

### Pipe Testing Plugs

#### Hazard and Risk Assessments

Before using this equipment, the job you are doing must be assessed for foreseeable hazards and risks and appropriate measures to eliminate, control or reduce those risks must be taken before you commence work.

#### Suggested PPE (Personal Protective Equipment):



Protective Gloves Protective Footwear Hard Hat Eye Wear

Note: PPE must be suited to the risks and person(s) using the equipment.

#### Safety Instructions:

- Operating Instructions** – Before using this equipment ensure you have read the ‘Operating Instructions’ and taken note of the ‘Hazards and Risks’ detailed on this instruction sheet and taken all necessary steps to prevent injury.
- Personal Protective Equipment** – Use appropriate personal protective equipment for the job.
- Installation Advice** – The safe use and application of these products must be in accordance with the Occupational Health and Safety Act 2011, approved Codes of Practice and any other regulatory requirements. Consultation with a qualified engineer is advised.

#### HAZARD:

... Incorrectly installed pipe plugs systems can result in plug failure resulting in possible injury or death.

... Consultation with a qualified engineer is advised.

- Check Your Tools** – As with any repair and maintenance procedure, it is important to use ONLY the proper tools for your task and know how to use them correctly. Inspect your tools closely to insure that they are in proper working condition.

Maintaining consistent and accurate inflation air pressure is extremely important in working with plugs. Be sure that your pressure gauges are calibrated accurately and capable of holding a steady pressure setting. Plug Inflation pressure must be checked constantly. Also be sure that you are using tools or equipment that are tested and tagged to local authorities’ regulations.

FOR GRAVITY PIPELINES ONLY. NOT FOR HIGH PRESSURE WATER MAINS ETC

### ALL PLUGS MUST BE BRACED TO STOP ANY MOVEMENT WHILE IN USE OR IF SUDDEN DEFLATION OCCURS. STAY OUT OF DANGER AREA AT ALL TIMES.

Pneumatic test plugs are generally used for gravity pipelines in LOW PRESSURE situations. Backpressure capacities are usually limited to around 10.35 metres/14.7 p.s.i./101.35 kPa/1.01 Bar/0.101 MPa, so any back pressure requirements above these may not be suitable for a pneumatic Plug. Consult the manufacturer’s specifications.

EVERY JOB IS DIFFERENT and must be carefully examined to insure the safest procedure for each circumstance encountered. The safest Plug on earth will not save you if it is handled improperly or if safety practices are ignored.

#### Warning:

This is a general guideline for the installation, handling and removal of pipe test plugs. For more detailed and specific information, the manufacturer’s document should be obtained and read prior to use. It is the user’s responsibility to comply with any local state, and/or federal safety regulation as it pertains to their geographical location or job situation.

#### Notice to Employers, Contractors and Users:

All personnel who use or work in close proximity to test plugs must be instructed and become familiar with proper installation, handling and removal procedures. **YOUR LIFE MAY DEPEND ON IT.**

Shore Hire strives to supply the best quality test plugs available and the most suitable for the project as outlined by the contractor. However, we cannot control or predict the unlimited workplace variables that can affect safety conditions. General safety conditions are overwhelmingly the result of workers adhering and utilising proper safety practices.

Natural rubber plugs are not for use in oil, gas, chemical or petroleum applications.

### Safety Instructions Continued:

Failure to maintain consistent air pressure can result in plug failure resulting in possible injury or death.

5. **Evaluate the Job** – Individual and unique characteristics of working environment can greatly influence the performance of any product. These could include weather, ground conditions, machinery available etc. It is extremely important to carry out a risk analysis prior to starting work.

It is the supervisor's responsibility to examine each situation to determine proper repair/testing and safety procedures. In addition the supervisor must be aware of any Local, state, and /or federal regulatory requirements that may be required to insure workers or public safety .It is extremely important to allow only experienced personnel to function in the decision-making capacity and provide close supervision for individuals considered to be 'assistants' or are 'in training'. Consult your supervisor, safety engineer or governing authority for proper instructions.

Failure to recognize inherent dangers at the jobsite can be deadly. If anyone is unsure of any aspect regarding safety- **DO NOT PROCEED!**

6. **Secure the Jobsite** – Reroute pedestrian and vehicle traffic as necessary by using traffic control equipment or provide other security measures as outlined by local authorities or as required to insure workers and public safety. Do not allow unauthorised or untrained individuals inside the work area. Use appropriate barriers as required.

**INSPECT THE WORK AREA** and ensure that all personnel have clear instructions regarding the "danger area" around the test plug.

7. **Test the Atmosphere** – The work area may contain toxic or flammable gases or be oxygen deficient. It is important to ventilate confined areas such as manholes or pits before allowing anyone to enter the work area. Always ventilate any confined space, starting from the bottom. Noxious gasses are usually heavier than air and will be found in greater concentrations at the lowest levels. REMEMBER always reinstall ventilation hoses after lowering workers into the confined space.

8. **Use Proper Entry Procedures – NEVER WORK ALONE**, when entering confined workspace, insure that proper harnesses, ropes, gloves and other safety equipment are used at all times.

Consult with your supervisor for established safe entry procedures and correct equipment to use.

9. **Clean the Pipe** – Test plugs are designed to be used in clean dry pipes ONLY! It is important to remove any debris from the area within the pipe to insure a proper seal. Failure to clean the pipeline of debris will cause the plug to slip and fail, resulting in possible injury or death.

10. **Inspect the Pipe** – Inspect the pipeline for evidence of damage, cracks or breaks. Plug pressure applied to a damaged pipe can further damage the pipe, causing failure of both pipe and plug.

### Making Necessary Calculations:

#### 11. Check That the Plug is Suitable For the Application

- a) **MEASURE THE DIAMETER OF THE PIPE.** Carefully measure the inside of the pipe you will be working with to determine its diameter. Measure this dimension in inches and millimeters, as plugs can be in imperial and metric.
- b) **DETERMINE THE BACKPRESSURE:** (Air or Liquid) The back pressures that a plug must withstand can be stated in various types of measurements:
- Pounds Per Square Inch (PSI)
  - Bar (B)
  - Kilopascals (kPa)
  - Megapascals (MPa)
  - Metres Head (Mh)
  - Feet Head (Hf)

Back pressure can be calculated by determining the height of water or pressure that accumulates from the center line of the pipe.

- c) **DETERMINE THE PIPE'S AREA:**  $R \times R \times 3.14$

- Divide the pipe's diameter by 2 to get the radius
- Multiply the radius by the radius.
- Multiply that number by 3.14, the resulting total will be the pipe's total square inches.

#### EXAMPLE

Step (1) 60" pipe diameter divided by 2 = 30"

Step (2) 30" x 30" = 900

Step (3) 900 x 3.14 = 2826 total square inches

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### Making Necessary Calculations Continued:

d) CALCULATE THE TOTAL POUNDS OF FORCE THE PLUG MUST WITHSTAND

Multiply the backpressure required by the total square inches of the pipe. The resulting total will give you the total pound of force that the plug must withstand.

EXAMPLE:

Now that you have calculated:

- 1) THE TOTAL BACKPRESSURE BEING EXERTED
- 2) THE TOTAL PIPE AREA
- 3) THE TOTAL FORCE/BACKPRESSURE THE PLUG MUST HOLD BACK, YOU ARE NOW READY TO SELECT THE CORRECT PLUG TO SUITE YOUR JOB APPLICATION

12. **Select the Proper Plug** – Test plugs are clearly marked with minimum and maximum usage/pipe size ranges. Select the appropriate size plug for your particular job application, and ensure that the maximum backpressure capacity is within the specified limit of that test plug.

Select a air hose that is long enough to place you OUTSIDE OF THE DANGER ZONE!. If using a plug in a manhole or other confined space, use of an inflation hose and rope is best practice to allow installation from a safe distance.

**WARNING: DO NOT INSTALL A PLUG WHERE PRESSURE AND FORCES EXCEED THE MAXIMUM RATING LISTED ON THE PLUG, IF YOU DO NOT HAVE THE RIGHT PLUG FOR YOUR SPECIFIC APPLICATION— DO NOT PROCEED!**

**USING THE WRONG PLUG OR OVERINFLATING A PLUG TO COMPENSATE FOR EXERTED PRESSURE CAN RESULT IN PLUG FAILURE, PIPE DAMAGE, INJURY, OR DEATH. UNDER INFLATION CAN RESULT IN PLUG BECOMING DISLODGED, SO ENSURE THAT THE INFLATION PRESSURE IS MONITORED. ENSURE PLUG IS BRACED.**

13. **Inspect the Plug Always** – Inspect the plug for damage before putting one into service.

**NOTE:** If a plug looks to have any damage - **DO NOT USE IT!**

Damage may consist of, but not limited to, bulges, cuts, abrasions, wear, looser distorted fittings, or apparent bond release.

