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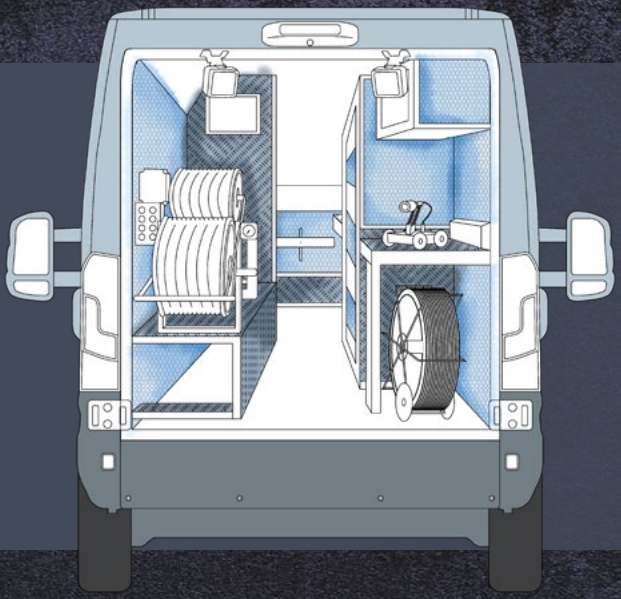
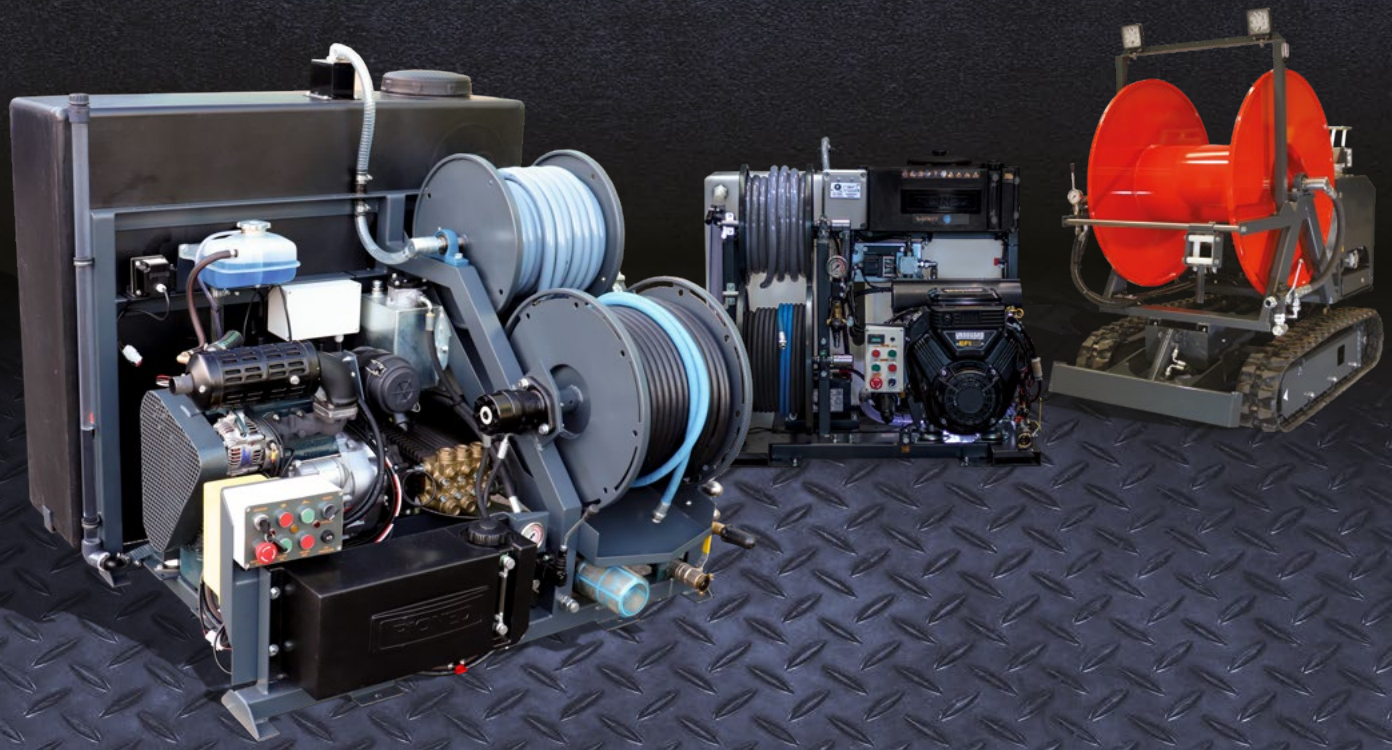
JETTERS



