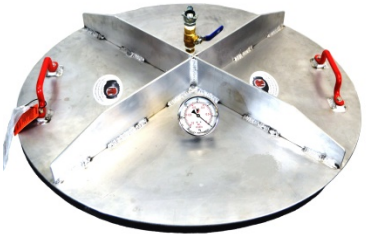
Operating Instructions for Max-Flow™ Vacuum Testing Equipment

Purpose: Plug Technologies, Inc.'s manhole vacuum testing equipment is engineered to perform vacuum (negative air pressure) testing on concrete sewer manholes per ASTM specification C 1244.

Equipment:

Description: Flat-Max™ Plate Style Manhole Vacuum Plate Tester

Part number: 550-38 or 550-44



Description: Max-Vac™ Venturi Pump

Part Number: 550-00

Description: Bladder-Max™ Bladder Style Manhole Vacuum Tester

Part number: 550-2127

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Additional equipment which will be required:

- Air compressor (85 CFM or larger recommended);
- Pipe Plugs (one for each inlet pipe);
- Fill Kits/Retrieval Ropes (one for each plug);

Vacuum Testing Procedures:

Warning

- Before entering any manhole, you must follow all local, state or federal guidelines including confined space entry regulations.

Warning

- Ensure that all pipes entering and/or exiting the manhole are temporarily plugged using the properly sized FatBoy™ plug. Brace the plugs and the pipes to prevent suction into the manhole during the vacuum test.

Warning

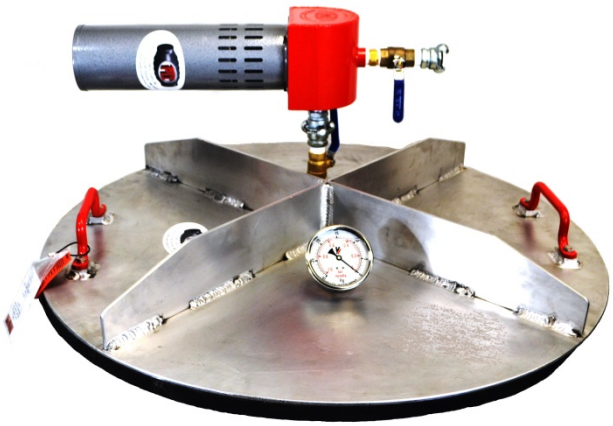
- Inflate all pipe plugs to the recommended inflation pressure. Not all pipe plugs are suitable for vacuum testing so it is important to ensure that you are using pipe plugs that are rated for at least 10 HG (10 Inches of Mercury).

Verify that all fill kits/retrieval ropes are completely inside the manhole and that no part of any equipment is sticking out of the top of the manhole.

Install the Bladder-Max™ or Flat-Max™ manhole vacuum head assembly on the manhole opening.

- Flat-Max" Plate: Install the plate with the foam liner side down on the manhole frame or on the top of the concrete cone.
- Bladder-Max: Install the bladder below the manhole frame but above the area where the manhole starts to cone out. See the illustration below on page 5. The bladder must be inflated to 25 PSI. Failure to properly inflate the bladder could damage your Bladder-Max™.

Install the Max-Vac™ Venturi Pump on the Flat-Max™ Plate or the Bladder-Max™ using the universal Chicago fittings on the bottom side of the Max-Vac™ Venturi Pump. The Max-Vac™ Venturi Pump is designed to be horizontal on the Flat-Max™ Plate or Bladder-Max™. See below on page 4 and 5:



Attach the air compressor hose to the back side of the Max-Vac ™Pump.

Close the valve on the Max-Vac™ Pump so that no air can flow through the unit. The valve handle will be vertical when the valve is closed (as shown in the picture above).

Open the valve on the Flat-Max™ Plate or the Bladder-Max™. The valve handle will also be pointing up.

Attach your air compressor (recommend 85 cfm or higher) hose to the back of Max-Vac™ Pump using the universal Chicago fitting.

Start the air compressor.

Open the valve on the Max-Vac™ pump by turning the valve handle ¼ turn (the valve handle should now be horizontal). Air will be moving through the Max-Vac™ and you should start to see vacuum registering on the Flat-Max™ Plate/Bladder-Max™ gauges which ever you are using.

A vacuum of 10 inches of Mercury (10 HG) is recommended by the ASTM specification.

Once you reach 10HG, close the valves on both the Max-Vac™ Venturi Pump and the Flat-Max™ Plate and turn off your air compressor.

The length of the test is determined by the diameter and depth of the manhole. Consult the ASTM specifications or your inspecting authority for the length of test and the maximum allowable leakage.

