onsite wastewater treatment alternatives, your Multi-Flo unit must be operated and maintained in accordance with the Manufacturer's requirements and service provider's instructions. When properly operated and maintained, your unit will produce an effluent that meets all certification requirements.

HOW DOES THE MULTI-FLO OPERATE?

One of the features of the Multi-Flo is that the entire treatment process takes place within a single tank. Wastewater flows into the tank. An aerator near the bottom draws air in and disperses it. This process transfers oxygen throughout the system. The oxygen, which is dissolved in the water, provides an environment conducive to the growth of aerobic bacteria. These bacteria effectively consume the organic materials. Consider your Multi-Flo a living organism and treat it as such.

Another feature are the filter "socks," suspended in the tank, which support additional bacteria and strain all effluent before it leaves the unit. Solids are retained in the system. There is no by-pass for solids.

IMPORTANT ITEMS TO REMEMBER

Multi-Flo units have an initial break-in period of six-to-eight weeks, during which time bacteria establish themselves in the unit. The development of these biological colonies occur naturally with the addition of sanitary wastes, so we recommend you use all your plumbing facilities in a normal manner from initial start-up. You may notice a tendency for the unit to foam from laundry wastes during this period. This is normal, and it should cease by the sixth week. You can help by using moderate amounts of low-sudsing biodegradable detergents. Break-in can be accelerated by "seeding," which is a process by which microbial growth is introduced from another aerobic treatment unit.

Multi-Flo units are designed to treat typical domestic wastewater. Flows from and materials in garage catch basins, storm water drains, sumps, and the like will adversely affect Multi-Flo operation. Excessive amounts of cleaners, solvents, paints, greases, etc., will lead to a failure and service calls.

The following of these simple rules will decrease or eliminate maintenance problems and prolong the life and efficiency of your unit.

- Obtain and maintain a service agreement with an authorized Multi-Flo service provider.
- Check that your unit's access lid is securely tightened down.

- Check the alarm by pressing the button to activate the light and buzzer on the audio-visual alarm.
- Keep the surface water from ponding around the unit.
- Call your service provider at the first sign of trouble.
- Follow your service provider's advice. He/she is trained to ensure that your unit operates at its maximum efficiency.
- Use low-sudsing, low phosphate biodegradable detergents.
- Contact your service provider if the system is to be used intermittently or if extended periods of non-use is anticipated.
- Keep un-disposable items out of your system. These items but are not limited to: wet strength paper towels, disposable baby diapers, sanitary napkins, rubber and plastic products, rags, grit, and coffee grounds.
- Avoid discharging a water softener backwash into the system.
- Avoid placing grease into your system. Excessive grease will bind the filter socks.
- Do not pour solvents, paints, etc., into your system. These substances will harm the bacteria and plug the filters.
- Always keep your aerator running unless instructed otherwise by your service provider.
- Do not service the unit yourself. Contact your service provider to maintain your Multi-Flo unit.
- Contact your service provider if you intend to be away from your residence for an extended period.

ALARM SYSTEM and ALARM CONDITION

Every Multi-Flo unit comes equipped with an audio-visual alarm system. This alarm should be mounted in a conspicuous location. If an abnormal condition develops, you will be notified with a light and buzzer. Silence the buzzer by pressing the "silence" button on the alarm. If the light should stay on, call your service provider.

Check your audio-visual alarm periodically by holding the "test" button for approximately 10-to-12 seconds or until the light flashes and the buzzer sounds. Push the "Silence" button. Contact your service provider if your "test" button fails to activate the alarm.

If your alarm goes off, there are several steps you can take to determine the possible nature of the malfunction.

1. Is the alarm activated during a non-flow period, i.e., late at night, early morning? If so, the probable cause is the aerator.
2. Is the alarm activated intermittently while washing clothes or taking a shower? If so, filter failure (1-2 weeks) may be impending.

MAINTENANCE PROGRAM

YOUR MULTI-FLO UNIT REQUIRES PERIODIC SERVICING.

Maintenance of your Multi-Flo is essential to ensure its proper operation and longevity.

During your initial two-year warranty, an authorized service representative will inspect your unit at six-month intervals and make any necessary adjustments to it at no cost to you. The only exception is for the replacement of "out of warranty" and "physically abused" parts or abuse to the treatment process. Moreover, this warranty will not cover other treatment and dispersal components and devices, such as trash traps, drain fields, pump stations, and the like.

For continued service, your service provider will offer an annual service contract at the end of the warranty. Please contact your service provider for details.

In the event a problem arises or service is required, refer to the unit's data plate (located on the alarm and access lid) or the service label for instructions on contacting your closest service provider. Occasional pumping is required, due to accumulation of solids. The pumping cost may not be covered under your maintenance and service program. If you need parts or service, please contact the factory for the name of the service provider nearest you.

