



JENNCHEM PRODUCTS

CHEMICAL ROOF SUPPORT, ROCK STABILIZATION
AND VENTILATION SEALING PRODUCTS

REV 10-26

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JENNCHEM designs and delivers chemical roof support, rock stabilization and ventilation sealing products to the mining and underground construction industries.

JENNCHEM® was established in 2009 to design and deliver chemical roof support, rock stabilization and ventilation sealing products to the mining and underground construction industries.

JENNCHEM's core product line includes the following:

J-CRIB®, a pumpable standing support, provides significant strength and logistical advantages over traditional coal mine standing support.

J-SEAL® is a specialized foaming cement which can be used for backfilling behind steel sets or other general backfilling applications in coal or hard rock mining. JENNCHEM's 120 psi Mainline J-SEAL is MSHA approved and can be used with a variety of form designs including wood, concrete block, props and mesh.

J-CAN is a custom made steel shell filled with a specialized cement that slowly yields under load. It replaces conventional timber cribs in longwall tailgates and bleeder entries.

JENNCHEM also offers a range of polyurethane, silicate, and phenolic grouts and resins for stabilization of fractured strata and void filling. Direct polyurethane injection into fractured rock has been performed for decades, however, JENNCHEM provides unique technical support to evaluate the dispersion and performance. In addition, a patent pending cable bolt design delivers polyurethane through the center of the bolt, enabling the post installation grouting in areas of roof instability.

JENNCHEM will continue to explore and transform chemical solutions into innovative new products that are consistent and reliable under the most demanding strata control challenges.

JENNCHEM's Core Product Line



J-CRIB®, a pumpable standing support, provides significant strength and logistical advantages over traditional coal mine standing support.



Ultra-X Foam is a two-component grout that is intended for, strata consolidation, coal face reinforcement, and large or small cavity filling.



J-SEAL® is a specialized foaming cement which can be used for backfilling behind steel sets or other general backfilling applications in coal or hard rock mining.

JENNCHEM's 120 psi. Mainline J-SEAL is MSHA approved and can be used with a variety of form designs including wood, concrete block, props and mesh.

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J-CRIB® Pumpable Crib

J-CRIB® is a specialized pumpable cement and containment bag that replaces conventional timber cribs in longwall tailgates and bleeder headings. The state-of-the-art mixing and pumping system, together with rapid gelling characteristics of the J-CRIB material ensure simple and fast installation. The rapid strength gain provides early resistance to mine roof convergence and bed separation.

J-CRIB is a two part system consisting of Part A and Part B, which when mixed together rapidly react to produce a load bearing mine roof support. J-CRIB (Part A) is a non-combustible grey powder that forms an easy to pump slurry when mixed with water. J-CRIB (Part B) is a non-combustible low viscosity easy to pump liquid accelerator. When mixed together, they gel in less than 30 seconds allowing the top of the crib to be pressurized against a stiff base.

Advantages

- High efficiency mixing and pumping equipment
- High yield, approximately 60% by water volume
- Long distance pumping, up to 15,000 ft (4572 m)
- Long pumping life, minimum 12 hours
- Consistent performance with pressurization of bags ensuring good contact with mine roof and even load bearing capacity
- Rapid gelling allows bags to be filled completely without additional form work

Standard J-CRIB Support Capacity

J-CRIB DIAMETER, in. (mm)	SUPPORT, tons (metric tons)
24 (610)	150 (136)
27 (686)	200 (181)
30 (762)	230 (209)



Trailer mounted, electric powered operations.

Underground Installation



J-CRIB bag attached to wire mesh.



Powder and accelerator lines.



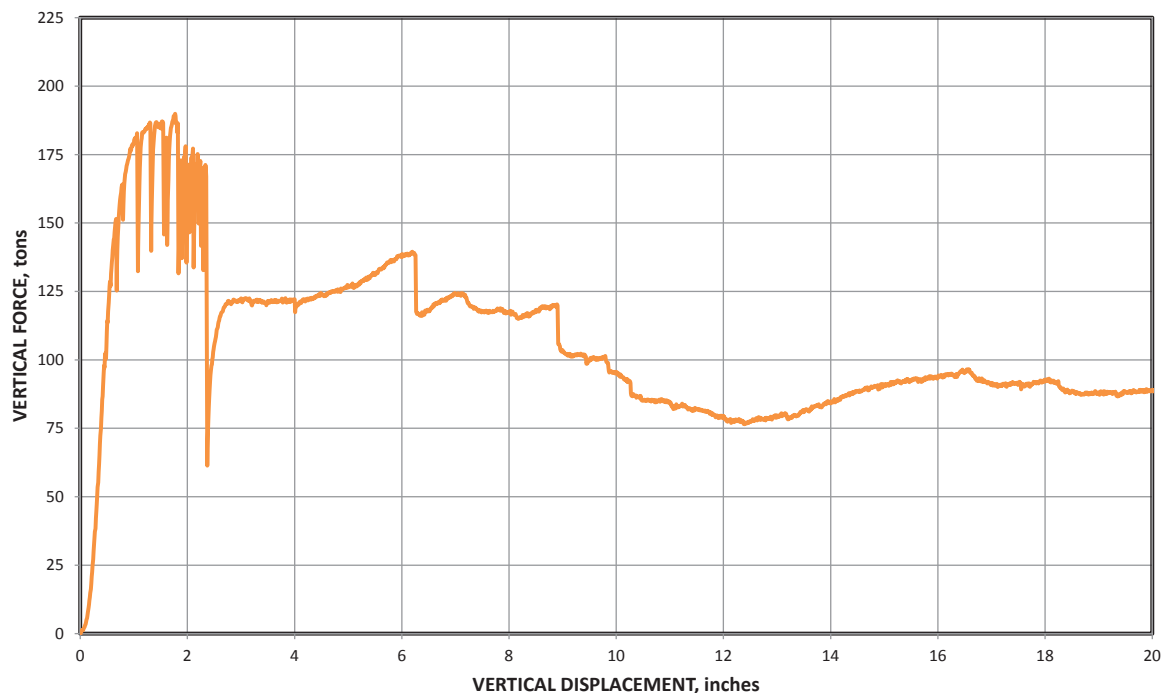
Pumped full and pressurized.

Surface Equipment



Liquid accelerator tanker, cement hopper, diesel powered mixer & pump system.

NIOSH Research Laboratory - J-CRIB Results



Response to Ground Pressure

Standing support response to ground pressure is critical to successful performance. Full scale NIOSH vertical load to failure testing has demonstrated the effectiveness of the J-CRIB system. The graph above was produced from such a test on a 72-inch high, 27-inch diameter, 4-inch steel pitch bag, plastic wrapped J-CRIB support. The near vertical loading over the initial inch of deformation is the loading of J-CRIB formulation. Controlled yield of the J-CRIB formulation loads the four inch pitch, continuous spiral wire reinforcement over the next two inches of deformation. The bag controls the load to approximately nine inches of deformation. The plastic wrap controls the load to over twenty inches of deformation. Stability of the standing support over the first three inches of deformation is the most critical aspect of longwall gateroad performance. The J-CRIB formulation provides this required consistent support, with significant installation and cost advantages.

The System

The J-CAN (formally known as "The-CAN") is a secondary standing support product with options in diameter and height. It is a cribbing system engineered to combine the superior load carrying characteristics of concrete with the slow deformability of wood. The result is a more-than-sensible one-piece replacement for all current cribbing systems.

