



Installation  
and Operation  
Instruction  
Manual

INSMAN-201

Industrial  
Multi Media  
Single Tank

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# INDUSTRIAL SYSTEMS | MULTI MEDIA SINGLE TANK

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## **GENERAL SAFETY GUIDELINES**

Please read the entire manual before beginning any procedure.

1. Only properly trained personnel should operate and service the equipment.
2. Always wear proper safety gear when servicing equipment.
3. Before installing the system, ensure that the system falls within the designed operating parameters.
4. Know the safety operating limits of the system and any equipment directly connected to or affected by it.
5. Be sure that the system is depressurized before any maintenance work, removing components or opening of the vessels.
6. Be sure to re-examine the system before putting it back into service.
7. Be sure to maintain all equipment and to continuously check the system for leaks and or damage. Fixing problems as they occur will prolong the life of the system.

**GENERAL:** Yardney Multi-Media Filtration Systems are designed to remove suspended solids from industrial plant water efficiently and economically.

Water is introduced, under pressure, through the inlet valve and into the filter vessel and deflector assembly to be evenly distributed over the filter media. Minimum suggested operating pressure of the filter system is 30 PSI.

**During the filtration mode, suspended solids are trapped in the filter media. The filtration mode of operation continues until a sufficient amount of solids are collected to create a differential pressure of 10 PSID above the normal clean filter differential pressure. At this time, the filter is automatically backwashed. This backwash mode of operation reverses the flow through the filter, causing a laminar expansion of the filter media and flushing the entrapped solid particulate out of the backwash discharge line.**

## **1. RECEIVING INSTRUCTIONS**

Upon receipt of the filter system, inspect for any visible damage, missing parts, etc. If any damage is noted, advise the freight carrier and Yardney Water Management Systems at once. A damage claim should be filed with the freight company as soon as possible to avoid any unnecessary delays in settlement of the damage claim or installation of the filter system.

## **2. INSTALLATION**

With a few exceptions Yardney Multi-Media Filter Systems are shipped completely assembled and mounted on a structural steel skid. Yardney Multi-Media Filter Systems are supplied complete with manifolding, valving and automatic backwash controls.

All filter systems must be installed on a level surface that will support the equipment. It is recommended that 1/4" tolerance be the maximum allowed. A concrete base with grouting and/or shims under the structural members is generally the best method to obtain the levelness required. The grouting and/or shims should be kept to a minimum for best results. A minimum of 48" should be maintained around the filter system to allow for media loading and servicing.

All filter systems are supplied with standard FIPT pipe connections to the filter and require the use of threaded male adapters. Refer to Table 2 for system pipe sizes.

The backwash line piping is connected to the backwash restrictor valve on the backwash manifold. The backwash line piping should discharge into a floor drain or sump and should not be connected directly to a pressurized drain line.

If it is necessary to run the backwash piping a long distance to a drain, allowance should be made in the size and drainage of the pipe to handle total backwash flow without restriction.

Specific sizes for backwash piping are shown in the table below.

	BACKWASH FLOW RATE (PER FILTER)	MINIMUM PIPE SIZE
MM2460-1A	47 GPM	2"
MM3060-1A	75 GPM	3"
MM3660-1A	107 GPM	3"
MM4860-1A	189 GPM	4"
MM5460-1A	239 GPM	4"

TABLE 1: BACKWASH FLOW RATE AND PIPE SIZE.

Restriction of backwash flow from the filters after the backwash restrictor valve to the drain will have an adverse effect on the overall backflushing capability and could lead to inadequate cleaning of the filter during the backwash cycle.

FILTER MODEL	FILTRATION AREA SQ. FT. (PER FILTER)	MAXIMUM OPERATING PRESSURE	PIPE SIZE INLET/OUTLET (INCHES)	BACKWASH PIPE SIZE (INCHES)
MM2460-1	3.15 SQ. FT.	100 PSI	2" FIPT	2" FIPT
MM3060-1	4.19 SQ. FT.	100 PSI	3" FIPT	3" FIPT
MM3660-1	7.10 SQ. FT.	100 PSI	3" FIPT	3" FIPT
MM4860-1	12.60 SQ. FT.	80 PSI	4" FIPT	4" FIPT
MM5460-1	15.91 SQ. FT.	80 PSI	4" FIPT	4" FIPT

TABLE 2: FILTER SPECIFICATIONS.