Your Multi-Flo system is designed and intended to treat typical domestic wastewater (i.e., human bodily waste and liquid waste generated by the occupants of dwellings). To insure optimum performance and longevity, do not discharge any type of non-residential wastewater or other high-strength waste, including commercial food service waste, without contacting the manufacturer to determine if this will be acceptable without additional treatment.

IMPORTANT: Multi-Flo units must be installed and maintained in compliance with all state and local laws and regulations. This includes compliance with all regulations concerning proper effluent disposal and the pumping and disposal of solids and byproducts pumped from the unit.

MULTI-FLO WARRANTY DOES NOT COVER THE COST OF SERVICE CALLS, LABOR, OR MATERIALS REQUIRED DUE TO THE FOLLOWING:

1. Misuse, abuse, or any repair or alteration performed by anyone other than authorized Multi-Flo personnel
2. Use of components other than authorized Multi-Flo replacement components.
3. Non-wastewater flows caused by infiltration, storm water connections, leakage from improperly maintained plumbing fixtures, water softener backwash, etc.
4. Failure to maintain electrical power to the treatment system in accordance with the requirements of the Manufacturer or the authorized Multi-Flo service provider.

5. Disposal into the Multi-Flo of non-biodegradable materials (i.e., plastics, coffee grounds, etc.) chemicals, solvents, grease, oil, paint, or any other substance, including but not limited to medicines, metals, toxins, volatile substances, and the like that are deleterious to the development and maintenance of the biological treatment process.
6. Short-term or daily wastewater flows to the Multi-Flo that exceeds the unit's hydraulic or organic design capabilities.
7. Any usage contrary to Multi-Flo owner's manual and/or the Multi-Flo representative's recommendations.

MULTI-FLO MODEL SPECIFICATIONS

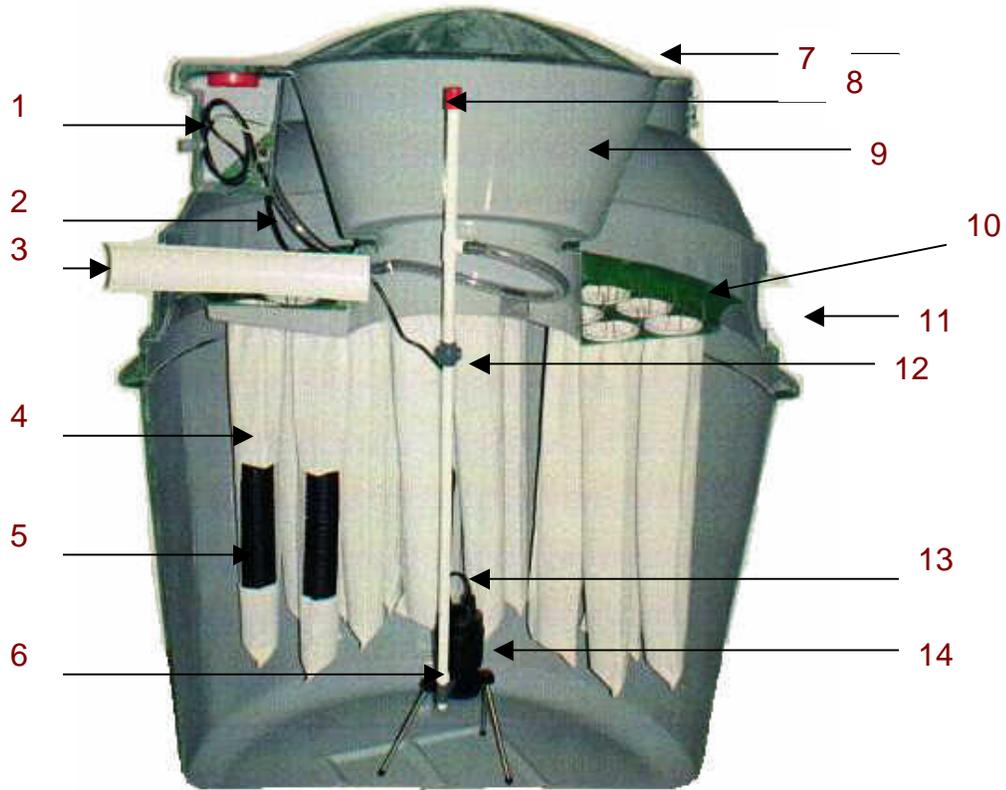
Item	FTB 0.5	FTB 0.6	FTB 0.75	FTB 1.0	FTB 1.5
Treatment (gal/day)	500	600	750	1000	1500
Volume (gal)	500	600	750	1000	1500
CBOD (lb/day)	1.5	1.5	1.5	3.0	4.5
Diameter (in)	63"	71"	71"	78"	135"x63"
Total Height (in)	86"	86"	90 ¾"	93"	86"
Grade to Inlet Invert (in)	17 ¾"	16 ½"	16"	14 ¾"	17 ¾"
Grade to Outlet Invert (in)	21"	20"	19 ½"	18 ½"	21"
Excavation Depth (in)	75 ¾"	74 ½"	78 ½"	82 ¾"	75 ¾"
No. of Aerators	1	1	1	2	3
No. of Filters	30	30	30	30	60
Shipping Weight (lb)	380	420	450	580	920
Inlet Invert* (in)	58"	58"	62 ½"	68"	58"
Outlet Invert* (in)	54 ¾"	54 ½"	59"	64 ¼"	54 ¾"
* From Bottom of Excavation – See Drawing					