Performance

In addition to the unique give of the uniformly consistent core, J-CAN minimizes the possibility of sudden failure by physically restraining the outward thrust caused by load forces.

The superior load carrying capability of J-CAN makes it comparable to concrete, but without concrete's sudden unannounced failures.

J-CAN has been thoroughly tested by NIOSH and has proven its capabilities in a multitude of underground applications.



PRODUCT SPECIFICATIONS

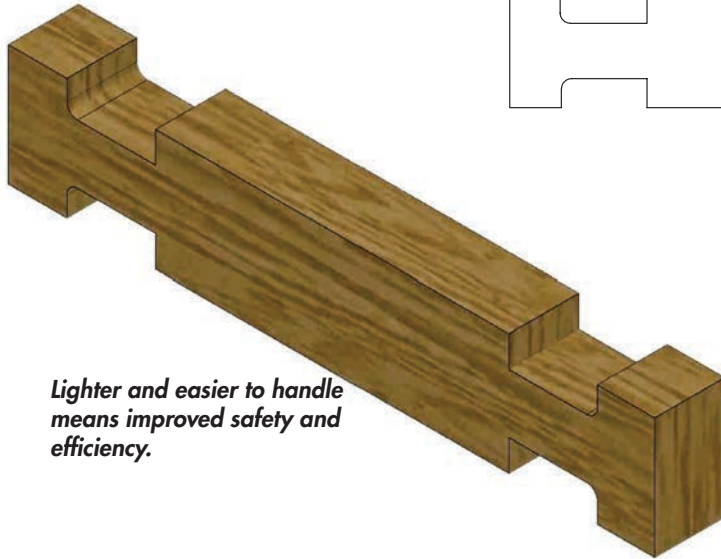
Sizes offered: 18", 22", 24", 30", 36" diameters up to 15' in verticle height.



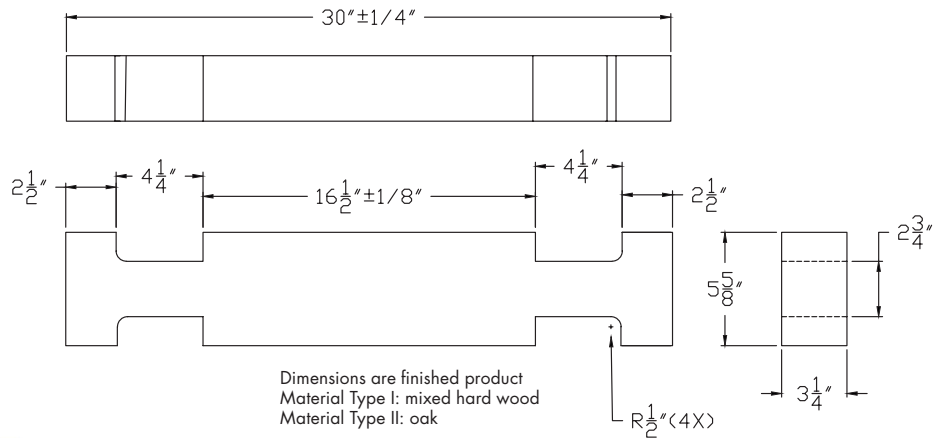
J-Latch™ Timber Crib



J-Latch™

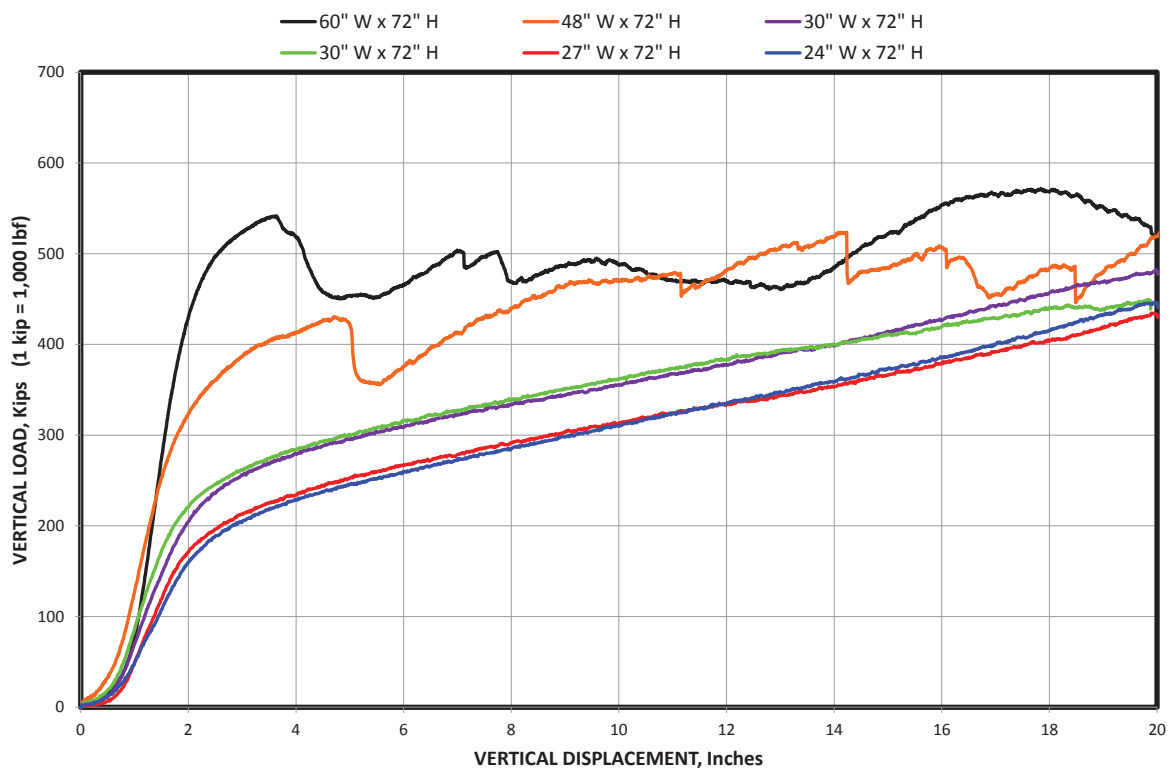


*Lighter and easier to handle
means improved safety and
efficiency.*



J-Latch™ is designed to replace conventional timber cribs (4- and 9-point). Timbers are interlocked and there is 100% contact which greatly improves strength and stability, and also allows for higher aspect ratios. Increasing length/width of the block contributes even further to the strength and stability. Select timber species helps to ensure equal loading as well as consistency and predictability.

JENNMAR: J-LATCH - 4/5/2017



J-BLOCK

- Forklift tine pockets are molded into the block for easy lifting.
- The blocks can be mortared or glued together.

PRODUCT SPECIFICATIONS

- 3 block sizes:
 - (384) 6" x 16" x 24" / 35 lbs.
 - (384) 8" x 16" x 24" / 45 lbs.
 - (443) 4' x 4' x 32" / 1,200 lbs.
- Nontoxic
- Zero air penetration
- Fire resistant



J-SEAL® is a specialized foaming cement that is used to build permanent coal mine ventilation seals. It is also used for general backfilling applications in coal or hard rock mining. J-SEAL is designed to be installed with a JENNCHEM continuous placer type pump. The rapid strength gain provides immediate ground support to the surrounding strata with quicker cure times to meet seal approval specifications in days rather than weeks.