DRAIN JETTING EQUIPMENT GUIDE



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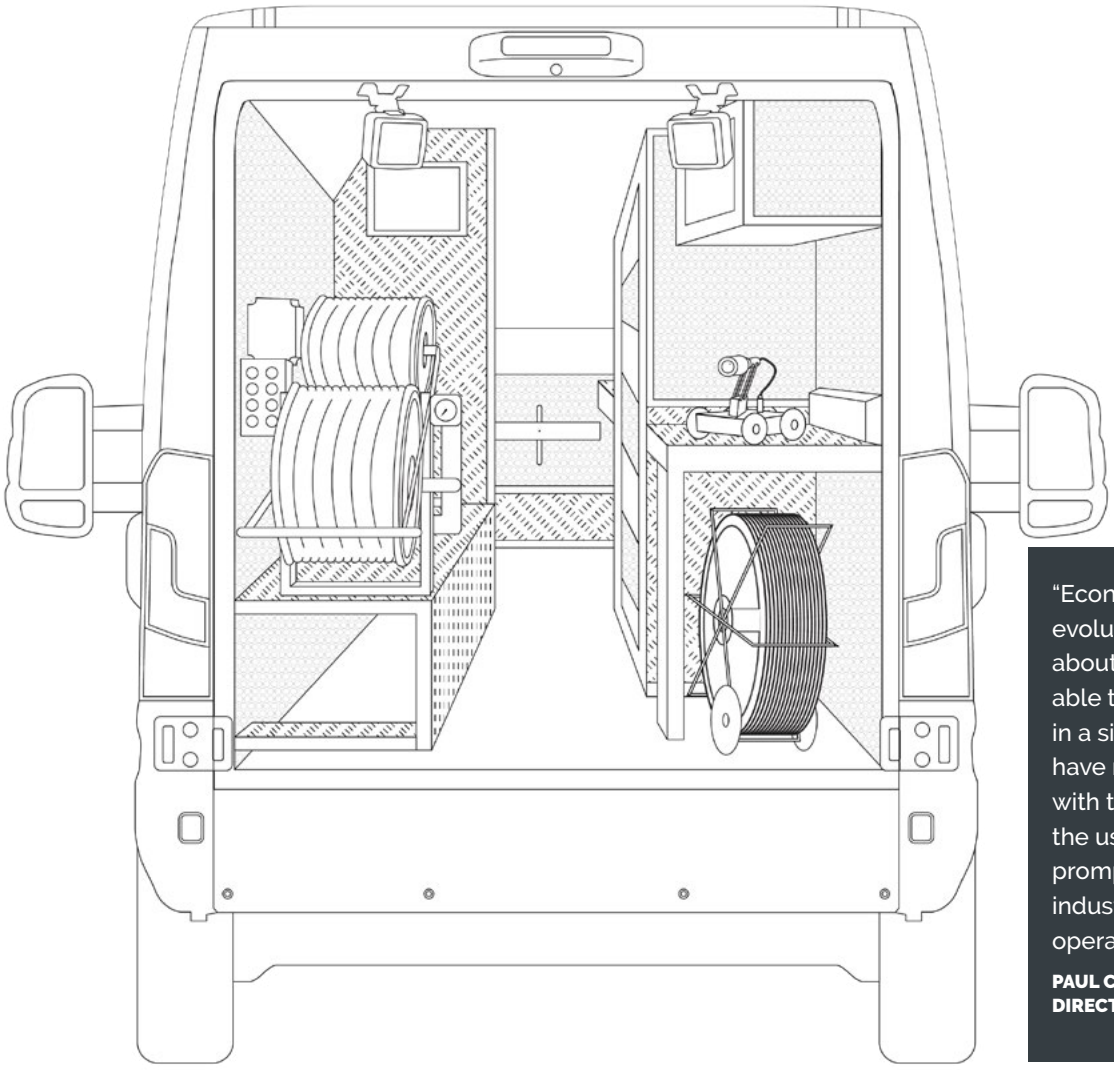
MULTIPURPOSE DRAINAGE VEHICLES



"Economics dictate the evolution of the industry. It's about making money by being able to identify and fix issues in a single visit. Manufacturers have modernised equipment, with the range of features and the use of remote controls prompting a switch in the industry to single-man operations."

PAUL CROWLEY
DIRECTOR OF DYNO-ROD IRELAND

Drainage vehicles have evolved in recent years, with multipurpose vans that can be operated by a single person becoming much more the norm. These types of made-to-measure vehicles are designed and equipped to carry out multiple tasks in a single visit.

Single-resolution is a phrase often used in relation to drain inspection, cleaning and repair within a single visit. To achieve this, vehicles need to remain within weight restrictions whilst carrying additional equipment, such as CCTV inspection units, ancillary drain cleaning tools and drain relining kits.

What's clear is that contractors in the drainage sector are increasingly turning to lightweight, compact diesel and petrol jetters with pump capacities similar to larger units. Many of these feature-rich, modern machines can be supplied in space-saving stack systems and include radio remote control systems – an essential part of single-person operations.