**IMPORTANT:** Mark damaged or questionable plugs with brightly colored paint and do not use, tag for repair or disposal and set aside in a separate location.

Failure to carefully inspect each plug before use could cause dire consequences such as property damage, personal injury or death.

Use of damaged plugs may result in plug slippage and failure resulting in property damage, personal injury or death.

14. **Clean the Plug** – After carefully inspecting the plug for damage, clean with detergent and water. Allow the plug to thoroughly dry before use, repeat this cleaning procedure after each use.

**NEVER USE SOLVENTS OR PETROLEUM PRODUCTS TO CLEAN PLUGS.**

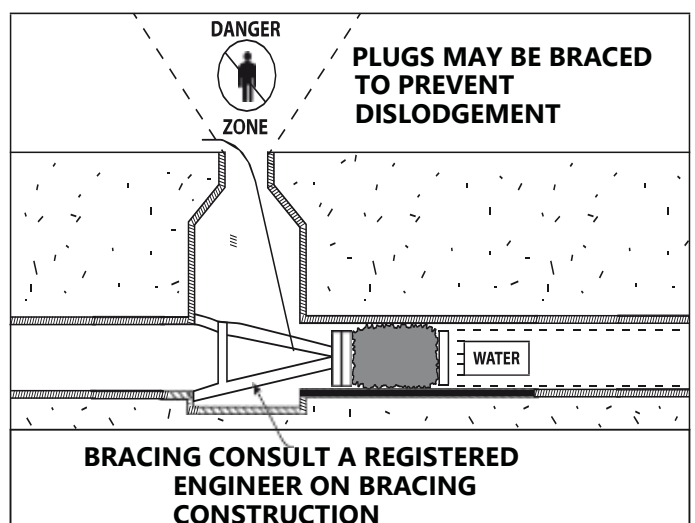
The rubber composition and bonding materials used in their construction may be severely weakened resulting in catastrophic failure of the plug.

### Installation of Pneumatic Test Plugs:

15. **Install Bracing and Back-Up System** – Tremendous and potentially deadly forces are present when plugging a pipeline.

It is therefore ABSOLUTELY ESSENTIAL that you provide bracing for the plug to insure your safety in the event of an accidental dislodge. This block or brace should be designed to contain a dislodged plug and all materials behind it, should the plug fail during use.

CONSULT A REGISTERED ENGINEER FOR PROPER DESIGN AND CONSTRUCTION OF SUCH A BRACE.



Additional back up plugs placed upstream from your main plug may be used to prevent leakage and reduce the pressure on the main plug.

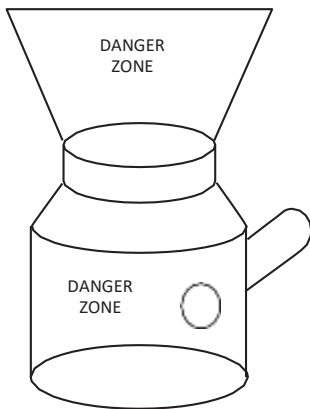
**NEVER RELY SOLELY ON A SINGLE PLUG TO PREVENT PROPERTY DAMAGE OR LEAKAGE. ALWAYS PROVIDE A BACK- UP SYSTEM.**

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### Installation of Pneumatic Test Plugs Continued:

#### 16. Warning! Always Avoid the Danger Zone



This is the area directly in front of the pipeline and plug. It is an invisible funnel shaped zone, increasing in size as it moves outwards from the plug.

It is essentially a blast acting much like the explosion of launching a projectile from a cannon. Should the plug fail, the plug and accompanying debris will launch outward with a tremendous, and deadly force. Surrounding obstacles may also deflect flying debris. This ricocheting factor adds a further unpredictable element to an already dangerous plug failure.

17. **Attach the Inflation Line and Rope—USE CAUTION!** Improper attachment of inflation hose may cause the plug to deflate unexpectedly resulting in plug failure.

18. **Lower the Plug Into the Pipe Carefully**—Metal eyebolts are provided for handling the plug.

NEVER USE THE EYEBOLTS TO SECURE A SAFETY ROPE OR AS A MEANS TO RESTRAIN THE PLUG DURING DEFLATION. THESE ITEMS ARE NOT DESIGNED TO WITHSTAND THE PRESSURES AND FORCES INVOLVED.

19. **Carefully Insert the Plug Into Position**—Insert plug into pipeline a minimum of the diameter measurement of the pipe inside the pipe.

- Do not allow plug to protrude from pipeline while inflating

- Do not insert plug over or near sharp objects or obstruction
- Do not insert plug where 2 pipes intersect. Plugs are designed to work by applying pressure evenly from the sides of the plug

20. **Inflate the Plug:** Check the air pressure gauge, ensure that the pressure is holding steady at all times. PARTIALLY INFLATE PLUG and check the air pressure at the gauge. Repeat this cycle of inflating and checking until the plug is fully inflated to maximum air pressure.

- Continue to monitor the air pressure gauge, ensure consistent pressure.
- Never exceed the maximum pressure, failure of the plug will result.
- Never use an under inflated plug, it will slip and fail.
- Do not remove or disable pressure relief valve.

#### 21. Removal of Pneumatic Test Plugs:

- DEFLATING THE PLUG—Before attempting to deflate the pneumatic plug must release all pipe back pressure. Stay out of **DANGER ZONE**.
- SLOWLY DECREASE THE AIR PRESSURE—Until the plug is **COMPLETELY** deflated.
- REMOVE THE PLUG SLOWLY—By pulling on the rope attached to the metal eyebolts provided for this purpose.
- DO NOT ATTEMPT TO PULL THE PLUG FROM A PIPELINE BEFORE THE PLUG IS COMPLETELY DEFLATED.
- DO NOT USE THE AIR INFLATION HOSE TO PULL THE DEFLATED PLUG FROM THE PIPELINE.
- INSPECT AND CLEAN—The plug before storing it away for future use.

### RISK ASSESSMENT (1= HIGH RISK, 5 = LOW RISK)

Risk (Ranking)	Description	Control
1	Test plugs must be braced at all times to ensure plug is not dislodged.	It is essential that bracing is provided for the test plug to insure safety in the event of an accidental test plug dislodgement
1	Never use a test plug in a pipe size different from recommended usage range. This could cause plug to be dislodged	Always use correct size test plug to the pipe being tested.
1	Ensure test plug pressures are continuously monitored as inflation pressure reduction could cause dislodgement.	Always monitor pressure clear of danger zone.
1	While inflating test plug, always monitor pressure. Do not over inflate test plug.	Always monitor inflation pressure clear of danger zone.
1	Damaged test plugs could fail never install a damaged test plug.	Always inspect the test plugs for damage before putting one into service.
1	Ensure pipe is clean and free of sharp objects, as plug could burst or dislodge.	Install test plug in pipe away from joints, T-sections and sharp objects.

### PRESSURE CONVERSION TABLE

Pounds per Square Inch (p.s.i.)	Kilopascals (kPa)	Metres (m)	Bar (Bar)	Megapascals (MPa)
1	6.89	0.70	0.07	0.00689
2	13.79	1.41	0.14	0.01379
3	20.68	2.11	0.21	0.02068
4	27.58	2.81	0.28	0.02758
5	34.47	3.52	0.34	0.03447
6	41.37	4.22	0.41	0.04137
7	48.26	4.92	0.48	0.04826
8	55.16	5.62	0.55	0.05516
9	62.05	6.33	0.62	0.06205
10	68.95	7.03	0.69	0.06895
11	75.84	7.73	0.76	0.07584
12	82.74	8.44	0.83	0.08274
13	89.63	9.14	0.90	0.08963
14	96.53	9.84	0.97	0.09653
15	103.42	10.55	1.03	0.10342
16	110.32	11.25	1.10	0.11032
17	117.21	11.95	1.17	0.11721
18	124.11	12.66	1.24	0.12411
19	131.00	13.36	1.31	0.13100
20	137.90	14.06	1.38	0.13790
21	144.79	14.76	1.45	0.14479
22	151.68	15.47	1.52	0.15168
23	158.58	16.17	1.59	0.15858
24	165.47	16.87	1.65	0.16547
25	172.37	17.58	1.72	0.17237
26	179.26	18.28	1.79	0.17926
27	186.16	18.98	1.86	0.18616
28	193.05	19.69	1.93	0.19305
29	199.95	20.39	2.00	0.19995
30	206.84	21.09	2.07	0.20684
31	213.74	21.80	2.14	0.21374
32	220.63	22.50	2.21	0.22063
33	227.53	23.20	2.28	0.22753
34	234.42	23.90	2.34	0.23442
35	241.32	24.61	2.41	0.24132
36	248.21	25.31	2.48	0.24821
37	255.11	26.01	2.55	0.25511
38	262.00	26.72	2.62	0.26200
39	268.90	27.42	2.69	0.26890
40	275.79	28.12	2.76	0.27579

# Vacuum Testing Equipment

**Purpose for which this equipment is designed:**  
Shore Hire's manhole Vacuum Testing Equipment is engineered to perform vacuum (negative air pressure) testing on concrete sewer manholes and lines.