MSHA Approved Designs

JENNCHEM has been granted four MSHA permanent coal mine ventilation approvals, a 50 and 120 psi explosion resistance for both mainline and gob seal applications:

- 50M-07.0 — JENNCHEM Mainline J-SEAL
- 120M-15.1 — JENNCHEM Mainline J-SEAL
- 50G-06.1 — JENNCHEM Gob Isolation J-SEAL
- 120G-16.0 — JENNCHEM Gob Isolation J-SEAL

The complete installation guidelines for all four of these approved seals are available on MSHA's website: www.msha.gov/seals/sealssinglesource2007.asp.

J-CRIB® form bags filled with J-SEAL®, mixed and pumped from a nearby underground location, are an effective standing support, when a limited number of cribs are required or bulk surface facilities are not economically feasible.

Features

- Pre-blended, cementitious, non-flammable, powder product packaged in 45 lb, 3-ply, one-layer polyethylene bags
- Once mixed with water, the product develops foamed, uniform, pumpable grout for constructing plug-type mine seal structure underground
- The product is optimally formulated and the grout is chemically stable after cure
- One-part system, longer gel time, better viscosity and longer pumping distance
- Rigorously tested, premier engineering properties, better bonding with strata and higher shear strength against strata
- J-SEAL is MSHA approved and can be used with a variety of form designs, including wood, concrete block, props and mesh

based on the superior shear strength of the J-SEAL material. When installed in a 7' high and 20' wide coal mine entry, within wood and brattice cloth forms, the required thicknesses are:

- 4.75 ft. for a 50 psi mainline seal
- 10.65 ft. for a 120 psi mainline seal
- 4.50 ft. for a 50 psi gob seal
- 5.58 ft. for a 120 psi gob seal
- J-SEALs superior mechanical properties results in a 21.7% reduction in seal thickness

Installation

- Calibration and pump set up needs to be carried out by qualified JENNCHEM personnel or authorized contractors
- A minimum of 600 ft. of 1-1/4" mine spray hose or slick line is required from the placer to the job site
- Underground requirements:
 - Water 20 gpm @ 50 psi (100 psi if water heater required)
 - AC Power @ 460 V
 - Requires only light form work and sealing of large gaps



continued



J-SEAL features a patent-pending formulation that is significantly thinner than competing brands, yet still maintains greater shear strength!

Less material means less handling, an improved safety factor and greater pumping distances. And with its excellent viscosity and a placer pump that is specifically designed for J-SEAL, application is virtually trouble-free.



J-SEAL Placer Pump



J-SEAL Placer Pump Specifications

Motor, 20 HP	21 Amps @ 460 V, 18 Amps @ 575 V Cable Size #6
Water Heater	90 Amps @ 460 V, 110 Amps @ 575 V Cable Size #2

1-Day J-SEAL® Cement

1-Day J-SEAL® is a specialized, highly pumpable cement that is designed to duplicate the engineering properties of standard J-SEAL within hours, permitting the rapid construction and approval of final 120 PSI main line seals. This product differs from traditional J-SEAL as the non-foamed formulation provides for extended pumping distances along with the quick strength gain required for an approved seal in less than 24 hours. It is also ideal as a single shot grout for pumpable cribs or general grouting applications in coal or hard rock mining. 1-Day J-SEAL is designed to be installed with a JENNCHEM continuous placer type pump into a variety of form designs including wood, concrete block, and metal.

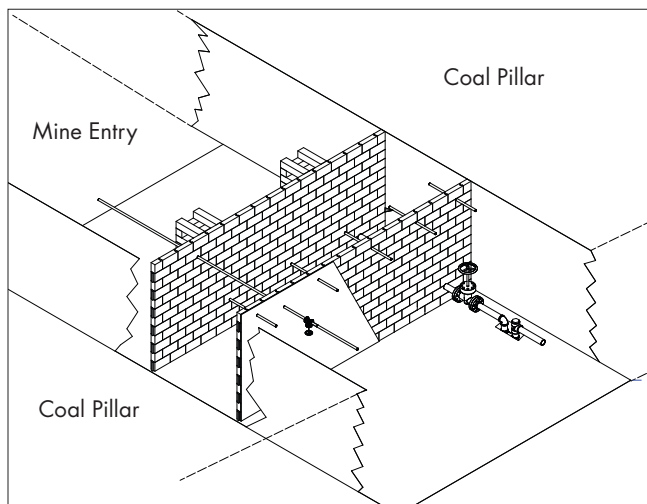
MSHA Approved Design

JENNCHEM has been issued MSHA approval (120M-17.0 – JENNCHEM Main Line 1-Day J-SEAL) for seals requiring an early cure rating and/or long distance placement properties.

The complete installation guidelines are available on MSHA's website: <http://www.msha.gov/seals/sealssinglesource2007.asp>.

The required thickness of the two JENNCHEM 120 PSI Mainline approvals are based on the superior shear strength of both J-SEAL materials. When installed in a 7-foot high and 20 foot wide coal mine entry, the required thickness is 10.15 feet utilizing a steel stopping or concrete block form.

1-Day J-SEAL's superior mechanical properties results in a 21.7% reduction in seal thickness.



Installation

- Calibration and pump set up needs to be carried out by qualified JENNCHEM personnel or authorized contractors
- A minimum of 250 ft of 1-1/4 in. mine spray hose or slick line is required from placer to job site
- **Underground requirements:**
 - Water 25 gpm @ 50 psi (100 psi if water heater required)
 - 460/575 VAC @ 60 Amps (200 Amps if water heater required)
- Requires simple form work and sealing of gaps.

Advantages

- Compared to traditional J-SEAL, 1-Day J-SEAL's non-foamed design provides a stronger final product to result in a shorter amount of time
- Longer pumping distances are achieved when compared to traditional J-SEAL due to its low viscosity design
- Both J-SEAL formulations utilize the same chemistry, providing ideal engineering properties including low heat of hydration and non-shrink characteristics
- Rapid Application: up to 12 CY per hour
- Good flow properties allows material to penetrate and consolidate broken ground
- Rapid gel minimizes leakage in forming
- High Yield: up to seven times its dry volume
- Superior durability for life of mine installations
- Acid mine water resistant.

Features

- Pre-blended, cementitious, non-flammable, powder product packaged in 45-lb, 3-ply, one layer polyethylene bags
- The product is optimally formulated and the grout is chemically stable after cure
- Simple one-part system, longer gel time, better viscosity, and longer pumping distance
- Rigorously tested, premier engineering properties, better bonding with strata, and higher shear strength against strata
- 1-Day J-SEAL is MSHA approved and can be used with a variety of form designs including wood, concrete block, and metal.

JENNCHEM Underground Roadway Repair (JURR)

JENNCHEM Underground Roadway Repair is a specially formulated fast-setting concrete designed for the mining and tunneling industries. It is designed specifically for demanding applications where quick return-to-service is required, and where traditional concrete mixing equipment is unavailable or impractical. JURR is formulated to absorb mixing water and gain strength rapidly with little or no mixing. It is ideal for rehabilitating underground roadway and filling mud holes or puddles.

JENNCHEM Underground Roadway Repair is a safer, more permanent solution than temporary bridges or traditional fill methods. The specially graded aggregates are designed to provide traction for foot traffic and wheeled vehicles while limiting unnecessary tire wear. Use JURR to limit liability from slippery mud holes and to mop up nuisance water areas, returning your attention and time to maximizing production.

