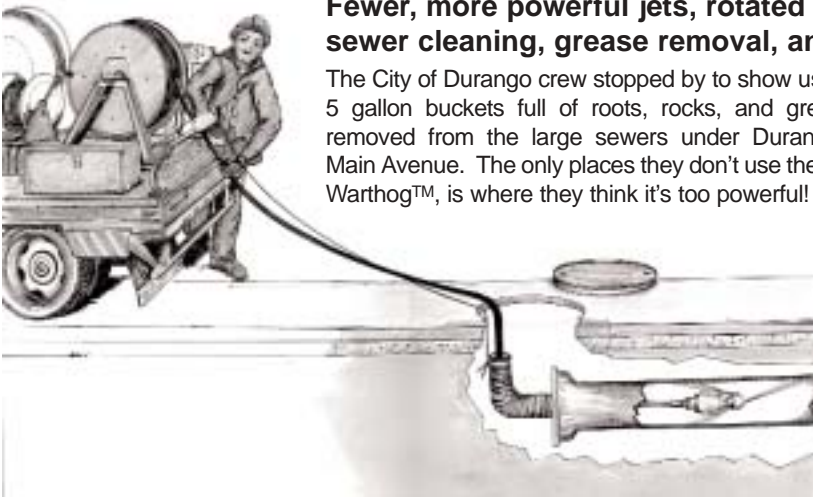


Warthog™ Sewer Nozzle

Four Sizes	WT - 3/8"		Small WS - 1/2" WS - 1/2 - J		Medium WH - 1/2" WH - 3/4"		Large WG - 1"	
	US	Metric	US	Metric	US	Metric	US	Metric
Flow Range	4-12 gpm	15-45 lpm	7-20 gpm	27-75 lpm	11-40 gpm	42-150 lpm	50-80 gpm	190-300 lpm
Flow Rating	0.75 Cv		1.3 Cv		3.0 Cv		4.6 Cv	
Max. Pressure, psi	4,000 psi	275 bar	4,000 psi	275 bar	8,000 psi	550 bar	3,000 psi	200 bar
Inlet Port	3/8" npt		1/2" npt		1/3" or 3/4" npt		1" npt	
Rotation Speed, rpm	300-500		200-500		150-300		150-300	
Length Overall	3.0 in.	7.6 cm	4.4 in.	11.2 cm	7.5 in.	19.1 cm	9.1 in.	23.1 cm
Centralizer Diameter	None		1.9 in.	4.8 cm	3.1 in.	7.9 cm	4.2 in.	10.7 cm
Body Diameter	None		1.8 in.	4.4 cm	1.8 in.	4.4 cm	2.6 in.	6.6 cm
Head Diameter	1.9 in.	4.8 cm	1.7 in.	4.3 cm	2.4 in.	6.1 cm	2.7 in.	6.9 cm
Weight	1.1 lb	0.5 kg	2.8 lb	1.3 kg	4.7 lb	2.1 kg	10.9 lb	4.9 kg

Fewer, more powerful jets, rotated at controlled speed for streak-free sewer cleaning, grease removal, and root cutting.

The City of Durango crew stopped by to show us six 5 gallon buckets full of roots, rocks, and grease removed from the large sewers under Durango's Main Avenue. The only places they don't use their 1" Warthog™, is where they think it's too powerful!



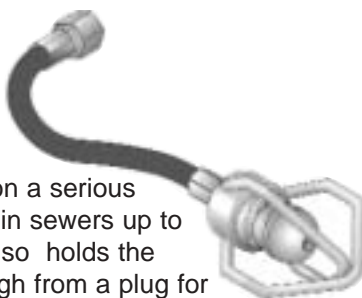
Root Cutting

The Warthog™ cuts a hole in a pine 1x8 in less than a minute, when jetted for 14 gpm at 4,000 psi. So there is no doubt that a waterjet alone can cut roots. But in real sewers other factors are important - like nozzle positioning, technique, and sewer diameter. Do not expect to cut 2 in. diameter roots! The Warthog™ has cut roots up to 1/4 in. diameter, or masses of smaller roots at joints. Bigger roots require water pressures as much as 8,000 psi.