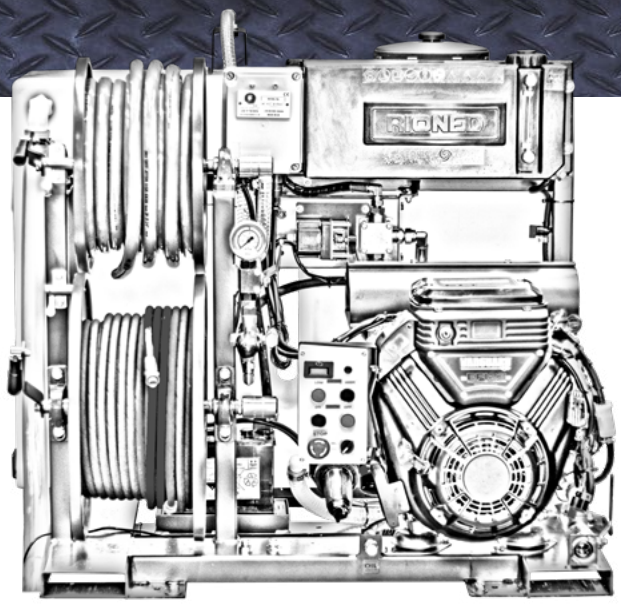
Carrying additional tools and equipment means that more than ever, van payload is a key consideration. For design engineers, this has involved taking a stripped back approach to reduce the weight and size of the jetting units.

CONTENTS

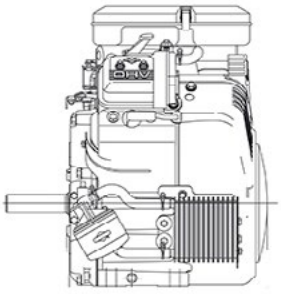
NEW EMISSIONS REGULATIONS

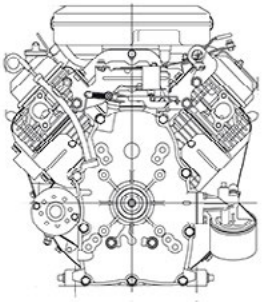
STAGE V JETTERS

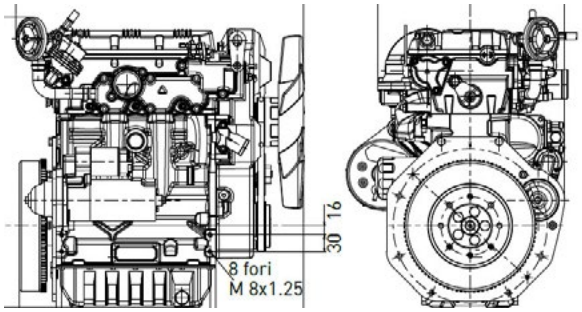
European Stage V emissions regulations have brought about significant changes in the manufacture of jetting equipment. The new regulations relating to NRMM engines (non-road mobile machinery) came into force in 2019/20 and apply to all engines, with a particular focus on diesel engines from 0 to 56 kW.



ENGINE TYPE	TYPICAL POWER RANGE	TYPICAL OUTPUT RANGE	MAX PIPE DIAMETER
Petrol	15 kW - 42.5 kW	2250 - 3600 psi @ 16 - 22gpm	450 mm
Stage V Diesel (above 18.5 kW)	18.5 kW - 49 kW	2250 - 3600 psi @ 16 - 28gpm	600 mm
Stage V Diesel (below 18.5 kW)	Up to 18.5 kW	2100 - 3000 psi @ 10 - 13gpm	450 mm







PETROL ENGINES

The move away from diesel-powered, high-performance jetting machines has coincided with the availability of more efficient and reliable fuel injection petrol engines. Although smaller petrol jetters have been in circulation for many years, new lightweight EFI engines offer improved torque, and performance figures that are comparable to larger diesel engines.

DIESEL ENGINES

Diesel jetters with a power range below 18.5 kW fall within the Stage V requirements for standard engines. Improved pump and engine performance mean that many of these models are suitable for most common drain and sewer cleaning tasks. Where more power is required (above 18.5 kW) regulations dictate the use of common-rail diesel engines fitted with a DPS filter.

STAGE V: WHY IT'S IMPORTANT

The requirement to reduce emissions by introducing cleaner, greener solutions is the new reality for the drainage sector. All new machines built after the Stage V deadlines must comply with the regulations, meaning that many popular diesel models can no longer be supplied. Alongside these new emissions regulations, individual local authorities have implemented carbon reduction methods such as Low and Ultra-low Emission Zones (ULEZ). In cities such as London, where schemes are already running, that means that contractors need to be aware of potential levies and fines for using non-compliant NRMM machines with a power rating that falls outside the regulatory limits.