Vacuum Testing Plate



Vacuum Venturi Pump

### Hazard and Risk Assessments

Before using this equipment, the job you are doing must be assessed for foreseeable hazards and risks and appropriate measures to eliminate, control or reduce those risks must be taken before you commence work.

### Suggested PPE (Personal Protective Equipment):



Protective Gloves Protective Footwear Hard Hat Eye Wear  
Note: PPE must be suited to the risks and person(s) using the equipment.

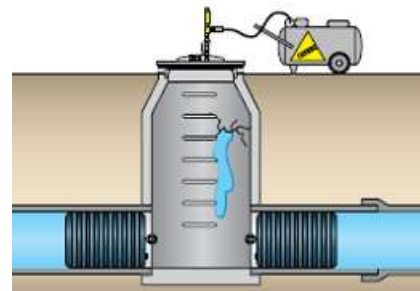
### Safety Instructions:

- Operating Instructions** – Before using this equipment ensure you have read the 'Operating Instructions' and taken note of the 'Hazards and Risks' detailed on this instruction sheet and taken all necessary steps to prevent injury.
- Personal Protective Equipment** – Use appropriate personal protective equipment for the job plus gas detectors and escape rebreathers for confined space entry.

### Operating Procedure:

Additional equipment which will be required:

- Air compressor (85 CFM or larger recommended);
- Pipe Plugs (one for each inlet pipe);
- Inflation hose and ropes (one for each plug);



### Vacuum Testing Procedures:

#### Warning

- Before entering any manhole, you must follow all confined space entry regulations.
- Ensure that all pipes entering and/or exiting the manhole are temporarily plugged using the proper sized plug. Brace the plugs and the pipes to prevent suction into the manhole during the vacuum test.
- 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).
- Do not use plugs or hoses with pressure relief valves, or rupture discs, as the vacuum may cause them to blow.
- Verify that all ropes and inflation hoses are completely inside the manhole and that no part of any equipment is sticking out of the top of the manhole.
- Install the manhole vacuum head assembly onto the manhole opening.
- Install the plate with the foam liner side down on the manhole frame or on the top of the concrete cone.
- Attach the air compressor hose to the back side of the Venturi Pump.

# Vacuum Testing Equipment

- Close the valve on the Venturi Pump so that no air can flow through the unit. The valve handle will be vertical when the valve is closed
- Open the valve on the Manhole Plate
- The valve handle will also be pointing up.
- Attach your air compressor (recommend 85 cfm or higher) hose to the back of Venturi Pump using the Minsup fitting.
- Start the air compressor.
- Open the valve on the venturi pump by turning the valve handle ¼ turn (the valve handle should now be horizontal). Air will be moving through the venture pump and you should start to see vacuum registering on the test plate gauges.
- A vacuum of 10 inches of Mercury (10 HG) is usually specified, check your local authorities requirements.
- Once you reach 10HG, close the valves on both the Venturi Pump and the Plate and turn off your air compressor.
- The length of the test is determined by the diameter and depth of the manhole. Consult the local inspection authorities specifications for the length of test and the maximum allowable leakage.

**Notice that the length of time in the specifications is usually 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.**

- Once the test is completed, exhaust the vacuum (let the air back in) into the manhole by disconnecting the air compressor hose and opening the valves on both the Venturi Pump and the Plate. You should hear air rushing into the manhole and you should start to see the vacuum pressure dropping on the Plate gauge.
- Once all the air has been let back into the manhole, (the Plate gauge will read zero and you will no longer hear air rushing into the manhole) remove the Plate from the manhole.
- Deflate the pipe plugs using the fill kits/retrieval rope and remove the pipe plugs from the manhole.

### Trouble Shooting:

1. 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 below) to find out whether the manhole is leaking.

Verify that the pipe plugs being used will hold the negative pressure (vacuum) being tested.

- Verify that the Plate is properly sealing the manhole.
- Verify that the foam liner on the bottom of the Plate is not worn out or damaged.
- Verify that the concrete cone is not too rough and is creating a leak path;

Verify that all fittings on the plate and pump are not leaking.

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

2. No vacuum is being pulled on the manhole and/or no vacuum is registering on the 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 Plate.

- Wetting down the concrete can help get a tight seal;
- Wetting down the foam liner on the bottom of the Plate can also help get a proper seal.
- Apply some weight or pressure to the top of the Plate.

### Warning

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

- Verify that the Venturi is connected properly to allow a vacuum to be pulled.
- Verify that the Venturi 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.

## RISK ASSESSMENT (1 = HIGH RISK, 5 = LOW RISK)

Risk (Ranking)	Description	Control
1	Plug Exploding	Always check the pressure of the plug being inflated don't assume they are the same.
1	Suffocation	Do not operate if there is anyone in the manhole.
3	Falling	Do not stand on the test plate when in operation.

# 1000-75 Petrol Powered Vacuum Generator



The 1000-65 can also be used for pressure testing to 15 PSIG. It should be noted that the hoses fitted are for vacuum applications but pressure hose are available if you intend to use this unit for pressure testing.

### HAZARD AND RISK ASSESSMENTS

Before using this equipment, the job you are doing must be assessed for foreseeable hazards and risks and appropriate measures to eliminate, control or reduce those risks must be taken before you commence work.

### Suggested PPE (Personal Protective Equipment)



Close fitting, protective clothing or a workshop apron



Rings and jewellery must not be worn.



Gloves must not be worn when operating this machinery

Note: PPE must be suited to the risks and person(s) using the equipment

### HAZARDS

Do not use air hose as they are rated for positive pressure and not negative pressure and may collapse and cause a blockage

Do not test pipe to a pressure greater than required. Some pipes are not rated for high pressures and could collapse under high negative pressure.

Do not allow the vacuum pump to operate when hoses are connected to the pump and not a plug or plate.

Any debris or water sucked up by the hose could damage the pump as it is designed to pump air only and cannot manage any contaminants. Damage will be caused and the pump is the most expensive component

Do not allow the vacuum hose to suck onto your clothing or skin. A full vacuum will quickly damage skin and blood cells.

The pump is capable of "full" vacuum and this could cause some pipe types to collapse if over vacuumed.

Before using the vacuum system

- Check petrol and engine oil levels
- Check that the pump oil reservoir is full
- Only use Castrol Perfecto T68 oil or the equivalent in the pump reservoir

### EQUIPMENT REQUIRED TO CONDUCT VACUUM TEST

1. Manhole Vacuum Test Plate, Ball Valve & Gauge





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### 2. Vacuum Pump and Hose



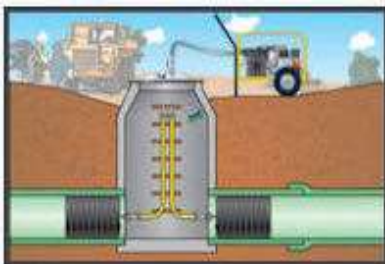
### 3. Blanking Plugs (2 + depending on test area)



**WARNING:** for plug installation instructions please refer to *Pipe testing plug Operating and Safety Instructions*

### CONDUCTING A TEST

1. Block off all outlets except the test point with plugs rated to at least 14.5 psi (1 bar) allowable back pressure. Install a vacuum plate rated to at least 14.5 psi (1 bar) allowable back pressure. Always inflate the plugs to the pressure indicated on the plug.
2. Connect the vacuum hose to the manhole plate. Do not use air hose as they are rated for positive pressure and not negative pressure and may collapse and cause a blockage.



3. Once the plugs are in place and the hose is attached to the plug and the vacuum pump start the engine and run the motor at maximum revs.
4. The volume of air to be displaced will determine the time required to reach the vacuum test pressure. As the negative pressure increase the rate of eduction decreases.
5. Once the test pressure has been achieved isolate the space with a pressure rated ball valve and monitor the pressure with a gauge connected to the test plug or plate.
6. If the pressure decreases below the allowable limit during the time you have a leak. The faster the pressure drop the bigger the leak.
7. If you are testing a manhole you can spray the walls with soapy water and pull vacuum then check to see if bubbles have been created. That's where the leak is.
8. If a leak is found, repair and conduct another test

### CALCULATING A VACUUM TEST

- CFM is a measure of speed as is LPM.
- A Cubic foot of air is equal to 28.3 liters of air and displaces the same space or area as 28.3 liters of water.
- 75 cfm is 2,122.50 liters of air per minute.
- A 900mm diameter manhole or pipe 1 meter deep (long) holds 636 liters of air and the air can be educted in about 15 seconds.