Instructions

Repaired area is only as durable as the underlying substrate. Remove mud or soft base if possible. Put down rock or ballast and compact to provide a solid base. Fill hole or depression with water until you have standing water up to where repair level is desired. Open packaging and dump material into standing water. Allow material to soak up water. Agitation with shovel or other suitable tool can be used to improve mixing. Finish to desired texture. This operation can be done in multiple levels if desired.

Packaging/Yield

- 2500 lb ($\approx$ 1.0 cu yd) super sacks

Shelf Life

One year when stored in cool, dry conditions.

Caution

JENNCHEM Underground Roadway Repair contains cementitious materials and may cause irritation to lungs, eyes, and skin. Avoid contact. Use only in adequate ventilation. Do not breathe dust. Wet mixture may cause burns. Wear suitable gloves, eye protection, and protective clothing. In case of skin contact, wash thoroughly with soap and water. In case of eye contact, flush immediately and repeatedly with large quantities of water and get prompt medical attention. In case of difficulty breathing, remove person to fresh air. If difficulty breathing persists, seek medical attention.

Set/Cure Time

Foot Traffic	2 hr
Light-duty Wheeled Traffic	6 hr
Heavy-duty Traffic (shuttle car, haul truck, roof bolter, jumbo)	18 hr
Extreme-duty (shield hauler, continuous miner, tracked vehicles)	24 hr

NOTE: Hot materials (and/or water) will accelerate set times and strength gain. Cold materials will slow set times and strength gain. PH and chemistry of water may affect set time and strength gain.



Latex Spray Mine Sealant

Latex Spray is a premixed latex-based sprayable mine sealant specifically designed with higher flexibility and moisture sealant for applications in the underground mining industry. It is water resistant after curing, flexible, and is capable of filling cracks and gaps without slumping.

Quantity

- 11 Liters

Specifications

- Flame spread index less than 25 per ASTM E-162
- Flexural strength greater than 39 per ASTM E-72
- Strength enhancing mine sealant, suitability number "MSHA-S15/04"
- Minimum applied thickness 3/16"

Directions for Use

- Apply directly to surface to be coated. Surface must be clean and free of foreign materials.
- Use proper personal protective equipment. Wear eye protection. Wear rubber gloves, protective clothing.
- Clean tools with water.

Caution

- Product freezes at 32°F. Must allow to thaw before using.
- Do not apply to surface where water is running or seeping.
- Store underground or under roof.

Warning

- Avoid contact with eyes and skin.
- May be harmful if swallowed.

First Aid

- Eyes—Flush with water for 15 minutes. Seek medical attention.
- Skin—Wash thoroughly with soap and water.
- Internal—Drink as much water or milk as possible. Seek medical attention.
- MSDS available upon request.



TC Spray Mine Sealant

TC Spray is the original premixed sprayable mine sealant and comes ready to use straight from the pail. It has a variety of applications in the industry providing ventilation control, fire-proofing, and strength enhancement to meet MSHA standards.

Quantity

- 13 Liters

Specifications

- Flame spread index less than 25 per ASTM E-162
- Flexural strength greater than 39 per ASTM E-72
- Strength enhancing mine sealant, suitability number "MSHA-S15/00"
- Minimum applied thickness 1/8"

Directions for Use

- Apply directly to surface to be coated. Surface must be clean and free of foreign materials.
- Use proper personal protective equipment. Wear eye protection. Wear rubber gloves, protective clothing.
- Clean tools with water.

Caution

- Product freezes at 32°F. Must allow to thaw before using.
- Do not apply to surface where water is running or seeping.
- Store underground or under roof.

Warning

- Avoid contact with eyes and skin.
- May be harmful if swallowed.

First Aid

- Eyes—Flush with water for 15 minutes. Seek medical attention.
- Skin—Wash thoroughly with soap and water.
- Internal—Drink as much water or milk as possible. Seek medical attention.
- MSDS available upon request.



Latex Trowel Mine Sealant

Latex Trowel is a premixed latex-based mine sealant that has multiple underground applications. It can be used to seal and maintain newly constructed stoppings and seals. It is water resistant after curing, easy to apply and spread, flexible, and is capable of filling cracks and gaps without slumping.

Quantity

- 11 Liters

Specifications

- Flame spread index less than 25 per ASTM E-162
- Flexural strength greater than 39 per ASTM E-72
- Strength enhancing mine sealant, suitability number "MSHA-S15/03"
- Minimum applied thickness 1/16"

Directions for Use

- Apply directly to surface to be coated. Surface must be clean and free of foreign materials.
- Use proper personal protective equipment. Wear eye protection. Wear rubber gloves, protective clothing.
- Clean tools with water.

Caution

- Product freezes at 32°F. Must allow to thaw before using.
- Do not apply to surface where water is running or seeping.
- Store underground or under roof.

Warning

- Avoid contact with eyes and skin.
- May be harmful if swallowed.

First Aid

- Eyes—Flush with water for 15 minutes. Seek medical attention.
- Skin—Wash thoroughly with soap and water.
- Internal—Drink as much water or milk as possible. Seek medical attention.
- MSDS available upon request.



TNT Trowel Pro Mine Sealant

TNT Trowel Pro is a cost-effective, premixed silicate-based fire retardant mine sealant designed to be used on newly constructed stoppings and overcasts, for ventilation control maintenance, and as fire-retardant material used to coat all accessible surfaces of wood used in the construction of ventilation controls.

Quantity

- 11 Liters

Specifications

- Flame spread index less than 25 per ASTM E-162
- Flexural strength greater than 39 per ASTM E-72
- Strength enhancing mine sealant, suitability number "MSHA-S15/01"
- Minimum applied thickness 1/8"

Directions for Use

- Apply directly to surface to be coated. Surface must be clean and free of foreign materials.
- Use proper personal protective equipment. Wear eye protection. Wear rubber gloves, protective clothing.
- Clean tools with water.

Caution

- Product freezes at 32°F. Must allow to thaw before using.
- Do not apply to surface where water is running or seeping.
- Store underground or under roof.

Warning

- Avoid contact with eyes and skin.
- May be harmful if swallowed.

First Aid

- Eyes—Flush with water for 15 minutes. Seek medical attention.
- Skin—Wash thoroughly with soap and water.
- Internal—Drink as much water or milk as possible. Seek medical attention.
- MSDS available upon request.



PUR70 Polyurethane Resin

PUR70 Polyurethane Resin is a two-component polyurethane resin system. When properly mixed at a ratio of one to one, PUR70 cures to a rigid polymer with unique physical properties, resistance to water and chemical attack, and long term durability. The fast reactivity of PUR70 is used to control high water flows and consolidate loose rock strata.

The product's high adhesive strength, outstanding mechanical properties and flexibility create an excellent bond with the strata. When injected into the strata for preventive or curative purposes, the low viscosity mixture remains liquid for several seconds and penetrates into the smallest fissures. The polyurethane then expands, sets and effectively consolidates and seals the broken rock.

PUR70 can be applied with various types of dual piston pumps.