### 3. MULTI-MEDIA INSTALLATION

The single tank multi-media filtration system generally consists of one grade of crushed rock gravel pack, two grades of garnet and one grade of anthracite filtration media. The crushed rock is used for supporting the filter media and also to provide even distribution of flow during backwash. The coarse garnet is used as an interface media between the crushed rock and the finer garnet. The top layer (and coarsest) filtration media is the anthracite (media table and diagram on page 6.)

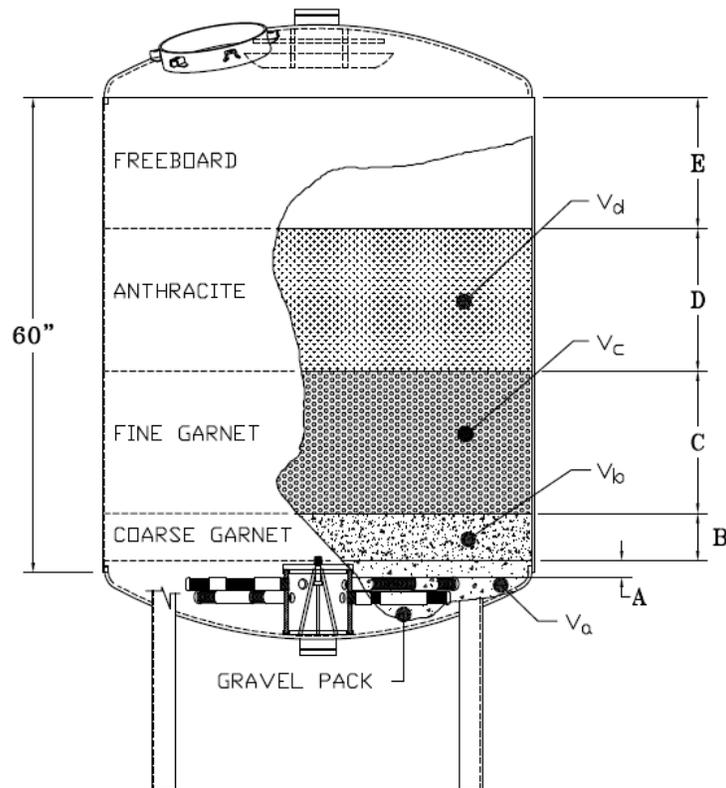
**THE CRUSHED ROCK MUST BE THOROUGHLY WASHED PRIOR TO LOADING INTO THE FILTER. FAILURE TO WASH THE CRUSHED ROCK COULD LEAD TO COMPROMISED FILTER PERFORMANCE AND A FOULED UNDERDRAIN UPON START-UP. ALWAYS LOAD THE GRAVEL FROM THE SIDE MANWAY.**

The crushed rock should be placed around the collection laterals. The gravel pack is used to separate the laterals from the media and to protect the laterals from damage and fouling during media loading.

**NOTE:** Installer should wear the appropriate dust masks when working inside the vessel, during media installation. Adequate ventilation and air sourcing should be maintained.

Once the crushed rock has been installed and packed around the collection laterals it should be raked moderately level. The succeeding layers of media should now be installed as is detailed in the loading table.

Remove all foreign material (i.e. pieces of media bagging material, etc.) from the filter vessel. Clean all sealing surfaces on the manways. Chipping of the vessel lining may occur unless the sealing surfaces are free of sand, grit, etc. Close the manway.



FILTER DIAMETER (INCHES)		18	24	30	36	48	54
1/2" TO 3/4" CRUSHED ROCK	A (INCHES)	2	2	2	2	2	2
	Va (FT <sup>3</sup> )	1.0	1.5	2.5	4	7	9.5
1.45 MM GARNET	B (INCHES)	6	6	6	6	6	6
	Vb (FT <sup>3</sup> )	1.0	1.5	2.5	3.5	6.5	8.0
0.35 MM GARNET	C (INCHES)	18	18	18	18	18	18
	Vc (FT <sup>3</sup> )	2.5	4.5	7.5	10.5	19.0	24.0
0.85 MM ANTHRACITE	D (INCHES)	18	18	18	18	18	18
	Vd (FT <sup>3</sup> )	2.5	4.5	7.5	10.5	19.0	24.0
E	(INCHES)	14.5	14.5	14.5	14.0	17.0	16.5

**NOTE:** Other filtration media packs are available depending upon established filtration objectives.

#### **4. INITIAL MEDIA CLEANSING**

Despite cleaning of the media prior to packaging, a certain amount of “fines” will be present in the media supplied. Serious operational problems could result if these “fines” remain in the filter during operation. Thus, it is necessary to clean the media prior to operating the filter system.

