

SPECIFICATIONS – SEWER CLEANER NOZZLES
(As Provided by KEG Technologies)

1.0 GENERAL REQUIREMENTS: These specifications are the minimum requirements for sewer line and storm water line cleaning, penetrating, and finishing nozzles, floor jet cleaners, and chain root cutters. All standard equipment is to be included with the unit(s), using components recommended by the manufacturer for these applications and shall meet all supplemental requirements listed. **All manufacturers of these nozzles and equipment whether they provide said equipment factory direct or through authorized distribution, shall be ISO 9000:2001 certified for the design, manufacture, and distribution of sewer and pipe cleaning equipment and shall provide a certificate of such certification as part of their bid packet.**

2.0 APPLICATIONS FOR CLEANING NOZZLES: Those nozzles designed for sewer cleaning applications shall meet the following standards and applications:

- Shall be made of 300 series hardened stainless steel,
- Shall be equipped with standard steel inserts, or titanium ceramic inserts,
- Shall carry a one year manufacturer's warranty,
- Shall be suitable for removal of sand, mud, sludge, brick, or other debris found in sewer or storm drain lines,
- Shall have verifiable patented fluid mechanics efficiencies of eighty percent plus (80%+),
- Shall be equivalent to KEG Sewer, Cleaning, or Traction Nozzles, US Patent # US 5.992.432,
- Shall have available as an option verifiable patented fluid mechanics efficiencies of ninety percent plus (90%+) and be equivalent to KEG Torpedo or Royal Nozzles, US Patent # US 6.089.243,
- Shall be available with titanium ceramic inserts as an option,
- Titanium ceramic insert option shall increase the manufacturer's warranty to three years on the nozzle and inserts.

3.0 APPLICATIONS FOR PENETRATING NOZZLES: Those nozzles designed for penetration of clogs, grease, and other impediments shall meet the following standards and applications:

- Shall be made of 300 series hardened 300 series hardened stainless steel,
- Shall be equipped with standard steel inserts,

- Shall carry a standard one year manufacturer's warranty,
- Shall be suitable for penetrating mud, grease, tree roots, and other clogs and obstructions,
- Shall be wedge shaped with a minimum of three (3) edges for penetration,
- Shall have a replaceable drill tip with three (3) pre-drilled water orifices, or a threaded forward jet with insert,
- Shall be available with titanium ceramic inserts as an option,
- Titanium ceramic inserts shall increase the manufacturer's warranty to three (3) years on the inserts, the nozzle, and the drill tip,
- Shall be equivalent to the KEG Quattro, Drill Point Quattro, or Rambo Nozzle.

4.0 APPLICATIONS FOR FINISHING NOZZLES: Those rotating type nozzles designed for grease, scale, or vegetation removal that rotate around a main shaft to provide "finishing cleaning" before video inspection and shall meet the following standards and applications:

- Shall be made of 300 series hardened 300 series hardened stainless steel,
- Shall rotate solely by water pressure,
- Shall not require lubrication of the main bearing or shaft,
- Shall provide cleaning in a 360° pattern within the pipe,
- Shall have steel or titanium ceramic inserts for both cleaning, rotation, and propulsion,
- Shall carry a one year manufacturer's warranty with steel inserts, and a three year warranty with titanium ceramic inserts
- Shall be equivalent to the KEG Rotor Nozzle.

5.0 APPLICATIONS FOR FLOOR JET CLEANERS: Those cleaning nozzles designed for debris removal and standard maintenance cleaning of storm or sewer pipes from the spring line to the invert of a pipe, commonly referred to as "floor jet cleaners", shall meet the following standards and applications:

- Shall be made of 300 series hardened stainless steel,
- Shall be water propelled through the use of nozzle inserts,
- Shall be suitable for the removal of rock, debris, compacted mud or solids,
- Shall have a roll cage design to allow the cleaner to right itself,
- Shall have an access port to allow for additional weight to be added in high flow applications,

- Shall have verifiable patented fluid mechanics efficiencies of eighty percent plus (80%+),
- Shall be equivalent to KEG Floor Jet Cleaner Nozzles, US Patent # US 5.992.432,
- Shall have welded or bolted skids and roll cages,
- Shall be provided with standard steel inserts for cleaning and propulsion,
- Shall carry a standard one year manufacturer's warranty,
- Shall have as an option titanium ceramic inserts, which shall provide a three year warranty on the floor cleaner, the inserts, skids, and roll cages.

6.0 APPLICATIONS FOR CHAIN ROOT CUTTERS: Those units designed for the removal of root ball obstructions, scaling, tuberculation, mineral deposits, grease, or other impediments, such units commonly referred to as "chain root cutters", shall meet the following applications and standards:

- Shall be supplied with as many as three (3) self sharpening chains,
- Shall rotate around a main shaft through the use of spinner nozzles,
- Shall not require lubrication of the shaft or main bearing,
- Shall have a cross cutter supplied manufactured of 300 series hardened stainless steel,
- Shall be adaptable to 2" to 48" diameters,
- Shall be provided with distance plates, skids, and other accessories,
- Shall be provided with titanium ceramic inserts for propulsion and spinning.