### HOW MUCH AIR DO YOU NEED TO MOVE?

To calculate the volume of air to be extracted simply

Multiply Pipe Radius x Pipe Radius x 3.142 x Length of Pipe (or depth of manhole) = Liters of air in pipe

Liters of air in pipe / 2,122.5 (liter of air per minute) = Time required to remove air

Example: 900mm Pipe @ 5000mm long

.450 x .450 x 3.142 x 5000 = 3181 liters rounded

3181/2,122.5 = 1.5 minutes

### VACUUM PERFORMANCE

RPM	Max CFM/L	5"Hg	10"Hg	15"Hg	20"Hg	25"Hg	27"Hg	Continuous HG/Bar	Intermittent HG/Bar
1750	75 2122	74 2095	72 2037	71 2009	67 1896	64 1811	60 1698	20 .67	27 .91

### RISK ASSESSMENT (1= HIGH RISK, 5 = LOW RISK)

Risk (Ranking)	Description	Control
1	Untrained operator	Ensure operator is competent and has read and fully understands operating instructions
1	Collapse pf pipework	Monitor pressure gauges at all times and check pipe pressure rating before conducting test
1	Pump fluid levels low	Check all of Vac Pumps fluid levels before starting pump
1	Failure or explosion of test Plug could cause injury or death	Ensure all test Plugs are braced & stay clear of danger zone

# Low Pressure Alarm System for Plugs



### Hazard and Risk Assessments

Before using this equipment, the job you are doing must be assessed for foreseeable hazards and risks and appropriate measures to eliminate, control or reduce those risks must be taken before you commence work.

### Suggested PPE (Personal Protective Equipment)



Protective  
Gloves



Protective  
Footwear



Hard Hat



Eye  
Protection

Note: PPE must be suited to the risks and person(s) using the equipment.

### Safety Instructions:

- Operating Instructions** – Before using this equipment ensure you have read the ‘Operating Instructions’ and taken note of the ‘Hazards and Risks’ detailed on this instruction sheet and taken all necessary steps to prevent injury.
- Personal Protective Equipment** – Use appropriate personal protective equipment for the job.
- Installation Advice** – The safe use and application of these this equipment must be in accordance with AS3610, the Occupational Health and Safety Act, approved Codes of Practice and any other regulatory requirements. Consultation with a competent person or qualified engineer is advised.

### Installation Requirements:

To set the required alarm pressure a regulated compressed air source and a calibrated gauge are required.

ENSURE YOU HAVE BEEN PROPERLY INSTRUCTED BY A COMPETENT PERSON BEFORE USING THIS EQUIPMENT.

### Purpose for which this equipment is designed:

Plug inflation pressures need to be monitored and checked at least every four (4) hours, or have the Low Pressure Alarm System installed. The Alarm fits on the end of the inflation line of the plug to warn when the pressure drops to 10% below the recommended inflation pressure.

Pressure drops occur as a small volume of inflation air over time may/will leak through the elastomeric (rubber) body of every pneumatic plug. This lost air must be replaced or under-inflation may result allowing the plug and any media restrained to dislodge from the pipe. The Low Pressure Alarm System will warn, via a flashing red light and a siren when the drop in pressure reaches 10% below inflation set pressure.

A regulated pressure source may be permanently attached to the plug’s inflation inlet port as an alternative to periodically checking and adjusting the inflation pressure. Shore Hire’s critical air regulator and cylinder is such a pressure regulated inflation source.

INFLATION PRESSURE VERSUS TEMPERATURE. Any temperature increase or decrease will cause a corresponding change in inflation pressure. Monitor (LP Alarm) and adjust (Critical Air Cylinder) plug inflation pressure as necessary to compensate for temperature changes.

NOTE: Temperatures in pipelines may vary widely from outside ambient temperatures.



Critical Air Cylinder and Alarm set up

### HAZARD: Risk of Plug Failure

- ... Always attach an inflation hose to the plug, so that it can be inflated/deflated from a position of safety
- ... Never deflate a plug with back pressure behind
- ... Do not exceed plug inflation pressure
- ...Always use properly calibrated gauges
- ...Always check the alarm is operational and set to the right inflation pressure prior to use
- ...Brace all plugs (eg 300mm plug with 5psi back pressure has the equivalent to 1,025kg of force to hold back)

## Operating and Safety Instructions

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### WARNING

**DO NOT OVER-INFLATE OR UNDER-INFLATE A PNEUMATIC PLUG!**

**OVER-INFLATION** of a pneumatic plug (exceeding the required inflation pressure) may cause the plug to rupture and dislodge at extreme velocity!

**UNDER-INFLATION** of a pneumatic plug (inflation to pressure less than that required) may cause the plug and the media restrained to dislodge from the pipe! A plug that is over-inflated or under-inflated may not fail immediately. However such failure may occur at any time without warning!

**IMPROPER INFLATION MAY CAUSE PLUG FAILURE OR DISLODGE-  
MENT WHICH MAY RESULT IN DEATH, SERIOUS BODILY INJURY AND/OR  
PROPERTY DAMAGE!**



Plug, poly lift hose, LP Alarm & Handpump (Hand pump must be disconnected once inflation pressure has been reached, to prevent air pressure leaking back through the handpump.

### Installation of the LP Alarm

The Alarm is pre-set at the Shore Hire Branch as plug inflation pressures vary from 12 to 40psi dependant upon make and size of plug.

#### Operating Instructions:

- Install plug in pipe as per plug operating instructions & brace as requires.
- Inflate the plug to recommended pressure, as indicated on the plug. Use a poly lift hose from the plug to the Alarm, then either a hand pump or regulated air supply to inflate
- Turn on the Alarm toggle switch, the green light should come on
- Test Alarm: Decrease source pressure to 10% below the desired pressure. This should be done prior to back pressure being applied
- Alarm should sound and red light come on
- Adjust the inflation pressure to the correct pressure to silence the Alarm

**Any questions please call 1300 SHOREHIRE**

### RISK ASSESSMENT (1= HIGH RISK, 5 = LOW RISK)

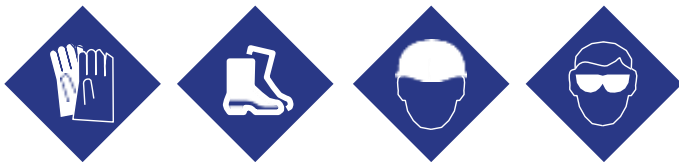
Risk(Ranking)	Description	Control
1	Alarm set for wrong inflation pressure	Always inflate plug in position and then drop inflation pressure by 10% to check the Alarm is operational, prior to allowing back pressure to be applied
3	Battery fails	Keep a spare 9v battery and replace if the green light goes out while in use
3	Over or under inflation of plug	Check the inflation pressure required as displayed on the plug. Always use calibrated gauges and wear correct PPE

### High Pressure Pipe Testing Plugs

#### Hazard and Risk Assessments

Before using this equipment, the job you are doing must be assessed for foreseeable hazards and risks and appropriate measures to eliminate, control or reduce those risks must be taken before you commence work.

#### Suggested PPE (Personal Protective Equipment):



Protective Gloves Protective Footwear Hard Hat Eye Wear

Note: PPE must be suited to the risks and person(s) using the equipment.

#### Safety Instructions:

- Operating Instructions** – Before using this equipment ensure you have read the ‘Operating Instructions’ and taken note of the ‘Hazards and Risks’ detailed on this instruction sheet and taken all necessary steps to prevent injury.
- Personal Protective Equipment** – Use appropriate personal protective equipment for the job.
- Installation Advice** – The safe use and application of these products must be in accordance with the Workplace Health and Safety Legislation approved Codes of Practice and any other regulatory requirements. Consultation with a qualified engineer is advised.

#### HAZARD:

...Incorrectly installed pipe plugs systems can result in plug failure resulting in possible injury or death.  
... Consultation with a qualified engineer is advised.

- Check Your Tools** – As with any repair and maintenance procedure, it is important to use ONLY the proper tools for your task and know how to use them correctly. Inspect your tools closely to insure that they are in proper working condition.

Maintaining consistent and accurate inflation pressure is extremely important in working with H.P. Plugs. Be sure that your pressure gauges are calibrated accurately and capable of holding a steady pressure setting. Plug Inflation pressure must be checked constantly. Also be sure that you are using tools or equipment that are tested and tagged to local authorities’ regulations.

- Evaluate the Job** – Individual and unique characteristics of working environment can greatly influence the performance of any product. These could include weather, ground conditions, machinery available etc. It is extremely important to carry out a risk analysis prior to starting work.

It is the supervisor’s responsibility to examine each situation to determine proper repair/testing and safety procedures. In addition the supervisor must be aware of any local, state, and/or federal regulatory requirements that may be required to insure workers or public safety.