Notice that the length of time in the ASTM specifications is noted in seconds and not minutes. Trying to hold a vacuum test on a porous concrete manhole for a long period of time may not be possible.

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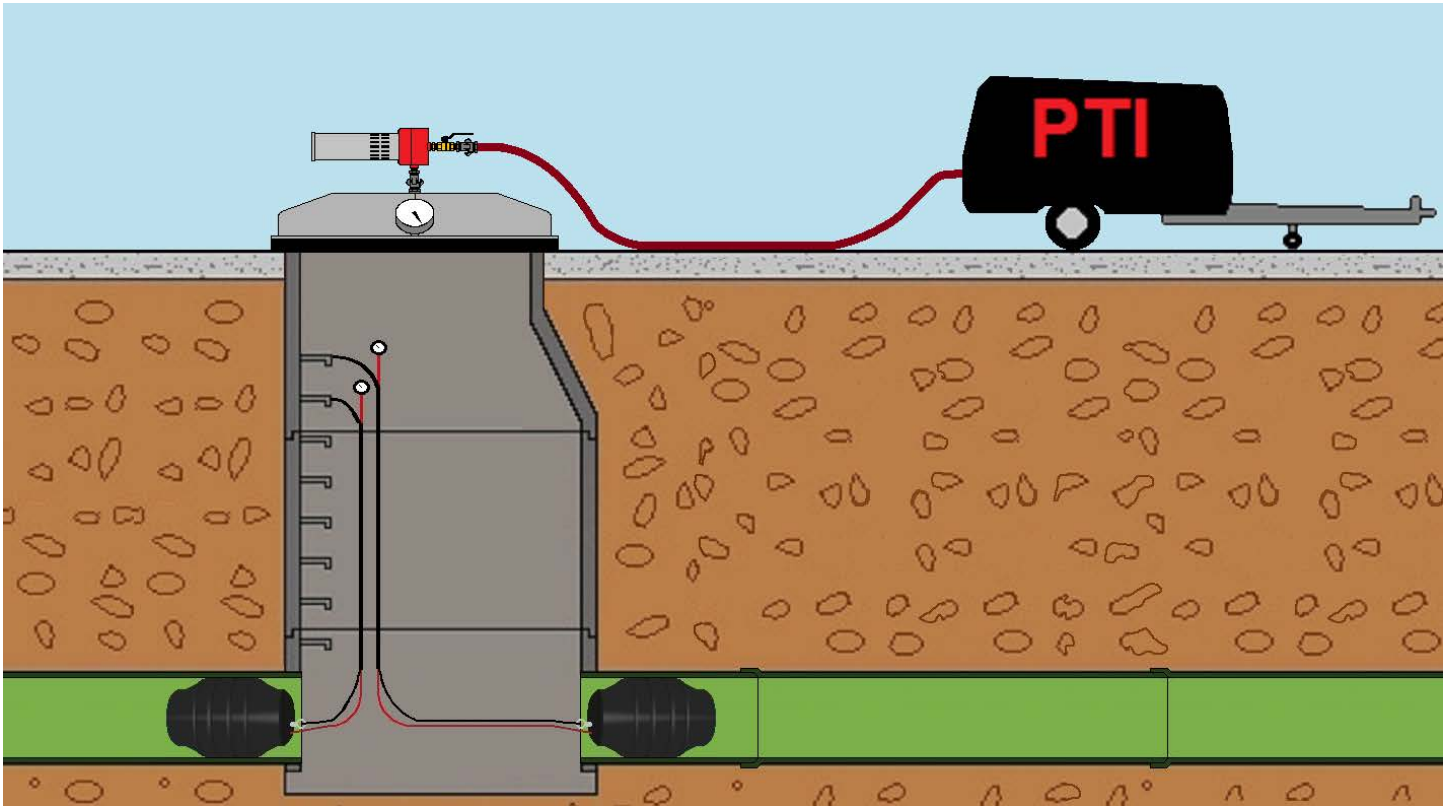
Once the test is completed, exhaust the vacuum (let the air back in) in the manhole by disconnecting the air compressor hose and opening the valves on both the Max-Vac™ Venturi Pump and the Flat-Max™ Plate. You should hear air rushing into the manhole and you should start to see the vacuum pressure dropping on the Flat-Max™ Plate/Bladder Max™ gauge.

Once all the air has been let back into the manhole, (the Flat-Max™ Plate or Bladder-Max™ gauge will read zero and you will no longer hear air rushing into the manhole) remove the Flat-Max™ Plate/Bladder-Max™ (deflate the bladder max bladder using the dump valve) from the manhole.