HIGH-PRESSURE JETTING MACHINES

TYPES OF DRAIN + SEWER JETTERS

Choosing a high-pressure machine is dependent on the type of tasks it will need to perform. Performance is often the first consideration, though the weight and size of the unit has become increasingly important, with many contractors choosing to also carry smaller units for use in domestic or confined spaces.

VAN-PACK JETTERS

Suitable for drains up to 600mm, van-pack jetters are skid-mounted for simple installation in a wide range of commercial vehicles. Modern jetter design is focussed on developing lightweight and compact solutions without compromising on pump performance. New machines are supplied with Stage V-compliant petrol or diesel engines.

STACK + BESPOKE JETTERS

Offering the same specification and level of performance as van-pack jetters, stack and bespoke jetters maximise vehicle access, space and payload. They are suited to everyday use in sewers and drains and can be easily modified to meet requirements, including stack and split units and customised parts and mountings.

PORTABLE JETTERS

Ideal for domestic and light commercial jetting in areas with limited working space, portable jetters are often powered by a small petrol engine or electric motor. Suited to jetting drains and sewers up to 200mm, they can be connected directly to a domestic water supply. In some models, the hose reel can be detached for working in confined spaces.

TRAILER JETTERS

Trailer jetters are comparable in specification to van-pack jetters, and are available with a range of engines and pressure/flow capacities for sewers up to 600mm. Modern trailer jetters utilise a range of features for improved performance road handling and noise reduction, including aerodynamic frames and interconnected water tanks.

FEATURES OF A JETTING MACHINE

MODERN JETTERS

Advancements in jetting equipment have seen the creation of more efficient jetters, bespoke parts and the adoption of single-person operation using wireless remote control systems.

PRESSURE + FLOW

The chart below represents some typical jetter pressure and flow values.

MOTOR	FUEL	PSI (PRESSURE)	GPM (FLOW)	PIPE SIZE
18kW (23 HP)	Diesel/Petrol	3,000	8	Up to 200mm
18.5kW (25 HP)	Diesel/Petrol	3,000	9	Up to 250mm
27.5kW (37 HP)	Diesel/Petrol	3,000	12	Up to 300mm
27.5kW (44 HP)	Diesel/Petrol	3,625	13	Up to 350mm
33kW (47 HP)	Diesel/Petrol/PTO/Electric	3,000	16	Up to 450mm
49kW (65 HP)	Diesel	4,000	18	Up to 600mm

1. HIGH-PRESSURE PUMPS

The jetter engine generally powers the high-pressure water pump to produce water under pressure. Modern direct-drive triplex plunger pumps offer smooth, continuous water flow and pressure. Integrated pressure unloaders enhance pump protection and prolong its life cycle.

2. HYDRAULIC HOSE REELS

A hydraulic hose reel significantly reduces the effort needed to operate a hose reel, whilst operator safety is further improved with the addition of a hose reel locking mechanism. Some jetters feature pivoting reels to allow easier access to drain openings.

3. FILLING HOSE + TANK

Most jetters are equipped with an integrated filling hose, mounted on a hand-operated reel for better storage. Water tanks, in a range of capacities, are often mounted on the frame behind the engine and can also be installed independently to aid weight distribution in the vehicle.

4. REMOTE CONTROL

Wireless remote control systems allow engineers to work more safely, efficiently and with greater control. Modern dual-brand remote control kits mean that pressure and flow settings can be fine-tuned to reduce running time and water usage.

5. SYSTEM PROTECTION

High-pressure jetters feature a number of components designed to reduce potential damage to the machine and extend its life cycle. These typically include run-dry protection systems, unloader valves, and anti-freeze systems and valves.