**FOR HIGH PRESSURE WATER MAINS, RISING MAINS ETC  
NOT FOR LOW PRESSURE SEWER PIPES, CLAY OR L.P. PVC PIPES**

It is extremely important to allow only experienced personnel to function in the decision-making capacity and provide close supervision for individuals considered to be ‘assistants’ or are ‘in training’. Consult your supervisor, safety engineer or governing authority for proper instructions.

**ALL PLUGS MUST BE BRACED TO STOP ANY  
MOVEMENT WHILE IN USE OR IF SUDDEN  
DEFLATION OCCURS. STAY OUT OF DANGER  
AREA AT ALL TIMES.**

All High Pressure Plugs are generally used for Sewer Rising mains, water mains, liquid transfer pipes and are under extreme pressure. The use of these plugs are limited to back pressure capacities usually between 100-250p.s.i./689.5-1723.7kPa/70.3-175.7mHead/6.89-17.23Bar, so any back pressure requirements above these may not be suitable for these Plugs. For any pressure’s outside of these, please consult the manufacturer’s specifications and ensure the pipe type is suitable for the anticipated back pressure and inflation pressure.

EVERY JOB IS DIFFERENT and must be carefully examined to insure the safest procedure for each circumstance encountered. The safest Plug on earth will not save you if it is used outside its specifications, handled improperly or if safety practices are ignored.

#### Warning:

This is a general guideline for the installation, handling and removal of High Pressure Plugs. For more detailed and specific information, the manufacturer’s document should be obtained and read prior to use. It is the user’s responsibility to comply with any local state, and/or federal safety regulation as it pertains to their geographical location or job situation.

#### Notice to Employers, Contractors and Users:

All personnel who use or work in close proximity to test plugs must be instructed and become familiar with proper installation, handling and removal procedures. **YOUR LIFE MAY DEPEND ON IT.**

Shore Hire strives to supply the best quality plugs available and the most suitable for the project as outlined by the contractor.

However, we cannot control or predict the unlimited workplace variables that can affect safety conditions. General safety conditions are overwhelmingly the result of workers adhering and utilising proper safety practices.

Natural rubber plugs are not for use in oil, gas, chemical or petroleum applications.

**FAILURE TO MAINTAIN CONSISTENT INFLATION  
PRESSURE CAN RESULT IN PLUG FAILURE  
RESULTING IN POSSIBLE INJURY OR DEATH.**

### Safety Instructions Continued:

**FAILURE TO RECOGNISE INHERENT DANGERS AT THE JOBSITE CAN BE DEADLY. IF ANYONE IS UNSURE OF ANY ASPECT REGARDING SAFETY - DO NOT PROCEED!**

6. **Secure the Jobsite** – Reroute pedestrian and vehicle traffic as necessary by using traffic control equipment or provide other security measures as outlined by local authorities or as required to insure workers and public safety. Do not allow unauthorised or untrained individuals inside the work area. Use appropriate barriers as required.  
**INSPECT THE WORK AREA** and ensure that all personnel have clear instructions regarding the “danger area” around the test plug.
  7. **Test the Atmosphere** – The work area may contain toxic or flammable gases or be oxygen deficient. It is important to ventilate confined space areas such as manholes or pits before allowing anyone to enter the work area. Always ventilate any confined space, starting from the bottom. Noxious gasses are usually heavier than air and will be found in greater concentrations at the lowest levels. REMEMBER always reinstall ventilation hoses after lowering workers into the confined space.
  8. **Use Proper Entry Procedures – NEVER WORK ALONE** – when entering confined space workspace, insure that proper harnesses, ropes, gloves and other safety equipment are used at all times.  
Consult with your supervisor for established safe entry procedures and correct equipment to use.
  9. **Clean the Pipe** – All plugs are designed to be used in clean dry pipes ONLY! It is important to remove any debris from the area within the pipe to insure a proper seal. Failure to clean the pipeline of debris will cause the plug to slip and fail, resulting in possible injury or death.
  10. **Inspect the Pipe** – Inspect the pipeline for evidence of damage, cracks or breaks. Plug inflation pressure applied to a damaged pipe can further damage the pipe, causing failure of both pipe and plug.
- Megapascals (MPa)
  - Metres Head (Mh)
  - Feet Head (Hf)
- Back pressure can be calculated by determining the height of water or pressure that accumulates from the center line of the pipe.
- c) DETERMINE THE PIPE’S AREA:  $R \times R \times 3.14$ 
    - Divide the pipe’s diameter by 2 to get the radius
    - Multiply the radius by the radius.
    - Multiply that number by 3.14, the resulting total will be the pipe’s total square inches.

EXAMPLE  
Step (1) 60” pipe diameter divided by 2 = 30”  
Step (2) 30”x 30”= 900  
Step (3) 900 x 3.14 = 2826 total square inches
  - d) CALCULATE THE TOTAL POUNDS OF FORCE THE PLUG MUST WITHSTAND  
  
Multiply the backpressure required by the total square inches of the pipe. The resulting total will give you the total pound of force that the plug must withstand.  
  
EXAMPLE:  
Now that you have calculated:  
1) THE TOTAL BACKPRESSURE BEING EXERTED  
2) THE TOTAL PIPE AREA  
3) THE TOTAL FORCE/BACKPRESSURE THE PLUG MUST HOLD BACK, YOU ARE NOW READY TO SELECT THE CORRECT PLUG TO SUITE YOUR JOB APPLICATION
  12. **Select the Proper Plug** – Test plugs are clearly marked with minimum and maximum usage/pipe size ranges. Select the appropriate size plug for your particular job application, and ensure that the maximum backpressure capacity is within the specification limit of that test plug (see Photo 1).  
  
Select an inflation hose (water) that is long enough to place you OUTSIDE OF THE DANGER ZONE!. If using a plug in a manhole or other confined space, use of an inflation hose and rope is best practice to allow installation from a safe distance.

### Making Necessary Calculations:

#### 11. Check That the Plug is Suitable For the Application

- a) MEASURE THE DIAMETER OF THE PIPE. Carefully measure the inside of the pipe you will be working with to determine its diameter. Measure this dimension in inches and millimeters, as plugs can be in imperial and metric.
- b) DETERMINE THE BACKPRESSURE: (Liquid only for High Pressure) The back pressures that a plug must withstand can be stated in various types of measurements:
  - Pounds Per Square Inch (PSI)
  - Bar (B)
  - Kilopascals (kPa)

**WARNING: DO NOT INSTALL A PLUG WHERE PRESSURE AND FORCES EXCEED THE MAXIMUM RATING LISTED ON THE PLUG, IF YOU DO NOT HAVE THE RIGHT PLUG FOR YOUR SPECIFIC APPLICATION – DO NOT PROCEED!**

**USING THE WRONG PLUG OR OVERINFLATING A PLUG TO COMPENSATE FOR EXERTED PRESSURE CAN RESULT IN PLUG FAILURE, PIPE DAMAGE, INJURY, OR DEATH. UNDER INFLATION CAN RESULT IN PLUG BECOMING DISLODGED, SO ENSURE THAT THE INFLATION PRESSURE IS MONITORED. ENSURE PLUG IS BRACED.**

### Making Necessary Calculations Continued:

13. **Inspect the Plug Always** – Inspect the plug for damage before putting one into service.

**NOTE:** If a plug looks to have any damage - **DO NOT USE IT!**

Damage may consist of, but not limited to, bulges, cuts, abrasions, wear, looser distorted fittings or apparent bond release.

**IMPORTANT:** Mark damaged or questionable plugs with brightly colored paint and do not use, tag for repair or disposal and set aside in a separate location.

**FAILURE TO CAREFULLY INSPECT EACH PLUG BEFORE USE COULD CAUSE DIRE CONSEQUENCES SUCH AS PROPERTY DAMAGE, PERSONAL INJURY OR DEATH. USE OF DAMAGED PLUGS MAY RESULT IN SLIPPAGE PLUG AND FAILURE RESULTING IN PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.**

14. **Clean the Plug** – After carefully inspecting the plug for damage, clean with detergent and water. Allow the plug to thoroughly dry before use, repeat this cleaning procedure after each use.

**NEVER USE SOLVENTS OR PETROLEUM PRODUCTS TO CLEAN PLUGS.**

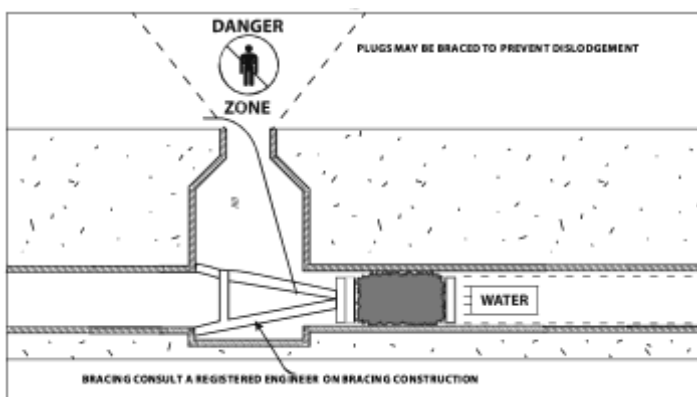
The rubber composition and bonding materials used in their construction may be severely weakened resulting in catastrophic failure of the plug.