Deflate the pipe plugs using the fill kits/retrieval rope and remove the pipe plugs from the manhole.



Manhole testing set-up with Flat-Max™.

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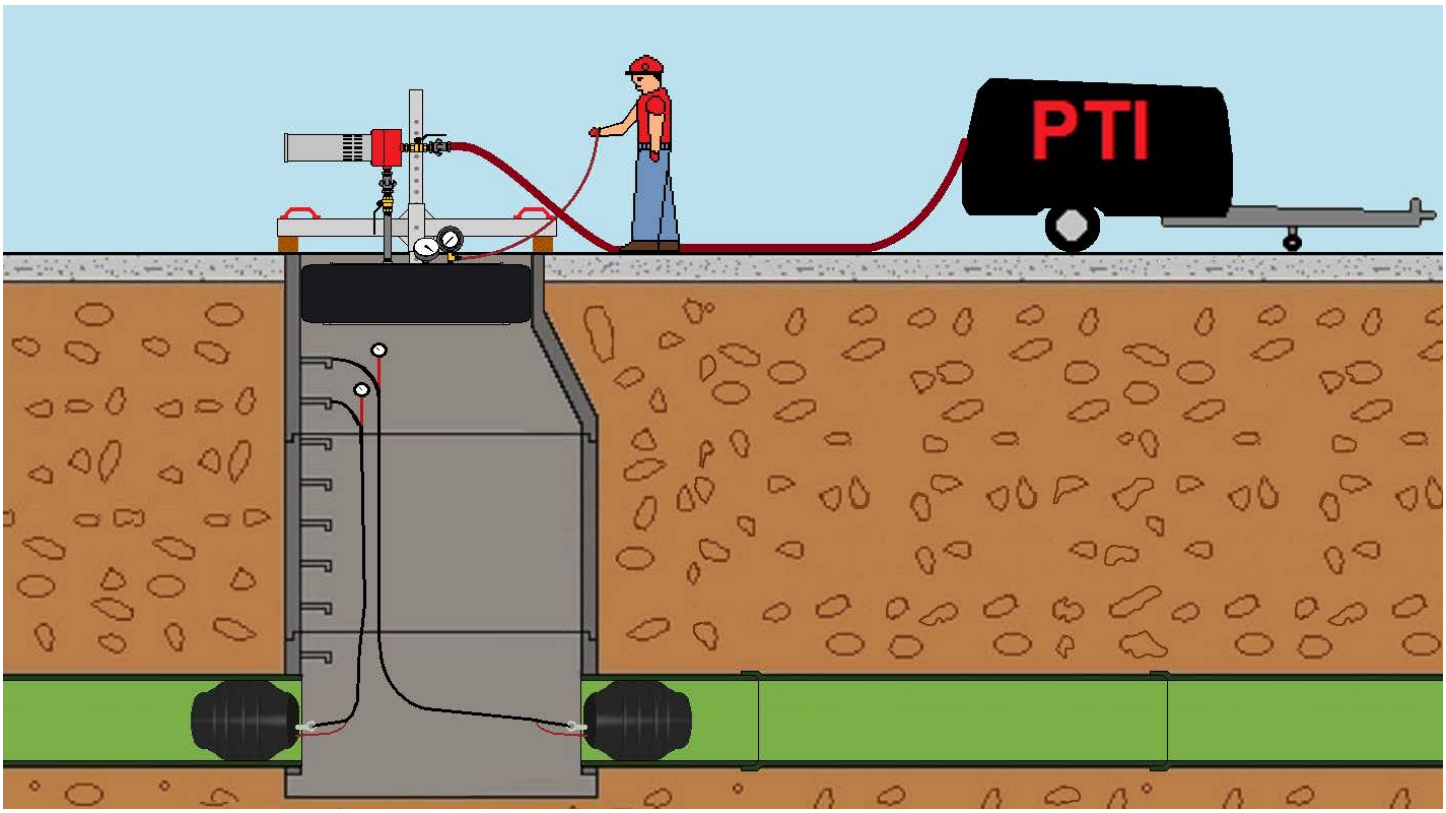

Manhole vacuum test set-up using a Bladder-Max™.

Trouble Shooting:

I. The test area will create a vacuum (negative pressurize) but quickly loses the vacuum causing the test to fail.

The manhole you are testing may not be leak free. Perform a soapy bubble test (see page 6) to find out whether the manhole is leaking.

Verify that the pipe plugs being used will hold the inches of mercury (vacuum) being tested.

Verify that the Flat-Max™ Plate or the Bladder-Max™ is properly sealing the manhole.