Applications

Typical applications include:

- Ground consolidation in the event of fractured and unstable ground
- Sealing against water ingress
- Injection of rock bolts, see the Fully Grouted Cable Bolt (FGCB)
- Ground stabilization
- Storm water systems, tunnels, manholes & underground vaults
- Concrete and earthen dams

Advantages

- Low viscosity product with good penetration into small fissures
- Non-flammable, non-toxic and does not contain any Volatile Organic Compounds (VOCs)
- Excellent adhesion, resistance and durability
- Ground cohesion quickly re-established under wet or dry conditions
- High flexibility, coherence maintained even in the event of strata movement
- Swells in the presence of water, suitable for stemming water ingress
- Full mechanical strength achieved very quickly, resulting in minimum disruption to workplace
- Storage and Shelf Life:
 - Product is moisture sensitive. Store product in original sealed containers at temperature range of 60–90° F (15–32°C). Opened containers must be handled properly to prevent moisture contamination. Shelf life is 12 months when properly stored



Technical Data — Solid Cured PUR70 Polymer Resin

		Test Method
Density, lb/ft. ³ (kg/m ³)	70 (1121)	ASTM D-1622
Compressive Strength, psi (MPa)	10,000+ (70+)	ASTM D-1621
Tensile Strength, psi (MPa)	5100 (35)	ASTM D-638
Shear Strength, psi (MPa)	10,000+ (70+)	ASTM D-732
Flexural Strength, psi (MPa)	10,000+ (70+)	ASTM D-790
Water Absorption (by volume)	<1%	ASTM D-2842
Elongation	8%	ASTM D-638

Gel Time (ratio of 1:1 by volume)

77°F (25°C)	45 seconds	—
50°F (10°C)	60 seconds	—

Technical Data — PUR70 Polyurethane Resin

Physical Properties — Liquid	Resin A	Resin B	Test Method
Viscosity, cps	250	500	ASTM D-1638
Specific Gravity	1.23	1.10	ASTM D-1475
Color	Dark Amber	Light Amber	—
Flash Point, °F (°C)	>250 (121)	>250 (121)	ASTM D-92

JM CABLE® Fully-Grouted Cable Bolt (FGCB)



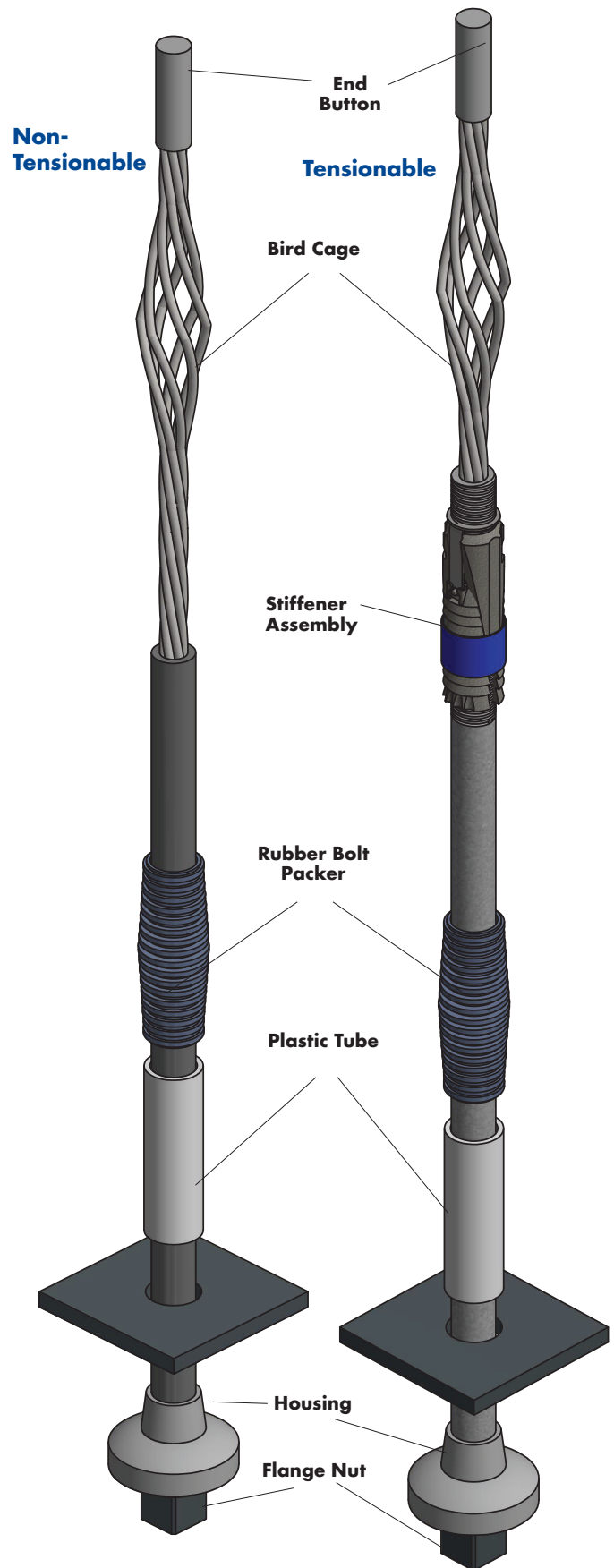
The Fully-Grouted Cable Bolt (FGCB) was developed by the JENNMAR Sales Team after extensive field testing. The FGCB allows for a standard cable bolt to be fully encapsulated during installation or post-installation with polyurethane (PUR). A fully encapsulated cable bolt is better protected than a traditional bolt from corrosive elements that may be in a mine roof which could affect the cable bolt's structural properties, especially if the cable bolt is subjected to these elements for prolonged periods of time. FGCB is available as a non-tensioned and INSTAL® CC Tensionable Cable Bolt models.

Function

Although initially developed for corrosion protection, field trials demonstrated that the FGCB can act as a traditional PUR injectable bolt. The FGCB is proven to be a very versatile roof support due to its ability to control many different ground conditions, from increasing the lifespan of standard cable bolt supports in long-term main entry systems to stopping the ingress of water and allowing access to previously unattainable reserves. The FGCB is a very effective and economical roof support option.

Locations

Outby areas, belt entries, belt rehabilitations, intersection support, intersections for pillar recovery, longwall recovery and set-up entries, and longwall headgate entries.



JM CABLE® Fully-Grouted Cable Bolt (FGCB)

	0.6 in. (15 mm) 30 Ton Nominal	0.7 in. (18 mm) 40 Ton Nominal
Jennmar I.D. No.	KW608*	KW708*
Strand Diameter, in. (mm)	0.6 (15)	0.7 (18)
Number of Strands	7	
Strand Grade, ksi (MPa)	270 (1862)	
Cable Length, min., ft. (m)	8 (2.4)	
Stiffener Tube Length, min., in. (mm)	18 (457)	
Resin Type	J-LOK	

* This code will be on samples made in WV.

JSC Grout

JSC Grout is JENNCHEM's series of single-component hydrophobic polyurethane grouts that are used for sealing leaking cracks or joints in a variety of applications.

Types of JSC Grout available are Flex, LV, Ultra and Classic.

Applications

- Mine seal grouting
- Rehab of older works
- Water control on slopes, shafts and all active underground areas
- Waste treatment plants and water related facilities
- Storm water systems and manhole facilities
- Concrete and earthen dams
- Tunnels
- Concrete and masonry repair
- Water control grouting

Advantages

- 100% solids
- Expands up to 30 times initial volume
- Pumps as single component
- Controllable reaction times
- Excellent resistance and durability
- Outstanding adhesion
- Non-hazardous shipping
- Non-flammable
- Cures inert, non-toxic permanent seal
- Closed cell/hydrophobic formula
- Low viscosity
- No shrinkage in wet/dry and freeze/thaw cycles



Certified to NSF/ANSI 61 Manufacturing Location: Canton, GA
For potable water applications, the minimum cure time is 12 hours at ambient temperature, with up to 2.5% accelerator.