### Installation of H.P. Hydrostatic Test Plugs:

15. **Install Bracing and Back-Up System** – Tremendous and potentially deadly forces are present when plugging a pipeline.

It is therefore **ABSOLUTELY ESSENTIAL** that you provide bracing for the plug to insure your safety in the event of an accidental dislodge. This block or brace should be designed to contain a dislodged plug and all materials behind it, should the plug fail during use.

**CONSULT A REGISTERED ENGINEER FOR PROPER DESIGN AND CONSTRUCTION OF SUCH A BRACE.**



Additional back up plugs placed upstream from your main plug may be used to prevent leakage and reduce the pressure on the main plug.

**NEVER RELY SOLELY ON A SINGLE PLUG TO PREVENT PROPERTY DAMAGE OR LEAKAGE. ALWAYS PROVIDE A BACK-UP SYSTEM.**

16. **Warning! Always Avoid the Danger Zone**

This is the area directly in front of the pipeline and plug. It is an invisible funnel shaped zone, increasing in size as it moves outwards from the plug.



It is essentially a blast acting much like the explosion of launching a projectile from a cannon. Should the plug fail, the plug and accompanying debris will launch outward with a tremendous, and deadly force. Surrounding obstacles may also deflect flying debris. This ricocheting factor adds a further unpredictable element to an already dangerous plug failure.

17. **Attach the Inflation Line (and Rope) – USE CAUTION!** – Improper attachment of inflation hose may cause the plug to deflate unexpectedly resulting in plug failure.  
**ONLY INFLATE H.P. Plug with water.**
18. **Lower the Plug Into the Pipe Carefully** – Metal eyebolts are provided for handling the plug.  
**NEVER USE THE EYEBOLTS TO SECURE A SAFETY ROPE OR AS A MEANS TO RESTRAIN THE PLUG DURING DEFLATION. THESE ITEMS ARE NOT DESIGNED TO WITHSTAND THE PRESSURES AND FORCES INVOLVED.**
19. **Carefully Insert the Plug Into Position** – Insert plug into pipeline a minimum of the diameter measurement of the pipe inside the pipe.
- Do not allow plug to protrude from pipeline while inflating
  - Do not insert plug over or near sharp objects or obstruction
  - Do not insert plug where 2 pipes intersect. Plugs are designed to work by applying pressure evenly from the sides of the plug

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### Installation of H.P. Hydrostatic test Plugs Continued:

20. **Inflate the Plug** – Check the pressure gauge, ensure that the pressure is holding steady at all times. PARTIALLY INFLATE PLUG and check the pressure at the gauge. Repeat this cycle of inflation and checking until the plug is fully inflated to maximum pressure as per the plug specifications.
  - Continue to monitor the pressure gauge, ensure consistent pressure.
  - Never exceed the maximum pressure, failure of the plug will result.
  - Never use an under inflated plug, as it will slip and fail.
  - Shut off safety valve when correct pressure is reached.
  - Do not remove or disable pressure relief valve.
  - Only inflate H.P. Plugs with water.
21. **Removal of Test Plugs** –
  - a) **RELEASE ALL BACKPRESSURE FROM BEHIND PLUG**- This MUST BE done prior to any deflation of plug occurs.
  - b) **DEFLATING THE PLUG** – Before attempting to deflate the plug, you must release all pipe back pressure. Stay out of **DANGER ZONE**. Ensure that hoses are long enough to enable clearance of **DANGER ZONE**.
  - c) **SLOWLY DECREASE THE PRESSURE** – Until the plug is **COMPLETELY** deflated
  - d) **REMOVE THE PLUG SLOWLY** – By pulling on the rope attached to the metal eyebolts provided for this purpose.
  - e) **DO NOT ATTEMPT TO PULL THE PLUG FROM A PIPELINE BEFORE THE PLUG IS COMPLETELY DEFLATED.**
  - f) **DO NOT USE THE INFLATION HOSE TO PULL THE DEFLATED PLUG FROM THE PIPELINE.**
  - g) **INSPECT AND CLEAN** – The plug before storing it away for future use.

### Carrying Out a High Pressure Hydrostatic Test:

1. **Place Plug in Pipe**- ensure pipe is clean & free from debris, and that pipe is capable of taking plug inflation pressure
2. **Attach the Inflation Line (and Rope)**–**USE CAUTION!** Improper attachment of inflation hose may cause the plug to deflate unexpectedly resulting in plug failure.
3. **Lower/place the Plug Into the Pipe Carefully** – Metal eyebolts are provided for handling the plug if necessary.  
NEVER USE THE EYEBOLTS TO SECURE A SAFETY ROPE OR AS A MEANS TO RESTRAIN THE PLUG DURING DEFLATION. THESE ITEMS ARE NOT DESIGNED TO WITHSTAND THE PRESSURES AND FORCES INVOLVED.
4. **Carefully Insert the Plug Into Position** – Insert plug into pipeline a minimum of the diameter measurement of the pipe inside the pipe.
  - a. Install Bracing as required
  - b. Always install plug with Breather hose at top (see photo 2)
5. **Inflate the Plug** – Connect inflation pump hose to male fitting for inflation. Make sure that lock off valve is open (see photo 3). Check the pressure gauge, ensure that the pressure is holding steady at all times. PARTIALLY INFLATE PLUG and check the pressure at the gauge. Repeat this cycle of inflation and checking until the plug is fully inflated to maximum air pressure as per the plug specifications.
  - a. Always use a Speedshore hand pump or Plumbers test Bucket to inflate H.P. Plugs. **ALWAYS INFLATE WITH WATER.** (see photo 4)
  - b. **ONLY INFLATE H.P. Plug with water** and ensure plug is always in centre of pipe (see photo 5). **STAY OUT OF DANGER ZONE. INSTALL BRACING.**
  - c. When plug is inflated to specifications, close inflation lock off valve and remove inflation device. Check inflation pressure regularly.

### RISK ASSESSMENT (1= HIGH RISK, 5 = LOW RISK)

Risk (Ranking)	Description	Control
1	Test plugs must be braced at all times to ensure plug is not dislodged.	It is essential that bracing is provided for the test plug to insure safety in the event of an accidental test plug dislodgement
1	Never use a test plug in a pipe size different from recommended usage range. This could cause plug to be dislodged	Always use correct size test plug to the pipe being tested.
1	Ensure test plug pressures are continuously monitored as inflation pressure reduction could cause dislodgement.	Always monitor pressure clear of danger zone.
1	While inflating test plug, always monitor pressure. Do not over inflate test plug.	Always monitor inflation pressure clear of danger zone.
1	Damaged test plugs could fail never install a damaged test plug.	Always inspect the test plugs for damage before putting one into service.
1	Ensure pipe is clean and free of sharp objects, as plug could burst or dislodge.	Install test plug in pipe away from joints, T-sections and sharp objects.



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### Carrying Out a High Pressure Hydrostatic Test Cont:

6. **Connect Bypass/Filler Pump** – depending on how pipe is being filled with water, connect test/filler pump to bypass fitting. Ensure that any safety clips are installed/connected (see photo 6). Before filling, ensure that the breather hose/pipe at top of plug is open.
  - a. Depending on test and equipment used, a separate pump may be used for filling of pipe and another for carrying out test.
  - b. Once pipe is filled with water – this is indicated by excess fluid being discharged from breather pipe at top of plug – disconnect Filler pump and connect test pump.
7. **Start Pump and commence Filling of Pipe** – check that pump specifications are to specifications to allow filling. (see operating instructions for specific pump to be used.)
  - a. Ensure that that any safety clips are installed/connected (see photo 8).
  - b. Keep breather hose lock off valve open.
8. **Testing of Pipe** – Connect test Pump to Bypass fitting (see photo 7). (see operating instructions for specific pump to be used.)
  - a. Start Test Pump and slowly introduce water into pipe via the bypass fitting. Water will be seen through clear discharge hose – this hose is rated to maximum 150 p.s.i. (see photo 9)
  - b. When a solid stream of water is being discharged from breather hose, close the lock off valve on the breather hose.
  - c. Increase r.p.m. on test pump until specified backpressure is indicated on gauge on test pump.
  - d. Once this is achieved, simultaneously close off valve on pump discharge hose and open dump valve on pump to allow pump to discharge water onto ground. The pipe should now be sealed and specified holding pressure. Shut down test pump.
  - e. Hold pressure for desired time as specified by operating authority ie 100p.s.i. at 5 minutes.
9. **Disconnect Pump** – once test is finished, release any back pressure by opening breather hose lock off valve first. **KEEP CLEAR AS HIGH PRESSURE WATER WILL ESCAPE.** Then release ALL fluid from pipe by opening valve on the test pump discharge line.
10. **Disconnect Plug** – refer to point 21 above.