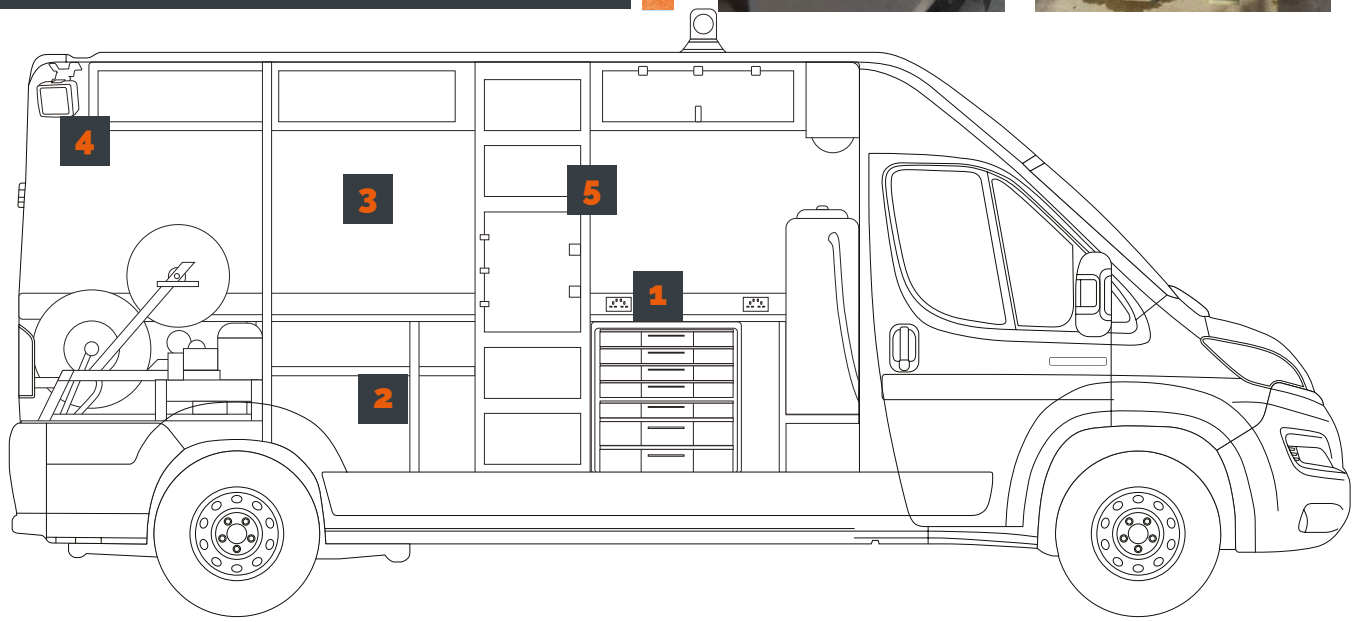
6. SYSTEM ENHANCEMENTS

Jetters can be fitted with pulsator systems that vibrate to reduce hose drag and propel the nozzle quicker and further along the pipeline. Hot water systems can also be integrated in jetting systems and are popular for the removal of fat deposits in drains and for cleaning street graffiti.

DRAINAGE VEHICLE CONVERSIONS

CUSTOM INTERIORS

Contractors are increasingly turning to bespoke vehicle conversions to provide space-saving solutions for their jetting equipment. Popular conversions include the installation of inverters, lighting and increased storage for tools and ancillary equipment.



1. INVERTER INSTALLATIONS

One of the most important additions to a jetting vehicle is a power inverter, which converts the vehicle's battery power (DC) into alternating current (AC). Most electric tools used by contractors use 110v or 240v AC power, and operating or recharging these tools from the van is only possible with an inverter running from the vehicle's battery supply.

2. ANCILLARY EQUIPMENT

To undertake all aspects of drainage work, contractors need to carry a wide range of additional equipment, such as CCTV crawler and push-rod systems, PPE and welfare kits, and drain rods. Multipurpose van-packs are designed to carry a wide range of tools and ancillary equipment.

3. VAN LINING MATERIALS

Lightweight vehicle lining systems play an important part in minimising the weight of a vehicle, with modern, composite materials offering considerable weight savings.

- **Spray Linings:** Usually a two-part polymer/catalyst spray system that provides a durable, water-resistant, airtight and non-slip surface without losing space.
- **Composite Boards:** Strong, flexible and 50% lighter than plywood, polypropylene boards combine several layers for extra thermal resistance and strength.

4. LIGHTING

A well-lit area is best for both safety and productivity when working at night or in bad light. Van-pack vehicles mainly use low energy internal and external LED lights, including interior strip and spot lights and exterior warning beacons and lamps for illuminating working areas.

5. STORAGE OPTIONS

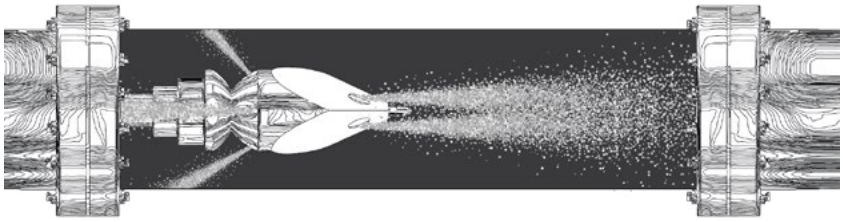
An imbalance in vehicle weight distribution can affect both fuel efficiency and road handling. Water tanks and storage units can be positioned to optimise weight distribution, while still providing adequate storage for a wide range of equipment and tools.

JETTING ACCESSORIES
HIGH-PRESSURE NOZZLES

JETTER NOZZLES

Nozzles are the backbone of jetting operations, and contractors rely on a broad spectrum of fixed, rotating and specialist nozzles to undertake specific drain cleaning and unblocking tasks. In this section, we explore some of the configurations and applications of nozzles used widely across the industry.

FLUSHING + PENETRATING NOZZLES



Also known as 'Fixed' nozzles, flushing or penetrating nozzles are available in 'Open' or 'Blind' configurations with forward and rear (or rear only) jets drilled to suit the pressure and flow of the jetter.