7.0 TECHNICAL SPECIFICATIONS FOR CLEANING NOZZLES:

- Fluid mechanics efficiency shall meet or exceed 80%,
- Traction type nozzles inserts shall have angles of incidence of 8° and 12°,
- Cleaning type nozzles inserts shall have angles of incidence of 15° and 25°,
- Sewer type nozzles inserts shall angles of incidence of 15° and 20°,
- Optional Torpedo or Royal type nozzles shall have fluid mechanics efficiencies of 90%+,
- Optional Torpedo or Royal type nozzles shall have inserts with angles of incidence of 12° and 18°, and 22° and 32°, respectively,
- Weight of said units shall range from .7 pounds minimum to a maximum of 16.6 pounds,
- Threaded hose connections shall be to NPT specifications,

- Cleaning nozzles shall be suitable for lines from 2" through 48" diameter,
- Units provided shall be equivalent to those cleaning type nozzles manufactured by KEG gmbH, of Burgstadt, Saxony, Federal Republic of Germany, and distributed by KEG Technologies, Inc., of Madison, Mississippi, or approved equal.

8.0 TECHNICAL SPECIFICATIONS FOR PENETRATING TYPE NOZZLES:

- Penetrating nozzles shall be suitable for usage with 1/4" to 1 1/4" hose threads,
- All hose threads shall be to NPT standard,
- Shall be suitable for pipe diameters from 2" and up,
- Removable drill points shall have a maximum of three (3) predrilled factory orifices with an opening size of .9 millimeter minimum to 3.2 millimeter maximum,
- Nozzles shall weigh a minimum of .22 pounds and a maximum of 5.5 pounds,
- Titanium ceramic inserts, size M8, shall be available as an option for the forward jets and thrust jets,
- Units provided shall be equivalent to those penetrating type nozzles manufactured by KEG gmbH, of Burgstadt, Saxony, Federal Republic of Germany, and distributed by KEG Technologies, Inc., of Madison, Mississippi, or approved equal.

9.0 TECHNICAL SPECIFICATIONS FOR FINISHING NOZZLES:

- Nozzles shall be manufactured of 300 series hardened stainless steel,
- Shall be suitable for grease and scale removal, root removal,
- Shall be suitable for pipes 2" to 20" in diameter,
- Shall have a minimum of 4 steel or titanium ceramic inserts total for cleaning, spinning, and propulsion, and a maximum of 12 steel or titanium ceramic inserts total for cleaning, spinning, and propulsion,
- All hose threads shall be to NPT standard,
- Nozzles shall be suitable for use with 1/4" to 1 1/4" hose sizes,
- Rotor mechanism shall free spinning around a main shaft, water driven, and shall not require lubrication of any type for operation,
- Units provided shall be equivalent to those rotor type nozzles manufactured by KEG gmbH, of Burgstadt, Saxony, Federal Republic of Germany, and distributed by KEG Technologies, Inc., of Madison, Mississippi, or approved equal.

10.0 TECHNICAL SPECIFICATIONS FOR FLOOR JET CLEANERS:

- Shall be equipped with a lubricated high pressure swivel joint of ¾" to 1 ¼" diameter,
- Shall be provided with a grease gun for lubrication of the high pressure swivel,
- Shall be provided with one (1) reducing bushing to downsize one hose diameter from the diameter of the swivel,
- Shall be suitable for removal of heavy or compacted solids, debris, sludge, and sand,
- Swivel joint must be to NPT standard,
- Shall be suitable for 6" pipe diameters and larger,
- Shall be equipped with five (5) to fourteen (14) steel or titanium ceramic nozzle inserts,
- Units shall weigh between 19 and 51 pounds, before additional weight for high flow applications is added,
- All jets provided shall angles of incidence of 5° and 20°,
- Shall have verifiable fluid mechanics of 80%+, equivalent to KEG Technologies, Inc., US Patent # US 5.992.432,
- Shall have an option to provide titanium ceramic inserts,
- Shall have a roll cage design welded and/or bolted to the main body to provide the nozzle ability to right itself within the pipe,
- Shall have an optional port to add weight for high flow applications,
- Shall have an extended three year manufacturer's warranty on the cleaner, inserts, nozzles, roll cage, and skids, when utilizing titanium ceramic inserts,
- Units provided shall be equivalent to those floor cleaner type nozzles manufactured by KEG mbH, of Burgstadt, Saxony, Federal Republic of Germany, and distributed by KEG Technologies, Inc., of Madison, Mississippi, or approved equal.

11.0 TECHNICAL SPECIFICATIONS FOR CHAIN ROOT CUTTERS:

- Shall be manufactured from tempered 300 series hardened stainless steel,
- Shall be provided with self-sharpening conveyor or other type chains (as suitable per application),
- Shall be provided individually changeable skids or pre-formed skid assemblies,
- Skids may be configured in a "distance plate" design, or have pre-formed skid configuration (for 4", 6" and 8" lines),

- Shall be provided with a lubricated high pressure swivel, suitable for ½" to 1 ¼" hose sizes,
- Shall be provided with a grease gun for lubrication of the high pressure swivel,
- High pressure swivel shall be to NPT standards,
- Shall be suitable for cleaning pipes of 2" to 48" diameters,
- Shall have a minimum range of flows and pressures of 8 GPM at 1,500 PSI to 60 GPM at 1,800 PSI (depending on model of unit),
- Shall be equipped with steel inserts for propulsion and rotation,
- Shall rotate the chain(s) installed at 2,500 RPM.

12.0 OPTIONS: The manufacturer shall provide a complete list and cost for all available options, installation, etc.

13.0 WARRANTY: All components of these units shall have a warranty for a period of one year from the date of delivery. Units provided with titanium ceramic inserts, where applicable, shall be warranted for three (3) years from the date of delivery.

14.0 TRAINING AND INSTALLATION: On site training shall be provided by the manufacturer for up to 5 personnel for one day in the operation and maintenance of these units. Installation shall be included in the price of this unit and shall be accomplished by the manufacturer or its designated employees, agents, or sub-contractors.