In order to accomplish this, the filter should be filled with water after media loading. This water should be clean as possible. The media should now soak for 6 – 12 hours. The media should be backwashed after the soaking period using the backwash sequence designed for this filter system as outlined on page 11. It is recommended that the backwash sequence be performed using the manual start mode of operation. By using the manual start mode, the operator will become familiar with the filter system and will also be able to spot any potential problems prior to actual automatic operation of the filter system. The filter media should backwash until such time as the backwash water becomes clear. A quick check of the backwash water may be made by filling a glass container with the water as it exits the filter. The container should not have any sedimentation or media “fines” at the bottom after the water has settled.

#### **5. ROUTINE MEDIA CLEANING THROUGH AUTOMATIC BACKWASH**

The filter media should be cleaned on a routine basis. The length of the filtering cycle between cleaning sequences is dependent upon how dirty the source water is. Typical filtering cycles are in the 6 – 12 hour range. However, some applications allow for a much longer cycle, or in some cases, a shorter cycle.

The factor which determines the length of the filtering cycle is the filter media bed pressure differential. The differential pressure is determined by reading the influent and effluent pressure gauges. Subtract the influent pressure from the effluent pressure gauge reading. The difference is the media bed pressure differential. The filter system should be cleaned when the differential pressure reaches approximately 10 PSID more than the clean filter pressure differential.

It is recommended that a filter be cleaned at least once a day, regardless of application or differential pressure. The cleaning sequence of a filter system varies from one step (for simple systems) to as many as twenty (for more complex systems.) Regardless of the complex nature of the system, all filters are cleaned by reversing the water flow inside the filters. Valve manipulation is controlled by the automatic control system.

## 6. DIAPHRAGM VALVES

The single tank multi-media series filter utilizes four (4) air actuated (standard) or hydraulically actuated (optional) diaphragm valves for the routing of water during the filtration and backwash modes. The standard system is designed to use air pressure to actuate the four (4) valves. The air supply to the valves should be regulated to provide air pressure equal to or slightly higher than the system operating pressure.

**NOTE:** On systems that are supplied with hydraulically actuated valves see page 10. Air supply must be maintained at all times when the filter is in operation. The “backwash in” and “backwash out” valves require a continuous supply of air to maintain the closed position. If air supply fails, the “backwash in” and “backwash out” valves will revert to the open position.

When the filter is in the **filtration cycle**, the valve position is as follows:

Inlet	open
Outlet	open
Backwash In	closed
Backwash Out	closed

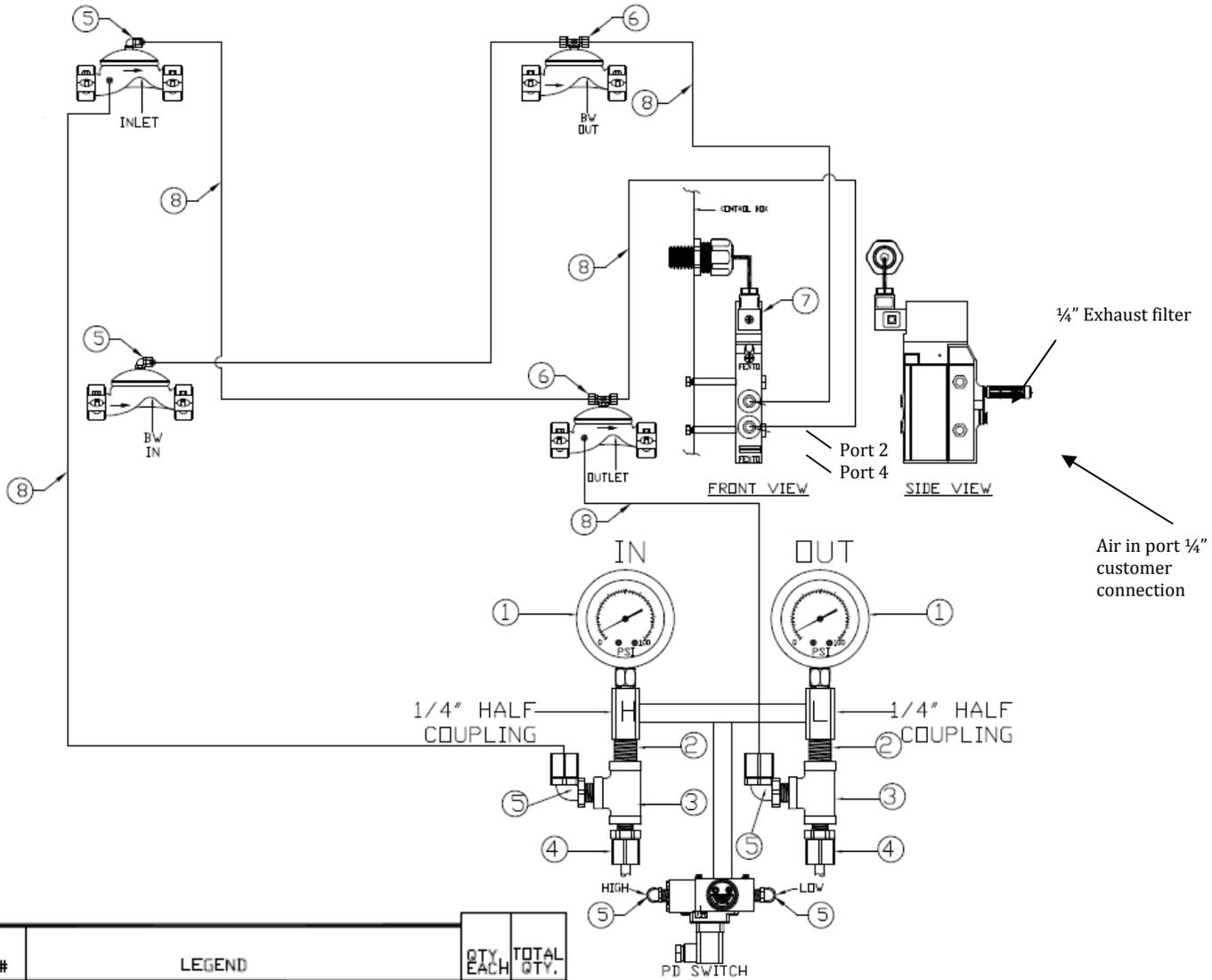
When the filter is in the **backwash cycle** the valve position is as follows:

Inlet	closed
Outlet	closed
Backwash In	open
Backwash Out	open

When the backwash cycle has been completed, the valves will automatically revert back to the position for the filtering cycle.