Use of Accelerator B Component

The reaction profile is adjusted prior to pumping by the addition of Accelerator B into the base resin and is affected by temperature and the amount of moisture encountered. At 2.5% (1 pint per five gallons), the expansion will start at 15 seconds and be complete at about 65 seconds. These reaction times were determined at 77°F with the addition of 2.5% water.

JSC Grout – Ultra

JSC Grout – Ultra Physical Properties

Liquid			
	Flex	Accelerator B	Test Method
Viscosity	650 cps	25 cps	ASTM D-1638
Specific Gravity	1.07	0.95	ASTM D-1475
Color	Pale Yellow	Clear	
Flash Point	> 250°F	225°F	ASTM D-92
Solid Cured			
Density	4 lb/ft. ³		ASTM D-1622
Elongation	300%		ASTM D-638
Tensile	300 psi		ASTM D-638
Toxicity	Non-Toxic		

JSC Grout – Flex

JSC Grout – Flex Physical Properties

Liquid			
	Flex	Accelerator B	Test Method
Viscosity	500 cps	25 cps	ASTM D-2196A
Specific Gravity	1.15	0.95	ASTM D-1475
Color	Amber	Clear	
Flash Point	> 250°F	225°F	ASTM D-92
Solid Cured			
Density	4 lb/ft. ³		ASTM D-1622
Elongation	44%		ASTM D-638
Tensile	29 psi		ASTM D-638
Shear	17 psi		ASTM C-273
Water Absorption	< 1%		ASTM D-2842
Toxicity	Non-toxic		

JSC Grout – LV

JSC Grout – LV Physical Properties

Liquid			
	Flex	Accelerator B	Test Method
Viscosity	250 cps	25 cps	ASTM D-1638
Specific Gravity	1.1	0.9	ASTM D-1475
Color	Light Amber	Clear	
Flash Point	> 250°F	225°F	ASTM D-92
Solid Cured			
Density	4 lb/ft. ³		ASTM D-1622
Elongation	50%		ASTM D-638
Tensile	29 psi		ASTM D-638
Shear	17 psi		ASTM C-273
Water Absorption	< 1%		ASTM D-2842

JSC Grout – Classic

JSC Grout – Classic Physical Properties

Liquid			
	Flex	Accelerator B	Test Method
Viscosity	700 cps	25 cps	ASTM D-1638
Specific Gravity	1.13	0.95	ASTM D-1475
Color	Amber	Clear	
Flash Point	> 425°F	225°F	ASTM D-92
Solid Cured			
Density	4 lb/ft. ³		ASTM D-1622
Elongation	44%		ASTM D-638
Tensile	29 psi		ASTM D-638
Shear	17 psi		ASTM C-273
Water Absorption	< 1%		ASTM D-2842

US Grout

US Grout is a two-component grout that comprises a silicate and a modified polyisocyanate intended for:

- Strata consolidation
- Coal face reinforcement
- Water control

The two-component resin is delivered by a pump unit and injected in a ratio of 1:1 by volume through a mixing gun. The resulting medium sets to produce an elastic non-foaming mass with outstanding adhesive and compressive strength.

When injected into the strata, the medium flows into the cracks and fissures and rigidifies, thereby creating an elastic bond that is capable of retaining its integrity even after rock movement has occurred. US Grout remains unaffected by water, is non-foaming and can even adhere to damp surfaces. In addition, US Grout is fire-resistant.



Technical Data – US Grout

Component Data	Resin	Catalyst
Density at 77°F (25°C), oz/in. ³ (g/cm ³)	0.68 (1.2)	0.88 (1.5)
Viscosity at 77°F (25°C), MPa.s	250	400
Mixing Ratio (in volume)	1	1
Shelf Life at 68°F (20°C), Months	12	12
Storage Temperature, °F (°C)	41–86 (5–30)	41–86 (5–30)
Reaction Data		
Set Time (minutes)	2:00	
Ultimate Tensile Strength, psi (MPa)	1400 (10)	
Compressive Strength at 50% Deformation, psi (MPa)	5800 (40)	

Ultra-X Foam



Ultra-X Foam is a two-component grout that comprises an organomineral activator and modified polyisocyanate intended for:

- Strata consolidation
- Coal face reinforcement
- Large or small cavity filling

The two-component resin is delivered by a pump unit and injected in a ratio of 1:1 by volume through a mixing gun. The resulting medium sets to produce an elastic, expanding mass with outstanding adhesive and compressive strength.

When injected into the strata, the medium flows into the cracks and fissures and rigidifies, thereby creating an elastic bond that is capable of retaining its integrity even after rock movement has occurred. Ultra-X Foam remains unaffected by water, therefore it will always expand to completely fill any void without compromising strength and expansion ability. In addition, Ultra-X Foam is fire-resistant.

The expansion ratio of Ultra-X Foam is approximately 40:1. Its low exothermic reaction allows large cavities to be filled completely in one pumping session without overheating.

Technical Data — Ultra-X Foam

Component Data	Resin (A Side)	Catalyst (B Side)
Density at 77°F (25°C), oz/in. ³ (g/cm ³)	0.68 (1.18)	0.64 (1.11)
Viscosity at 77°F (25°C), MPa.s	250	250
Mixing Ratio (in volume)	1	1
Shelf Life at 68°F (20°C), Months	12	12
Storage Temperature, °F (°C)	41–86 (5–30)	41–86 (5–30)
Reaction Data		
Rise Time (minutes)	<1.5 min	
Tack Free Time (minutes)	<3 min	
%NCO	24.5%	
Exotherm	<200°F (93°C) at 6 min	
Compressive Strength at Yield, psi (MPa)	Up to 7 psi	
Expansion Ratio	40:1	



Images show an approximate 15,000 cubic feet void filled in approximately 10 hours of pumping over a two day period.

Ultra-S Foam



Ultra-S Foam is a two-component grout that comprises an organomineral activator and modified polyisocyanate intended for:

- Strata consolidation
- Coal face reinforcement
- Large or small cavity filling

The two-component resin is delivered by a pump unit and injected in a ratio of 1:1 by volume through a mixing gun. The resulting medium sets to produce an elastic, expanding mass with outstanding adhesive and compressive strength.

When injected into the strata, the medium flows into the cracks and fissures and rigidifies, thereby creating an elastic bond that is capable of retaining its integrity even after rock movement has occurred. Ultra-S Foam remains unaffected by water, therefore it will always expand to completely fill any void without compromising strength and expansion ability. In addition, Ultra-S Foam is fire-resistant.

The expansion ratio of Ultra-S Foam is approximately 20:1. Its low exothermic reaction allows large cavities to be filled completely in one pumping session without overheating.