- Verify that the foam liner on the bottom of the Flat-Max™ Plate is not worn out or damaged.
- Verify that the concrete cone is not too rough and is creating a leak path;
- Verify that the bladder on the Bladder-Max™ is inflated to 25 psi.

Verify that all fittings on the Flat-Max ™ or the Bladder-Max™and the Max-Vac™ pump are not leaking.

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- Tighten any loose fittings;
- Verify that all fitting are properly sealed with teflon tape or other pipe tape;

II. No vacuum is being pulled on the manhole and/or no vacuum is registering on the Flat-Max™ Plate gauge.

Verify that all the pipes entering the manhole are blocked?

- Verify that there are no unblocked drop down pipes present in the test area.

Verify that you are getting a seal on the Flat-Max™ Plate or the Bladder-Max™.

- Wetting down the concrete can help get a tight seal;
- Wetting down the foam liner on the bottom of the Flat-Max™ Plate can also help get a proper seal.
- Apply some weight or pressure to the top of the Flat-Max™ Plate by using protective equipment.
- Make sure the bladder is properly lined up and sealing on a flat area at the top of the manhole.

Warning

Never place any part of your body over or on top of the Flat-Max™ Plate or Bladder-Max™ during testing (i.e. attempting to apply pressure either by pushing on or stepping on the Flat-Max™ Plate).

- Verify that the Max-Vac™ is connected properly to allow a vacuum to be pulled.
- Verify that the Max-Vac™ muffler is not wet or dirty.

Soapy Bubble Test:

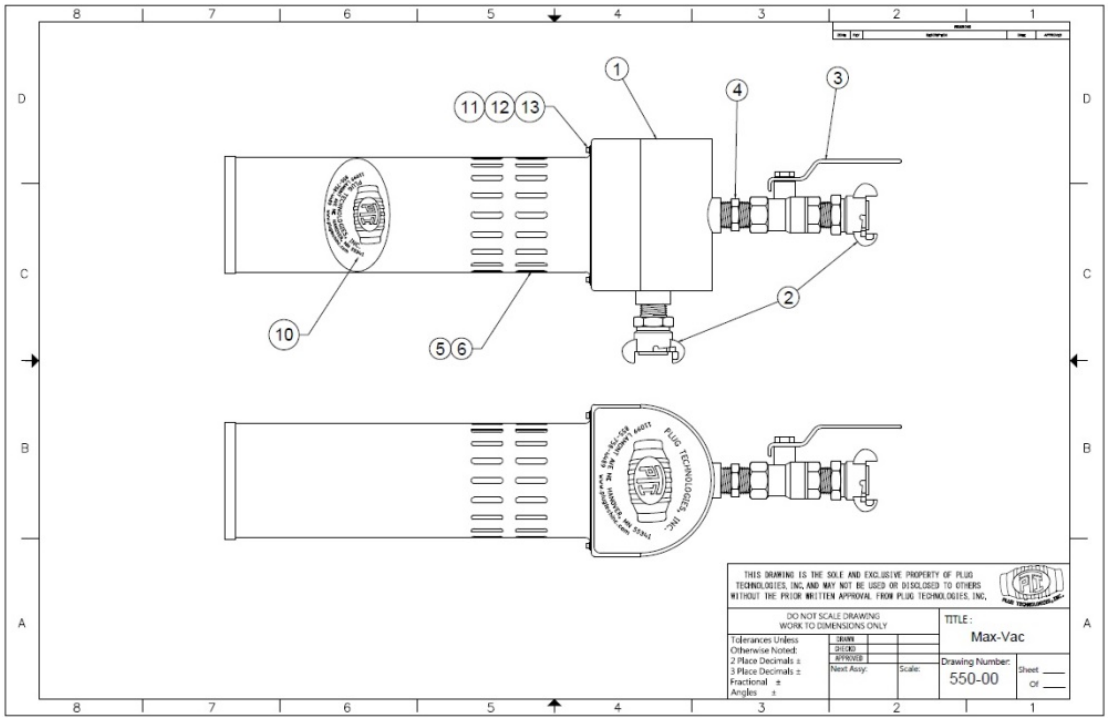
- Wet the inside of the manhole with a soapy water solution.
- Draw one inch of Mercury (1 HG) on the manhole. You do not need to hold it for more than 30 seconds.
- Let the air exhaust back into the manhole.
- The soapy bubbles may indicate locations in the manhole that have leaks.