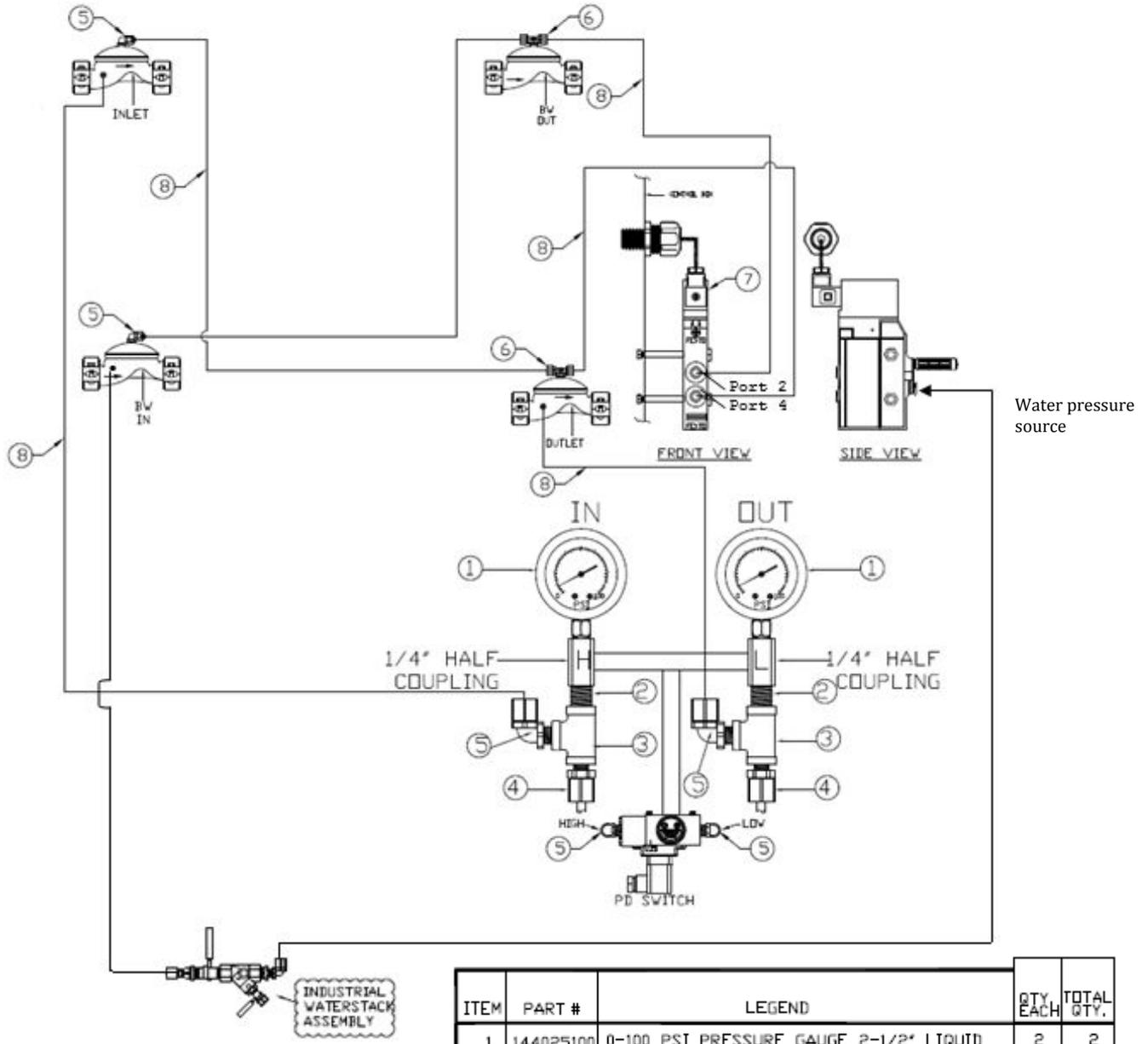
## AIR ACTUATED VALVES – STANDARD

The supply to operate the valves is connected to the pressure port in the back side of the solenoid valve, mounted on the backwash controller. The two ports on the front of the solenoid supply air to the influent and effluent valves and the backwash in and backwash out valves. During filtration mode air is supplied to the backwash in and backwash out valves through port 4. When a backwash cycle is initiated, air is supplied to the inlet and outlet valves through port 2.



ITEM	PART #	LEGEND	QTY EACH	TOTAL QTY.
1.	144025100	0-100 PSI PRESSURE GAUGE 2-1/2" LIQUID	2	2
2.	106521025	1/4" GALV. CLOSE NIPPLE	2	2
3.	107011025	TEE GALVANIZED 1/4"	2	2
4.	143010404	POLYPROPYLENE P4MC4 CONNECTOR	2	2
5.	143003400	POLYPROPYLENE P4MC4 ELBOW	6	6
6.	143004000	1/4" POLY PROP "T" (P4MT4)	2	2
7.	166002478	SOLENOID 24VAC 4-WAY FESTO	1	1
8.	143000025	1/4" OD X .170" ID TUBING, POLYETHYLENE	AS NEEDED	
9.	106522150	NIPPLE GALVANIZED 1/8" X 1"	1	1

valves is fed through the water-stack located on the inlet manifold. This supply is filtered through a small strainer inside the valve. The strainer should be cleaned during normal maintenance to remove any buildup of foreign material.