With wide rear jets, flushing nozzles are ideal for cleaning debris, whereas penetrating nozzles feature narrower rear jets to aid propulsion down the pipe.

Along with a wide variety of specialist nozzle body shapes, the forward jets are designed to cut through the obstacles and blockages commonly found in sewers and drains.

1. STANDARD NOZZLES

Low-cost standard nozzles can be configured as either 'open' for penetration or flushing, or 'blind' for flushing tasks only, and are often used in an exploratory capacity prior to using a more specialist nozzle to complete a task.

2. UNBLOCKING NOZZLES

With specially formed heads that aid progress along the pipe, unblocking nozzles typically feature powerful forward jets to cut through the wide range of deposits found in drains and sewers. Some nozzles, such as the bullet (opposite), have been specifically designed to deliver better propulsion when used under high-pressure, aiding the speed that the nozzle travels along the pipeline.

3. CLEARING NOZZLES

Powerful rear jets make clearing nozzles ideal for flushing materials from the pipe walls, often used after a penetrating nozzle has cleared the initial blockage. Clearing nozzles are available in a range of configurations, such as plough jet nozzles that are flat in design and run along the floor of the pipe.

1

STANDARD NOZZLE

Designed for basic cleaning and unblocking, standard nozzles have a bulbous head and short body for negotiating tight corners in pipes.

2

BULLET NOZZLE

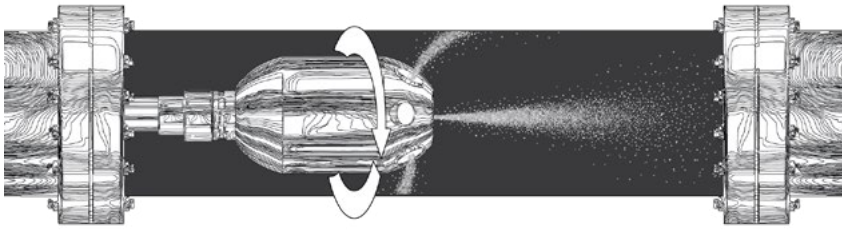
This powerful flushing nozzle features a smooth body for increased mobility and is the ideal choice for long distances and difficult unblocking.

3

PLOUGH JET NOZZLE

Designed for highly effective heavy silt removal, the plough jet sits on the bottom of the pipe and utilises powerful fan jets for removing waste.

JETTING ACCESSORIES
HIGH-PRESSURE NOZZLES

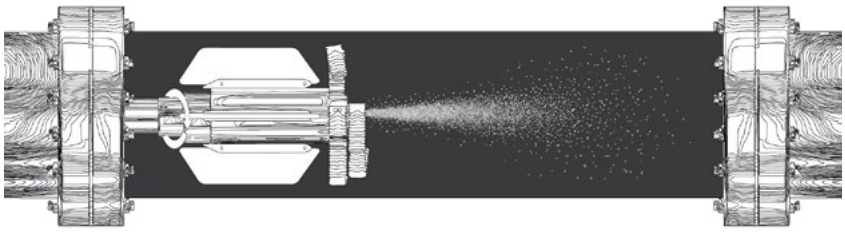


ROTATING NOZZLES

Most rotating nozzles feature a rotating head with jets that spray in all directions, providing wall-to-wall clearing and cleaning. Considered the best multipurpose drain cleaners, they are often used on tougher blockages and on maintenance contracts to prevent future obstructions.

1. MULTI-PURPOSE NOZZLES

Rotating nozzles are used for multiple types of tough drain and clearing tasks and offer all-around cleaning. Typically comprising of three components; a propulsion unit, drive and cleaning head, controlled rotation keeps the nozzle centred in the pipe and allows for optimal wall-to-wall cleaning power.



SPECIALIST NOZZLES

Specialist nozzles can be used for a range of tasks, including root cutting, desilting and the removal of hardened deposits from drain walls. Used alongside fixed or rotating nozzles for optimum results, tools such as chain flails and root cutters provide enhanced cutting power.

1. CHAIN FLAIL CUTTERS

Chain cutters tackle the most difficult obstructions by using turbine technology to deliver powerful cutting power. Kits may include skid or sledge mounts to centralise and guide the cutter along the pipe, offering the most effective cleaning when using the correct cutter size to cover the entire pipe wall.

2. ROOT CUTTERS

Root cutters use hydraulic power to drive the circular saw and are widely used in the drainage sector to remove roots, hard grease, and compacted sand or soil from blocked drains. They are typically supplied in a kit, consisting of the hydraulic body, a range of cutting knives (with sharp angular teeth at the front and rear), and matching skids to keep the cutters centralised in the drain.

TARANTULA NOZZLE

Tarantula nozzles have slow speed rotation and concentrated rear jets, effective for pipe wall cleaning and breaking down obstacles.