Technical Data — Ultra-S Foam

Component Data	Resin (A Side)	Catalyst (B Side)
Density at 77°F (25°C), oz/in. ³ (g/cm ³)	0.68 (1.2)	0.68 (1.2)
Viscosity at 77°F (25°C), MPa.s	300	300
Mixing Ratio (in volume)	1	1
Shelf Life at 68°F (20°C), Months	12	12
Storage Temperature, °F (°C)	41–86 (5–30)	41–86 (5–30)
Reaction Data		
Rise Time (minutes)	<3 min	
Tack Free Time (minutes)	<5 min	
%NCO	24.5%	
Exotherm	<250°F (121°C) at 15 min	
Compressive Strength at Yield, psi (MPa)	20 psi	
Expansion Ratio	20:1	

J-FIRM™ Soil Stabilization Grout



Jennchem's J-Firm Soil Stabilization Grout is a free flowing, low viscosity, sodium silicate grout and hardener that fully encapsulates and hardens loose soil in order to allow for safe excavation. Pumped at a 1:1 ratio, this product will permeate soil and sand to provide consolidation and support. Good for soils with very low void spacing.

Technical Data – J-FIRM

PHYSICAL PROPERTIES	
Viscosity (cP, mixed)	5-8
Specific Gravity	1.6
Gel Time (minutes)	30
Compressive Strength (psi, 24 hours)	200

Applications

- Pre-Excavation Grouting
- Temporary Shoring

Advantages

- Pumped out of bulk containers from above ground
- Environmentally friendly
- Low viscosity
- Easy Clean up with water

Packaging

- Tote and truckload quantities

Storage and Shelf-Life

- Storage Temperature: 32-90°F (0-32°C)
- Shelf Life: 1 Year

Mixing

- Parts A and B are pumped at a 1:1 ratio. Part A should be mixed well prior to pumping. The components that comprise Part B should be combined and mixed 30 minutes prior to pumping and mixed again during the pumping process.

Ultra-LOK is a superior two-component urea silicate grout optimized for strength and providing industry leading advancement times.

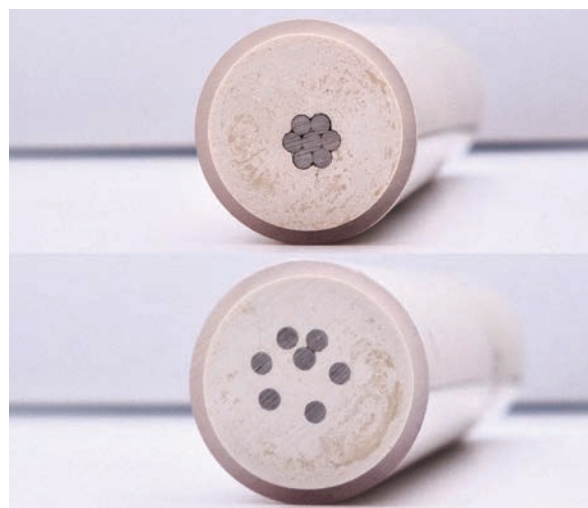
This grout is designed to secure rock and cable bolts in tunnel and mine applications. It quickly develops a thixotropic characteristic that minimizes free flow but allows continuous, as well as interrupted, pumping overhead.

Applications

- Strata consolidation
- Water control
- Cable grouting
- Bolt grouting
- Rock containment

Advantages

- Optimized for rapid strength development.
- Secures rock and cable bolts in tunnels and mines.
- Thixotropic characteristic allows controlled overhead pumping.



Cross section of a grouted cable bolt

Mechanical Properties	Ultra-LOK 60	Ultra-LOK 240
Pull, tons	≥ 1.5 tons/inch (<3 minutes)	≥ 1 tons/inch (<10 minutes)
Pull, tons (<24 Hours)	≥ 2 tons/inch	≥ 2 tons/inch
Compressive, psi	up to 5000	up to 5000
Set Time, mins	1	4-6

Chemical Properties	Part A (Silicate)	Part B (Isocyanate)
Viscosity, cps (@70F)	450	220
Specific Gravity	1.40	1.16
Parts by Volume	50	50
Color	Clear	Dark
Physical State	Liquid	Liquid

*Pull test results (R32 Bolt - in limestone block)

Product customizable to application needs

MSDS should be read before using JENNCHEM products

J-PLUG Acrylate Grout

J-PLUG Acrylate Grout is a fast reacting, low viscosity, acrylate polymer that is used to seal water leaks in concrete structures and stabilize soils. J-PLUG utilizes environmentally safe acrylic resins in conjunction with catalysts and accelerators. The system is typically pumped at a ratio of 1:1 (catalyst & water : resin & promoter), when controlling active water leaks and at higher ratios with water when ultra-low viscosity is needed to penetrate fine soil particles. At 1:1 ratio, the resulting product is a flexible elastomer, while at higher ratios of water to catalyst, a pliable gel results.

Applications

J-PLUG is typically used to seal any leak below grade and applications include:

- Tunnels of all types
- Below grade parking garages
- Foundations
- Tanks, sewers, shafts
- Around large diameter pipes, cracked concrete and various failed construction joints.

Technical Data – J-PLUG Acrylate Grout

Physical Properties

Viscosity	5-8 cps mixed
Specific Gravity	1.2
Elongation	300%
Boiling Point	>212°F
Freezing Point	32°F
PH	6.5-7.5

Set Time

% of complete solution by weight		Setting Time
Catalyst in Water	Promoter in Resin	
0.25	0.25	40 Minutes
0.50	0.50	15 Minutes
1.00	1.00	3 Minutes
2.00	2.00	30 Seconds

Advantages

- Super low viscosity
- Easy clean up (soap and water)
- Non Hazardous for shipping
- Non Hazardous when cured
- Economical
- Non-flammable
- Reaction is site *adjustable*

Packaging, Storage and Mixing

J-PLUG Acrylate Grout is supplied in 275 gallon totes, 55 gallon drums and 5 gallon pails. The promoter and catalyst are supplied in plastic containers filled by weight as required. Materials should be stored above 40°F and below 80°F in plastic (or stainless steel) containers at all times and must be kept separated prior to use.

All equipment used to pump J-PLUG must be designed specifically for this acrylic formulation. Stainless steel pumps and equipment are required due to the corrosive nature of the materials. **Do not use aluminum components.** Catalyst and promoter components may form a toxic gas if mixed prior to field application.

Follow manufacturer's instructions carefully during mixing and application. Always wear protective clothing in accordance with current OSHA requirements. Avoid skin and eye contact. Do not ingest. Do not mix catalyst and promoter exclusively from other components.

Handling and Clean Up - Read MSDS and understand safety issues prior to use.

Grouts & Resins Usage

Cable Bolt Grouts

- **PUR70** is pumped (bottom up) into Fully-Grouted Cable Bolts (FGCB) to provide corrosion protection and improve bolt life.
- **TDS-240** is a urea silicate (top down) grout which is used when high early strength is required as in longwall recoveries. Full strength is achievable in 4 hours.

Cable Bolt Grouts

PUR70 (Bottom up grout)	Polyurethane grout for corrosion protection
TDS-240 (Top down grout)	Urea silicate grout for high early strength

Cavity Filling Grouts

- **J-SEAL®** is a high strength foaming grout used primarily for rated seals. The J-SEAL placer pumps allow for control of the material density, so that lower strength mixes can be used for cavity fill applications such as behind steel sets.
- **Ultra-X Foam** is a high expansion urea silicate foam (40:1) which can be used to rapidly fill cavities with minimum construction of formwork.
- **JPH foam** is a phenolic foam (50:1) which can be used also to rapidly fill cavities with minimum construction of formwork. Because of the low exotherm, greater volumes of material can be more safely placed at any one time.