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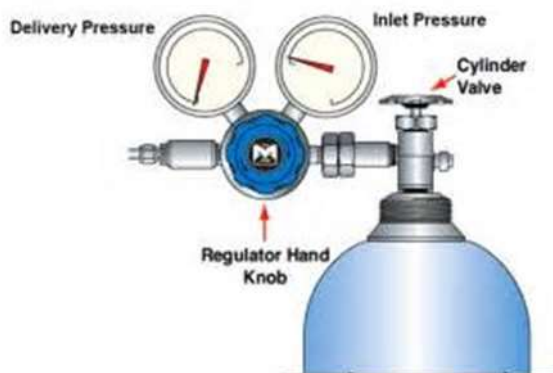
### PRESSURE CONVERSION TABLE

Pounds per Square In. p.s.i	Kilopascals kPa	Metres m	Bar Bar	Megapascals Mp	Feet ft	Pounds per Square In. p.s.i	Kilopascals kPa	Metres m	Bar Bar	Megapascals Mp	Feet ft
1	6.89	0.70	0.07	0.00689	2.31	106	730.84	74.53	7.31	0.73084	244.51
50	344.74	35.15	3.45	0.34474	115.33	108	744.63	75.93	7.45	0.74463	249.12
52	358.53	36.56	3.59	0.35853	119.95	110	758.42	77.34	7.58	0.75842	253.73
54	372.32	37.97	3.72	0.37232	124.56	112	772.21	78.74	7.72	0.77221	258.35
56	386.11	39.37	3.86	0.38611	129.17	114	786.00	80.15	7.86	0.78600	262.96
58	399.90	40.78	4.00	0.39990	133.79	116	799.79	81.56	8.00	0.79979	267.57
60	413.69	42.18	4.14	0.41369	138.40	118	813.58	82.96	8.14	0.81358	272.19
62	427.47	43.59	4.27	0.42747	143.01	120	827.37	84.37	8.27	0.82737	276.80
64	441.26	45.00	4.41	0.44126	147.63	122	841.16	85.77	8.41	0.84116	281.41
66	455.05	46.40	4.55	0.45505	152.24	124	854.95	87.18	8.55	0.85495	286.03
68	468.84	47.81	4.69	0.46884	156.85	126	868.74	88.59	8.69	0.86874	290.64
70	482.63	49.21	4.83	0.48263	161.47	128	882.53	89.99	8.83	0.88253	295.25
72	496.42	50.62	4.96	0.49642	166.08	130	896.32	91.40	8.96	0.89632	299.87
74	510.21	52.03	5.10	0.51021	170.69	132	910.11	92.81	9.10	0.91011	304.48
76	524.00	53.43	5.24	0.52400	175.31	134	923.90	94.21	9.24	0.92390	309.09
78	537.79	54.84	5.38	0.53779	179.92	136	937.69	95.62	9.38	0.93769	313.71
80	551.58	56.25	5.52	0.55158	184.53	138	951.48	97.02	9.51	0.95148	318.32
82	565.37	57.65	5.65	0.56537	189.15	140	965.27	98.43	9.65	0.96527	322.93
84	579.16	59.06	5.79	0.57916	193.76	142	979.06	99.84	9.79	0.97906	327.55
86	592.95	60.46	5.93	0.59295	198.37	144	992.85	101.24	9.93	0.99285	332.16
88	606.74	61.87	6.07	0.60674	202.99	146	1006.63	102.65	10.07	1.00663	336.77
90	620.53	63.28	6.21	0.62053	207.60	148	1020.42	104.05	10.20	1.02042	341.39
92	634.32	64.68	6.34	0.63432	212.21	150	1034.21	105.46	10.34	1.03421	346.00
94	648.11	66.09	6.48	0.64811	216.83	152	1048.00	106.87	10.48	1.04800	350.61
96	661.90	67.49	6.62	0.66190	221.44	154	1061.79	108.27	10.62	1.06179	355.23
98	675.69	68.90	6.76	0.67569	226.05	156	1075.58	109.68	10.76	1.07558	359.84
100	689.48	70.31	6.89	0.68948	230.67	158	1089.37	111.09	10.89	1.08937	364.45
102	703.27	71.71	7.03	0.70327	235.28	160	1103.16	112.49	11.03	1.10316	369.07
104	717.05	73.12	7.17	0.71705	239.89						

# Critical Air Cylinder and Regulator

The 'Critical Air Cylinder' will;

- Maintain a set pressure in Pneumatic plugs, and is used where a plug will be in place for some time.
- Not have enough volume in the cylinder to be used as an inflation device. (Inflate the plug to the manufacturers recommended inflation pressure, either with a hand pump or compressor).
- Always use the 6m inflation hose and gauge and inflate the plug from outside of the danger zone. When inflated to the correct pressure, disconnect the inflation tool and connect the critical air cylinder and regulator.
- Need to be monitored regularly for plug inflated pressure and cylinder capacity.



- The cylinder valve isolates the cylinder from the regulator.
- Inlet pressure gauge reads the high pressure in the cylinder, indicating the amount of gas left in the cylinder.
- Delivery pressure is the low pressure gauge, this reads the pressure going to the plug.
- The Regulator Hand Knob is used to set the pressure of the test plug, as recommended by the manufacturer.

### Hazard and Risk Assessments

Before using this equipment, the job you are doing must be assessed for foreseeable hazards and risks and appropriate measures to eliminate, control or reduce those risks must be taken before you commence work.

### Suggested PPE (Personal Protective Equipment):



Protective Gloves   Protective Footwear   Hard Hat   Eye Wear

Note: PPE must be suited to the risks and person(s) using the equipment.

### SAFETY INSTRUCTIONS

1. Operating Instructions – Before using this equipment ensure you have read the 'Operating Instructions' and taken note of the 'Hazards and Risks' detailed on this instruction sheet and taken all necessary steps to prevent injury.
2. Personal Protective Equipment – Use appropriate personal protective equipment for the job.
3. Service Advice – The safe use and application of this equipment must be in accordance with AS3610, the Occupational Health and Safety Act, approved Codes of Practice and any other regulatory requirements.

### HAZARD: Risk of Eye Damage or cuts and Explosion

...Eye Injury or cuts and lacerations may occur from over pressurisation of plug and hose.  
... Risk of Explosion - Using the regulator with any other gas than compressed air may result in an explosion

### WARNINGS

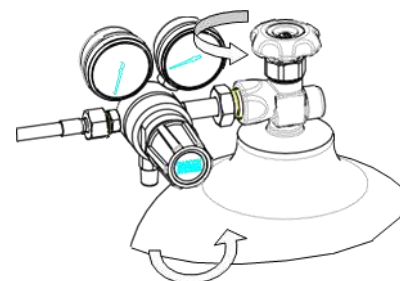
- DO not use this regulator with gases other than compressed air.
- Always open the cylinder valve slowly, to minimize possible issues with the regulator.
- Always pressurize the downstream side of the regulator in a slow and controlled manner.
- Do not allow the regulator to free flow gas to atmosphere without any back pressure.

## Operating and Safety Instructions

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### SETTING UP EQUIPMENT

1. Secure cylinder so it will not tip over or fall.
2. Remove the protective dust seal from the cylinder valve.
3. Inspect the cylinder valve for damaged threads, traces of dirt, dust, oil or grease.
4. With the cylinder valve outlet pointing away from people "crack" the cylinder by momentarily opening and closing the cylinder valve.



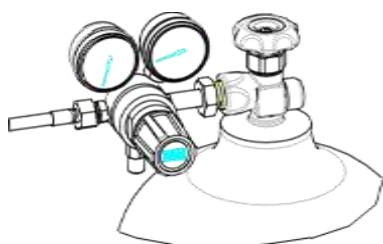
### ADJUSTING REGULATOR DELIVERY PRESSURE

1. Once the regulator has been securely attached to the cylinder valve and the cylinder valve is open, attach the plug inflation hose.
2. Adjust the delivery pressure by turning the adjusting knob in a clockwise direction until the required plug inflation pressure is reached.



### FITTING THE REGULATOR

1. Make sure the regulator has the correct inlet fitting to fit the cylinder valve. Check the fitting for any damaged threads.
2. Make sure the o-ring is in place between the regulator and the cylinder valve outlet.
3. Tighten the regulator inlet nut securely with a spanner.
4. Connect the hose and plug to the regulator outlet fitting.