CHAIN FLAIL CUTTER

Made for the most stubborn of blockages, but relatively lightweight, chain flails hit, cut and scrape through a wide range of materials.

ROOT CUTTER

Consisting of a central body with angled knives, root cutters are ideal for cleaning pipes that are blocked by roots, grease, sand or soil.

JETTING ACCESSORIES
HIGH-PRESSURE HOSES

TWIN WIRE HOSES

Fabricated from reinforced rubber and wire braiding, standard twin wire hoses are suitable for a wide range of sewer and drain cleaning applications and have a maximum working pressure of 4000 PSI.

Type	Lengths	Diameters
Twin-wire	30m/60m/90m/200m	1/2”
Single-wire	50m/80m/100m	3/8”, 1/2”, 5/8”

SINGLE WIRE HOSES

Single wire hoses are made from a flexible rubber alloy and a single steel inner shell for extra strength, durability and product lifespan. Due to a single steel inner shell, the hose is much lighter than standard hoses, and is designed to reduce pressure loss for greater cleaning power.

OTHER TYPES OF HOSES

1. MINI HOSE

Ideal for passing through tight bends, such as those found in gulleys and traps, mini hoses are usually supplied in a kit with a standard nozzle and ½” BSP male adaptor for connection to the main jetting hose or unit.

2. LEADER HOSE

Leader hoses are used as a warning to operatives that the jetting nozzle is near the entry point of the drain. The 3m or 5m length blue hose is fitted with male coupling to connect to the jetting end of the main hose and a female coupling for connection to the jetting nozzle.

3. FILLING HOSE

Filling hoses pump water into the jetting machine and are suitable for use with both jetters and combination units. Available in lengths of 30m and 50m, they are extremely flexible and coil well for easy storage.

4. SUCTION VENTURI

Used to empty flooded areas without having to use a separate suction pump, suction venturi devices connect directly to the jetter hose and use the high-pressure water flow to generate a vacuum that creates suction for removing large volumes of water from flooded areas.

REMOTE JETTING HOSE REELS

FOR THE TOUGHEST TERRAINS

Remote jettting hose reels are designed for high-pressure jetting in restricted access sites where normal water supply is difficult, and rugged terrains inaccessible by standard jetting vehicles.

Enabling contractors to undertake jobs at a distance from the jetting machine, these robust units are custom built in a range of configurations to suit the work requirement. The most common caterpillar track systems are especially suited to off-road terrains, such as fields, golf courses, railway embankments and canal or river sides.

1. CONTROLS

The joystick operated control panel allows for precision manoeuvring and efficient single-person operation. Units can also be operated remotely via a remote control handset.

2. ENGINES

Standard units are powered by a low-noise diesel engine. For indoor use, and in situations where fuel engines are prohibited, electro-hydraulic drive systems can be used.

3. REEL CAPACITY

Most units feature a hydraulic drive hose reel, available in various widths and hose capacities. A standard 1m wide reel has the capacity to carry 230m of 1" thermoplastic jetting hose.

4. CARRIAGE

Remote reel carriage configurations include tracked, wheeled and dumper arrangements. With a low ground pressure, tracks are ideal for use on delicate sites such as golf courses.

5. TERRAIN + STABILITY

Tracked units can operate on ground gradients up to 50% for working on steep slopes. Hydraulic stability bars and manual stabiliser jacks anchor the unit securely when in operation.

6. SAFETY + OPERATION

Beacons and LED work lights provide safe working conditions in remote areas and in low light. Units can be supplied with a stand-on platform or seat with seatbelt and anti-roll cage.

JETTING EQUIPMENT ACCESSORIES

Modern multipurpose drainage vehicles often carry a wide range of ancillary equipment, allowing engineers to undertake a variety of drainage tasks in a single visit.

LANCES

Lances are primarily used for surface and street furniture cleaning. Also called dry-shut lances, they can only be used with jetting systems that include an unloader valve; a trigger-operated mechanical valve that shuts off the flow of water to the pump, and ensures that the pressure in the hose remains constant at all times. Dry-shut lances are available in a standard configurations for everyday tasks, with a working pressure up to 5000 psi, or heavy duty versions that offer pressures up to 7500 psi.

CAMERAS

Commonly used to survey and efficiently locate blockages and other issues in pipes and sewers, drainage cameras are an important tool in jetting operations. Camera systems are available in flexible push-rod formats for navigating smaller drains with diameters between 25mm and 200mm. For larger sewers, remote-operated crawler cameras equipped with wheels or tracks are preferable. Both types of systems often featuring a sonde (radio beacon) for precisely locating the position of the camera in the pipe.

CABLE MACHINES

Available in a range of spring configurations, cable machines are small, high-performance units for clearing domestic and light commercial drains. With the capabilities to handle most obstacles encountered by contractors and plumbers, these portable machines can be used in pipes with a diameter from 32mm to 250mm. Either handheld or wheel-mounted, cable machines can be effortlessly moved from job to job and often feature an enclosed drum for storing and protecting the spring. Larger sectional machines are suited for longer pipe runs.