Cavity Filling

J-CRIB	2-part cement/silicate system pumped from surface
J-CRIB AP	all powder, 2-part cement system pumped from surface
J-SEAL	1 part foaming cement pumped from surface/ underground
Ultra-X Foam	Urea silicate resin grout
JFill Pro	Long distance backfill grout

Geotechnical Grout Selection

The choice between chemical grout and cement grout has been debated between engineers and contractors from all disciplines, from tunneling to mining from water to waste water to structural. Although there are strengths and weaknesses to both, no one can dispute that chemical grout and its variants can handle a wider array of issues such as poor ground conditions, void filling, and water inflow. JENNCHEM provides various formulas for the three types of chemical grouts: **polyurethanes**, **silicates**, and **acrylics**. Each is different by design, but applied in the same fashion and pumping equipment, making chemical grouting logistically pleasing to any project manager.

Chemical grouts are relatively new in comparison to cement grouts. The 1960s and early 1970s saw the first widespread applications of chemical grouts in various civil applications. The grouts were simple yet effective. Side A met with side B and formed a foam or hard mass. Today's resins still can do the same thing, but perform exponentially better with increased compressive strength, tensile strength, and lower viscosity. Choosing the optimum grout requires an understanding of your geologic issues and grout properties. JENNCHEM engineers and technicians can assist you in grout selection, pumping equipment and training necessary for a prompt and cost effective solution.

Polyurethanes

Out of all of the chemical grouts, polyurethanes are probably the most prominent on a jobsite. There are more formulations of these petroleum based products than all others. Polyurethanes can be made to foam, made to gel, and can be made to form high compressive strength masses. The two primary types of polyurethanes are hydrophilic and hydrophobic. Hydrophilic resins are typically installed as a single component resin, sometimes with a catalyst and expand from 5 to 10 times the liquid volume installed. These types of resins are usually installed after a large leak has been slowed or as the primary resin to stop small leaks in infrastructure. Some hydrophilic resins can also be used for consolidation of poor soil or to build containment walls in soils should the void spacing allow. These resins usually form a gel or flexible foam and shall stay in that state as long as there is moisture present. Hydrophobic resin can be pumped either in a two part system with an A and B component where no water is necessary for activation or a single component (sometimes with a catalyst) that a small amount of water is needed for activation. Hydrophobic resins are versatile in the fact that they can be used for stopping water leaks, both large and small, soil and strata consolidation, and void filling. Most manufacturers will generally have at least one hydrophobic resin that is NSF 61 approved or environmentally neutral. The most present byproduct of the polyurethanes is carbon dioxide gas. The resin uses the CO₂ to form its structure (closed cell or open cell foam). JENNCHEM manufactures both types of polyurethanes and has the technical support to supplement any project. Our Maximum Strength PUR 70 is a true hydrophobic two part resin that is designed to consolidate poor strata in mining and tunneling applications. It also works as a great leak stopper because the resin foams approximately 5 to 6X its liquid volume when in the presence of water. Its properties let it react fast enough to coagulate near and in leak pockets effectively slowing down or shutting off the water.

JENNCHEM's line of single component urethane resins effectively seal cracks and joints. Flex LV is a low viscosity (250 cps) single component hydrophobic resin that is used in crack and joint sealing along with stopping large water ingress or egress. The fast acting formula along with the closed cell structure allows the product to be pumped through the tiniest of cracks or into large fissures. The expansion rate and gel time can also be manipulated with an optional catalyst. Both products work well in soils and strata with fairly high void spacing (30-40 Standard Sieve) and will not penetrate and permeate most fine cements and bentonite. Whenever the soils or strata is considerably more compact, silicates or acrylics are up to bat.

Silicates

Both the sodium and urea silicates are found to penetrate smaller voids than polyurethanes. The uses of these chemical grouts vary greatly. The US Grout manufactured by JENNCHEM produces a hard mass achieving over 5000 PSI and is used to consolidate loose or poor

strata in mining application. Through recent testing it has also proven itself to be great at consolidating fine soils and sands, lending itself to contractors for pre-excavation grouting and temporary shoring. The US Grout is a two-part system much like Maximum Strength PUR 70, choosing which is most effective depends on changing geotechnical conditions. US Grout is pumped through the same pumps as the polyurethane grouts and exhibits much of the same characteristics, except that the US grout is not affected by water. It will settle and fall to the bottom if the water is static. A property which is appreciated when void filling below the water table. Since it doesn't foam and permeates well, the US grout is well suited for underpinning, tie-back walls, and soil nailing.

JENNCHEM manufactures a unique variant of the US Grout and it is Ultra-X Foam. As stated above, the US Grout will not foam even in the presence of water, however, the Ultra-X Foam will do so and do so well. The Ultra-X Foam is also a two-part system, and when mixed it generates a foam with an expansion rate of up to 30 times its liquid volume. The final product produced is a foam with approximately a 4-pound density per cubic foot. The Ultra-X Foam is applied in void fill situations where polyurethane cannot be used due to a very high exothermic reaction. It can also be installed to stop water ingress or egress from a few gallons per minute to thousands of gallons per minute. The final product also remains flexible making it suitable to pump into construction joints or any other dynamic crack situation. The manipulation of the US Grout formulations has led JENNCHEM to a new product named TDS 240. TDS 240 is a thixotropic (under shear it moves) US Grout used for grouting bolts, stopping water, and void filling annulus spaces. The product is a two-component resin that when mixed initially forms a highly viscous gel-foam. After the gel-foam has set for approximately 24 hours, it will have a compressive strength of over 4000 PSI. Underground the TDS 240 is commonly used to seal shaft casings and other areas where there are voids.

Unlike the US Grouts, JENNCHEM's sodium silicate resin, J-FIRM is to be used as a very temporary form of shoring and pre-excavation grouting. It's ultra-low viscosity (4-8 cps) enables the product to flow as water does through soils. Pumped under pressure, it will permeate and encapsulate all media organic or otherwise and harden to 200 PSI in 24 hours. The final product is rigid and is easily excavated making it ideal for tunneling applications at the face or canopy. This resin is on the lower end of the price spectrum and can be pumped out of tankers or totes making it feasible to pump many cubic feet of void space.

Acrylics

This category falls into two types, Acrylates and Acrylamides. Both variations are extremely low in viscosity (4-8 cps) and penetrate soils well, but acrylates get the nod for safety and jobsite manipulation and workability. JENNCHEM's J-PLUG is a 2 part acrylate system that involves a resin and hardener. The hardener is simply water mixed with a metal salt (SP) and the resin is mixed with a promoter, TEA. When mixed, it forms a hard rubber compound or a very flexible non expansive gel dependent upon the percentage of admixture (up to 3% by volume). The applications for this product are soil consolidation, waterproofing (curtainwall grouting), pre-excavation grouting, soil containment walls, below grade infrastructure, crack sealing. The installer of this product has options. The resin can be diluted up to 2-parts water to 1-part resin, which will make a gel. This enables the installer to cut costs while maintaining impenetrable membrane wherever installed. There are very few injectable grouts that can be modified or manipulated as easily or quickly as the J-PLUG. When pumped as straight resin to straight hardener, it can provide immediate temporary support from the crown to invert. If flooding soils to contain spills, the dilution ratio of 2:1 makes a cheap and effective environmental barrier. Clean up with this product is simple as well. Dish detergent and water will clean the pump at the end of shift.

Notes



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