WS 084 Centralizer

The WS 084 Centralizer adds length to prevent the WS-1/2, or WS 1/2-J from reversing direction a serious safety problem - in sewers up to 8" diameter. It also holds the front jet far enough from a plug for best results from the front jet.



Super Centralizer

The Super Centralizer places the Warthog™ closer to the sewer centerline, for more powerful cleaning of the top wall. It also keeps the nozzle back from blockage, allowing the powerful front jet to do its work. The Super Centralizer bolts to the standard centralizer.





The Warthog's™ rotating jets follow a helical path down the pipe wall, much like the threads on a bolt. So the entire surface can be cleaned with as few as two powerful jets. The result is streak-free cleaning that passes the most demanding inspection. With stationary jets, the only way to avoid streaks is to use more jets. The more jets in a nozzle; the less power is available for each.

Unlike other rotating jet sewer nozzles, the Warthog's™ viscous fluid governor slows rotation to about 10 MPH along the wall, preserving jet quality and maximizing cleaning power. Un-governed rotating nozzles can spin as fast as 10,000 rpm. At that speed, the jets are moving nearly 360 MPH along the wall of a 12 inch diameter line. It's too fast, and destroys jet quality and hitting power.

When water flows through a hose, pressure is lost due to friction. As a result most jetters lose 20% and 40% of their power due to hose pressure drop. The effect is easily demonstrated by pumping at maximum throttle, with the hose end restrained, and no nozzle. The pump discharge pressure will be between 400 and 1200 psi - a direct measure of how much pressure is lost due only to flow through your hose. Jet power is directly proportional to pressure.

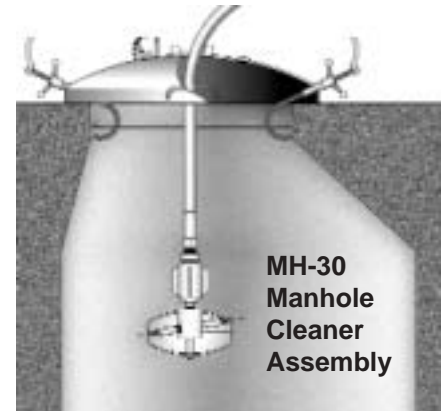


Jetting of the sewer nozzle is very important for delivery of jet power, because its orifices control the flow and pressures at which the jetting pump will operate. When we jet a Warthog™ nozzle, we run a computer analysis to be sure we're supplying the most powerful possible jetting.

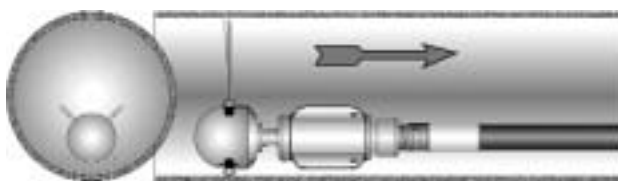
That's why we ask how much flow the customer's pump puts out, at what pressure, as well as hose diameter and length. The computer calculates pressure drop in the hose and in the Warthog™ nozzle, then calculates jet sizes. With this information, you can be sure that the Warthog™ will deliver the maximum possible jetting power.

Manhole Restoration

Infiltration of storm water into sewer systems overloads treatment facilities causing effluent flows to exceed permitted levels. Manholes are a major cause for the problem. The Warthog™ Nozzle can be used for manhole clean-up preparation for repair, coating, or lining. The nozzle head on the Warthog™ is replaced with a special head with extension nipples that clean the vertical walls, bottom, and upper areas of the manhole. The hydraulic hose reel on the jetter is used to stroke the nozzle from top to bottom. A heavy steel guard protects the operator from hazardous jets in case the nozzle is moved too far up and out of the manhole.



Mineral or Corrosion Scale Removal



Mineral deposits or corrosion scale present a particularly difficult cleaning challenge, requiring direct impingement of the waterjet on the sewer wall. The job is accomplished by jetting through the line to the next manhole, then changing the jetting. The usual jets are plugged and two at 90° are used while the hose is retracted. The extra 90° ports can be added to

Warthog™ Model WH and WG heads at a nominal charge. Sometimes it is necessary to use higher pressure pumps than normal for sewer cleaning. The Model WH, operated at 8,000 psi pressure is frequently used for de-scaling.