FLEXSHAFT MACHINES

Lightweight and easily transportable, flexible shaft machines have grown in popularity across the drainage sector in recent years. Producing a rotational speed of 3,000RPM, these high-speed machines can be fitted with multiple heads for efficient scouring, clearing and unblocking tasks such as the removal of limescale, rust and cement. Smaller machines are favoured by plumbers for the cleaning of short pipes in kitchens and bathrooms, while larger units, such as the RioFlex (above), offer effective wall-to-wall cleaning in larger pipes.

SAFE OPERATION OF YOUR EQUIPMENT

TIPS FROM A PROFESIONAL

Try to complete risk assessments before each job to highlight potential hazards and either avoid and/or protect people and equipment from their consequences.

Drain jetting is an occupation with many hazards, and the misuse of high-pressure jetting equipment can result in serious injury or even death. Most contractors ensure their staff undertake regular accredited jetter and safety training and understand the importance of the correct safety porceedures. Below we've listed some of the safety processes that greatly reduce the risk of injury.

GENERAL WARNINGS

From our experience of commonly reported incidents and near misses, please take note of the following:

- Personnel that use, maintain and inspect the equipment should be suitably qualified and authorised
- Never operate high-pressure equipment in close proximity to a person or animal
- Use protective barriers, warning beacons and signs to reduce the risk of unauthorised access to the work area
- Never block the control levers or lean equipment on or near them
- Do not engage the high-pressure pump until the jetting nozzle is at least 3 feet from the pipe opening.
- Ensure that the high pressure nozzle does not leave the drain whilst the unit is in operation.
- Before using a spray gun, set the pressure below the maximum (± half of the maximum pressure is recommended) before the machine is started
- Never exceed the maximum pressure that is marked on the manometer when using the spray gun
- Always depressurise the high-pressure circuit unit when you have finished using it.
- Always check for electrical feeds or equipment if you are cleaning with a spray gun
- Always check for loose items near the application of the spray gun to avoid them becoming projectiles

PERSONAL PROTECTION EQUIPMENT (PPE)

The following PPE is prescribed when operating jetting equipment:

- Ear Protection (LWA 109dB)
- Eye Protection (goggles and face shields)
- Hand Protection (gloves)
- Waterproof clothing
- Spray boots with toe protection
- Head Protection (hard hats)

Always apply PPE prior to operation of the equipment and use your risk assessments to determine if any additional PPE is required.

WATER JETTING ASSOCATION TRAINING COURSES

To maintain registration with the WJA, the Water Jetting Safety Awareness course must be retaken every three years.

The Water Jetting Association (WJA) is the UK's leading provider of water jetting training and promotes technical excellence and safety in the use of high-pressure water jetting. Its City & Guilds accredited training courses are the industry standard for the safe and correct operation of a range of high-performance jetting equipment. Below is an outline of a typical two-day WJA course covering user safety and jetter operation.

SAFETY AWARENESS

Health and Safety is integral in the drainage industry and many contractors, Councils and utility companies require operators to hold the correct training and certificates. The one-day course includes the following:

- Legislation and WJA Codes of Practice
- Machines and Applications
- Jetting Equipment - Nozzles & High-pressure Hoses
- Jetting Equipment - Pumps
- Jetting Equipment - Pressure Controls
- Water Jetting Hazards & Injuries
- Welfare and PPE
- Operational Procedures

DRAIN & SEWER CLEANING

Trainees are provided with a full range of sewer cleaning techniques and educated about any problems and hazards that they may encounter. This includes the safety and correct operation of pressures and flows, jetting nozzles and accessories, and combines both written and practical study. The course covers the following:

- Safety Awareness Issues
- Applications & the Types of Machine
- Jetting Equipment - Nozzles & Ancillary Equipment
- Jetting Equipment - High-pressure Hoses
- High-performance Jetters
- Job Planning & Assessments
- Operational Procedures
- Practical Exercises

WJA COURSE BENEFITS

- Water Jetting Association and City & Guilds certified
- Successful candidates are recognised by the WJA international database
- Most contractors and employers require and recognise WJA training
- Successful candidates are issued with a WJA photo-ID card and certificate detailing completed courses
- WJA courses are seen as the benchmark for jetting operational standards and skills
- Certificates provide assurance on the quality of skills for prospective customers
- Educates and supports the productive, safe and correct codes of water jetting practice
- Supports workforce development and key operative retention

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At Andy Guest Jetters we recognise that the journey doesn't end once your equipment has been manufactured. Alongside jetting solutions, we help customers arrange vehicle, jetter and equipment finance, undertake installations and vehicle customisations and provide a full range of after-sales services, including scheduled maintenance, emergency repairs and the supply of parts and accessories.

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