### TURNING ON THE REGULATOR

1. Be sure that the adjusting knob of the regulator is fully "backed-off" (ie. fully counter clockwise). Stand in a position so that the cylinder valve is between you and the regulator. Only attach the plug inflation hose once the cylinder valve is open.
2. NOTE: For greater safety never stand in front of a regulator when opening the cylinder valve. Slowly turn the cylinder valve on in a counter clockwise direction until you hear the gas begin to flow into the regulator. Wait about 10 seconds then proceed to fully open the cylinder valve.
3. Check for leaks, close the cylinder valve and observe the high pressure gauge for 5 minutes. If the high pressure gauge drops, there is a gas leak in the cylinder valve, inlet fitting, high pressure gauge or regulator seat. Retighten the regulator to cylinder connection and repeat step 1. Should the high pressure gauge continue to drop after retightening, the regulator must be removed and returned for servicing.

### TURNING OFF CYLINDER VALVE

1. When you have finished using the regulator, close the cylinder valve off in a clockwise direction and allow the regulator to de-pressurise. The pressure has been released from the regulator when gas ceases to flow and the pointers on both pressure gauges indicate zero.
2. After all pressure has been released from the regulator, release the tension on the regulator adjusting knob by turning it fully counter clockwise.



### REMOVING THE REGULATOR

1. It is not necessary to remove the regulator unless the cylinder is being moved, or an empty cylinder is being replaced.
2. NEVER attempt to remove the regulator if any pressure is showing on either pressure gauge. If pressure is showing, follow the "Turning Off Cylinder Valve" procedure described previously.
3. Remove the regulator from the cylinder and replace the protective cap on the cylinder.
4. Place the regulator in the yellow hard case provided to avoid damage and contact with oils, greases, dust or any other possible contaminants.

### RISK ASSESSMENT (1= HIGH RISK, 5 = LOW RISK)

Risk (Ranking)	Description	Control
2	Using gas other than compressed air could result in an explosion	Cylinder threads are different styles for other gases and will not attach without modification
1	Risk of explosion with high pressures	Open both cylinder and regulator valves slowly , and in a controlled manner
2	Plugs, hoses and regulators can explode and cause injury	Take care and wear safety glasses

# 12v DC Plug Inflation Compressor



**HAZARD: Risk of Injury from compressed air**

- ..... do not play or fool around with compressed air
- ..... Never direct compressed air at a person as the air can penetrate the skin and cause significant health issues
- ..... Blowing air from a compressed air system into your mouth can cause ruptures in the lungs or stomach.

### Hazard and Risk Assessments

Before using this equipment, the job you are doing must be assessed for foreseeable hazards and risks and appropriate measures to eliminate, control or reduce those risks must be taken before you commence work.

### Suggested PPE (Personal Protective Equipment):



Note: PPE must be suited to the risks and person(s) using the equipment.

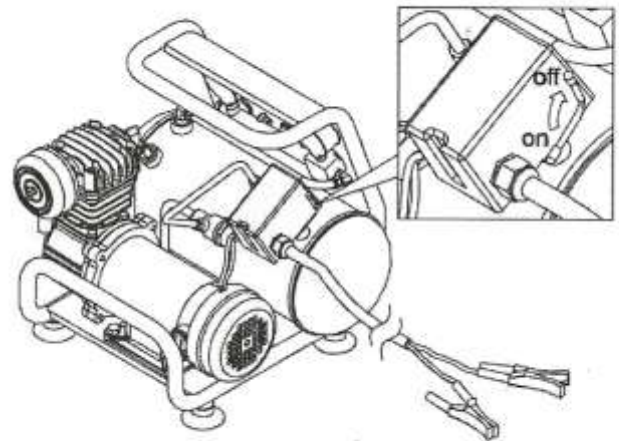
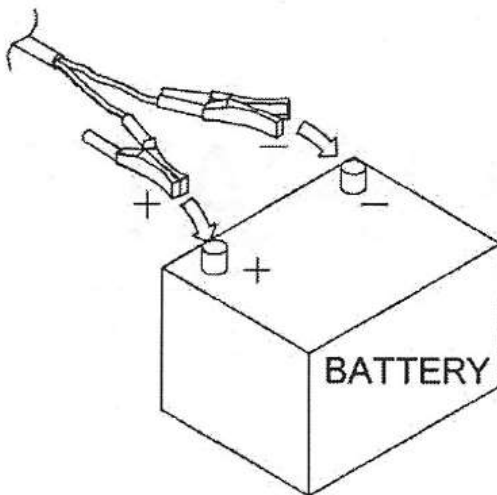
### Safety Instructions:

1. **Operating Instructions** – Before using this equipment ensure you have read the ‘Operating Instructions’ or “Instruction Manual” and taken note of the ‘Hazards and Risks’ detailed on this instruction sheet and taken all necessary steps to prevent injury.
2. **Personal Protective Equipment** – Use appropriate personal protective equipment for the job.

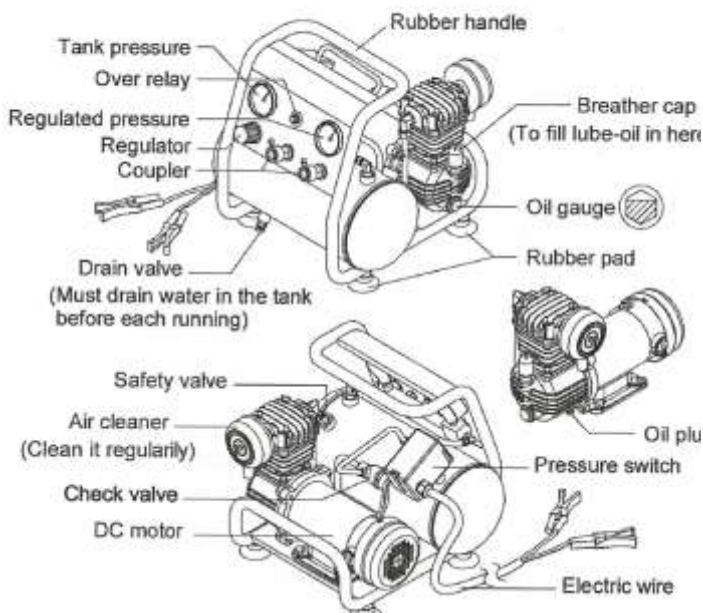
- Risk of attachments and accessories bursting, exceeding the pressure rating of air tools, plugs, tyres and other inflatables can cause them to explode, with the potential of serious injury. Check the inflation pressure required, only start the compressor with the regulator wound off (anticlockwise) and hose not yet connected.
- Risk of electric shock, only use with a 12v battery, never operate outdoors when it is raining, or in a wet environment.
- Risk of explosion or fire, this unit is not intrinsically safe and can cause a spark under normal operation, do not use where flammable vapors are present.
- Risk to breathing, the compressed air from this compressor is not safe for breathing and is for industrial use only.
- Risk from moving parts, once connected to the battery and turned on the compressor will auto stop/start once the tank pressure has been reached.
- Risk of burns, the compressor head and tubes become hot when operating, do not touch compressor parts during or just after operating.

## Operating and Safety Instructions

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### MAIN PARTS NAMES



### Daily Checks:

- Check oil level
- Drain condensed water from the air tank via the Drain Valve
- If working in dusty environments check and clean the air filter

### Purpose for which this equipment is designed:

The compressor is designed to operate on a duty cycle of not more than 50%, this means that if the compressor is required to operate longer than ½ hr at a time, it is undersized for the job you are doing.

### Operating Procedure

#### Daily Start-up Check

1. Before attaching air hose or accessories, make sure the pressure switch lever is set to 'OFF' and the air regulator is wound fully anti-clock wise to the off position.
2. Attach the hose and accessories. Check the inflation pressure required. This is written on the front or side of the plug, depending on plug type, always check, do not assume, as plugs have different inflation pressures that are required to function properly. The regulator outlet pressure should never exceed the plug's inflation pressure rating.
3. Turn the pressure switch lever to 'ON/AUTO' and allow the tank pressure to build. The motor will stop when the tank pressure reaches the 'cut-out' pressure.
4. Open the regulator by turning it clockwise, adjust the regulator to the correct plug inflation pressure, now your compressor is ready to use.
5. Always operate the air compressor in well ventilated areas, free from petrol or other solvent vapors.

#### When Finished

6. Set the pressure switch lever to 'OFF'.
7. Using the air line, bleed the tank pressure down to zero.
8. Remove any air lines.
9. Drain the water from the air tank by opening the drain cock valve on the bottom of the tank

### RISK ASSESSMENT (1= HIGH RISK, 5 = LOW RISK)

Risk (Ranking)	Description	Control
1	Plug Exploding	Always check the pressure of the plug being inflated, don't assume they are the same. Start compressor with regulator wound right off.
3	Electric Shock	Don't operate outside in the rain
3	Explosion or Fire	Observe safety procedures, always wear correct PPE
3	Burns	Do not touch compressor parts while in operation