Parts List 550-00

Max-Vac™ Venturi Pump

Item	Part Number	QTY	Description
13	30-023	1	Washer, Lock, Cap Screw, #10
12	30-022	1	Washer, Flat, Cap Screw, #10
11	30-021	1	Cap Screw, #10- 32 x .5" Long
10	08-005	2	Sticker, Logo, Oval
8	11-002	1	Label, Logo, 3.5" x 4.125"
7	11-001	1	Label, Part Number, 3.5" x 4.125"
6	55-011	1	Muffler, Max-Vac
5	55-010	1	Protector, Muffler, Max-Vac
4	36-010	1	Nipple, Shoulder, $\frac{3}{4}$- 14 NPT
3	37-020	1	Valve, Ball, 2-Way, $\frac{3}{4}$- 14 F NPT
2	33-002	2	Coupler, Chicago, $\frac{3}{4}$- 14 M NPT
1	70-005	1	Housing, Welded-PC, Max-Vac

PARTS LIST



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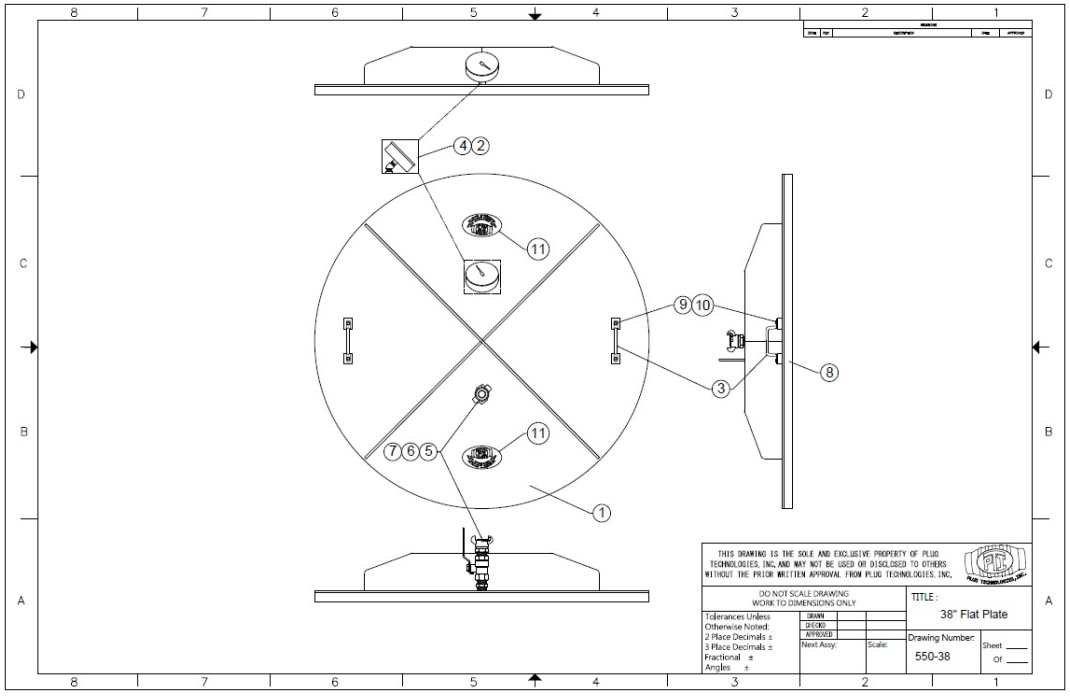
Parts List 550-38

Flat-Max™ Plate Style Vacuum Assembly

Item	Part Number	QTY	Description
16	11-002	1	Label, Logo, 3.5" x 4.125"
15	11-001	1	Label, Part Number, 3.5" x 4.125"
13	07-101	1	Brochure, Safety, Plug Technologies, Inc.
11	08-005	2	Sticker, Logo, Oval
10	30-003	4	Washer, Flat, $\frac{5}{16}$, SS
9	30-002	4	Screw, $\frac{5}{16}$-18 x .75" L, SS
8	05-025	1	Foam, Close Cell
7	36-010	1	Nipple, Shoulder, $\frac{3}{4}$- 14 NPT
6	37-020	1	Valve, Ball, 2-Way, $\frac{3}{4}$- 14 F NPT
5	33-002	1	Coupler, Chicago, $\frac{3}{4}$- 14 M NPT
4	37-004	1	Gauge, Vacuum, Dry, Back Mount, -30 - 0 PSI, $\frac{1}{4}$- 18 M NPT
3	31-010	2	Handle, Flat Plate
2	32-012	1	Fitting, Brass, 45° Bend, $\frac{1}{4}$- 18 M NPT x $\frac{1}{4}$- 18 M NPT
1	70-006	1	Plate, Flat, Welded-PC, 38"

PARTS LIST



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Parts List: 550-2127

21”-27” Bladder-Max™ Bladder Style Vacuum Head Assembly

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