MULTI-FLO WASTEWATER SYSTEM SPECIFICATIONS

Wastewater Treatment Performance (ANSI/NSF Standard 40 Evaluation)

TEST RESULTS (Mean Results)	INFLUENT (mg/L)	EFFLUENT (mg/L)	REDUCTION (%)
CBOD ₅	150	5	97
TSS	195	5	98

MULTI-FLO COMPONENTS AND SPECIFICATIONS



Item	Part No.	Description	Qty.
1	A5037	Junction Box & Junction Box Cover	1
2	A9510	Air Tubing from sensor	1
3	A5025	Inlet Pipe	1
4	B5017	Filter	30
5	W49104L	Expander	30
6	A3016	Air Intake Assy.	1
7	A3008	Access Cover Assy.	1
8	A6517	Primary Alarm Sensor Assy.	1
9	A5029	Surge Bowl	1
10	A6002	Spring Ring Retainers	60
11	A5026	Outlet Pipe	1
12	A9516	¾" Union	1
13	A6603-4	Aerator Power Cord	1
14	A10031	Aerator	1

WARRANTY

Consolidated Treatment Systems, Inc., warrants the parts in each aerobic treatment unit to be free from defects in material and workmanship for a period of two (2) years from date of installation for treatment of household wastewater when properly registered with the manufacturer. Consolidated Treatment Systems, Inc., sole obligation under this warranty is as follows: Consolidated Treatment Systems, Inc., shall fulfill this warranty by repairing or exchanging any component part, FOB Factory, that shows evidence of defects, provided said component part has been paid for and is returned through an authorized dealer, transportation prepaid. The warrantee must also notify Consolidated Treatment Systems, Inc., of the defect complained of. There is no informal dispute settlement mechanism available under this LIMITED WARRANTY.

No warranty is made as to the field performance of any unit. This LIMITED WARRANTY applies only to the parts manufactured by Consolidated Treatment Systems, Inc., does not include any portion of the household plumbing, drainage, or installation of disposal system. Components or accessories supplied by Consolidated Treatment Systems, Inc., but manufactured by others, are warranted only to the extent of and by the terms and conditions of the original manufacturer's warranty. In no event shall Consolidated Treatment Systems, Inc., be responsible for delay or damages of any kind or character resulting from, or caused directly or indirectly by, defective components or materials manufactured by others.

Recommendations for special applications will be based on the best available experience of Consolidated Treatment Systems, Inc., and published industry information. Such recommendations do not constitute a warranty of satisfactory performance.

This LIMITED WARRANTY extends to the consumer of the product. As used herein, "consumer" is defined as the purchaser who first uses the unit or the subsequent user(s) for the 2 years after its initial installation. It is the first user's or servicing dealer's obligation to make known to the subsequent user(s) the terms and conditions of this warranty.

This warranty is a LIMITED WARRANTY and no claim of any nature shall be made against Consolidated Treatment Systems, Inc., unless and until the consumer, or his legal representative, notifies Consolidated Treatment Systems, Inc., in writing of the defect complained of and delivers the product and/or defective part(s), freight prepaid, to the factory or an authorized service station.

Consolidated Treatment Systems, Inc., reserves the right to revise, change, or modify the construction and design of the aerobic treatment units for household wastewater, or any component part or parts thereof, without incurring any obligation to make such changes or modifications in equipment previously sold. Consolidated Treatment Systems, Inc., also reserves the right, in making replacements of component parts under this warranty, to furnish a component part which, in its judgment, is equivalent to the part replaced.

UNDER NO CIRCUMSTANCES WILL CONSOLIDATED TREATMENT SYSTEMS, INC., BE RESPONSIBLE TO THE WARRANTEE FOR ANY OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO LOST PROFITS, LOST INCOME, LABOR CHANGES, DELAYS IN PRODUCTION AND/OR IDLE PRODUCTION, WHICH DAMAGES ARE CAUSED BY A DEFECT IN MATERIAL AND/OR WORKMANSHIP IN ITS PRODUCT OR PARTS SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER EXPRESS OR IMPLIED WARRANTY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS, AND OF ANY OTHER OBLIGATION ON THE PART OF CONSOLIDATED TREATMENT SYSTEMS, INC., SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU. THIS WARRANTY GIVES YOU SPECIAL LEGAL RIGHTS AND YOU MAY HAVE OTHER RIGHTS, WHICH VARY FROM STATE TO STATE.