ITEM	PART #	LEGEND	QTY EACH	TOTAL QTY.
1.	144025100	0-100 PSI PRESSURE GAUGE 2-1/2" LIQUID	2	2
2.	106521025	1/4" GALV. CLOSE NIPPLE	2	2
3.	107011025	TEE GALVANIZED 1/4"	2	2
4.	143010404	POLYPROPYLENE P4MC4 CONNECTOR	2	2
5.	143003400	POLYPROPYLENE P4ME4 ELBOW	6	6
6.	143004000	1/4" POLY PROP "T" (P4MT4)	2	2
7.	166002478	SOLENOID 24VAC 4-WAY FESTO	1	1
8.	143000025	1/4" OD X .170" ID TUBING, POLYETHYLENE	AS NEEDED	
9.	106522150	NIPPLE GALVANIZED 1/8" X 1"	1	1

## 7. OPERATION OF THE AUTOMATIC CONTROLS

Yardney Multi-Media filters are normally supplied with solid-state electronic controls (see Yardney Synergy controller instructions contained within the control box.) The control box operation is detailed in a separate instruction manual.

- 7.1 Periodic – Sets the time between the backwashes.
- 7.2 Flush Duration – Sets the duration of the backwash.
- 7.3 Delay – Set to “0” seconds for air actuated valves. Set to allow for a slight valve overlap on hydraulically actuated valves.
- 7.4 Pressure Differential – The system is designed for use with the supplied pressure differential switch gauge that senses a differential in pressure across the filter bed as the contaminant accumulates in the filter bed. When a pressure drop through the filter reaches the setting on the gauge, the switch will initiate a backwash after sensing the sustained pressure loss for more than 30 seconds.

## 8. THE BACKWASH FUNCTION

Backwashing the filter is the process by which water flows upward through the filter bed, lifting and expanding the media allowing it to release the collected contaminant. Excessive backwash flow will expand the media to the point that the media itself is expelled out of the tank. Insufficient backwash flow will not expand the media enough to purge all the entrapped contaminant. This could result in a residual pressure loss through the bed even after backwash. To achieve maximum filter performance, the backwash flow must be properly adjusted.

### **BACKWASH FLOW CONTROL ADJUSTMENT PROCEDURE**

- 8.1 Prior to adjustment, the filter must be ran for a few minutes to fill the system to the designed pressure and flow. The system discharge flow control valve should be adjusted prior to making any backwash flow adjustment.
- 8.2 Open the backwash control gate valve approximately one turn.
- 8.3 Press start on the controller. This will put the filter into a backwash cycle for the length of time set on the duration window. This sequence may have to be done more than once to provide enough time for proper backwash adjustments.
- 8.4 Using a piece of screen or a sampling device, monitor the content of the backwash water from the sand filter.

- 8.5 If the media shows in the backwash water, gradually close the backwash control gate valve until the water is showing only a slight trace of media. If no media is showing, gradually open the control gate valve until a trace amount of media is showing. A trace amount of media is acceptable since it is desirable that the lighter granules (fines) in the new media bed are allowed to wash out. After adjustment of the backwash adjustment valve, the handle should be covered or removed to avoid tampering.

## **OPTIONAL EXTERNAL WATER BACKWASH**

On Multi-Media series industrial filters that will utilize municipal for other clean water backwashing, the following instructions should be followed.

The clean water supply for backwashing is connected to the normally closed valve marked "backwash in." The amount of water required for backwashing can be found in Table 1, page 4 of this manual.

The correct backwash flow can be achieved by either of the following two methods. The first method requires adjusting the flow of the **external supply** before the filter. This can be achieved by using a flow-regulating device installed in the external supply line. The other method is to adjust the backwash manifold. Either method will provide for correct adjustment of the backwash flow.

If the system utilizes hydraulic pressure to actuate the valves, then the water system should be operational prior to turning in the clean water supply. If not the "backwash in" valve will be in the "OPEN" position allowing the water to flow into the system.

On systems that utilize air pressure to actuate the valves, the air pressure to the valves should be "ON" prior to starting the filter system.

**NOTE:** Provisions should be made to either by-pass the filter system or shut down the filter feed pump during the back flush cycle. If the pump is allowed to run, then a "deadhead" condition on the pump could result in damage to the pump.

If the supply for backwash has a higher pressure than the system operating pressure of the system, then the air supply should be regulated to provide an equal or higher pressure of this supply.