The Anvil Experience
Volume 2 Issue 3

Safety & Education in Hard Rock Mining

Install the Right Products and Protect Your Mining Operations

Mining safety precautions have advanced far beyond the well-known caged canary, but the dangers that miners face underground remain the same. Cave-ins, explosions, flooding, leakage of caustic fluids, and poisonous gases; no mine is exempt from these threats.

Each year, 15,000 miners worldwide[1] lose their lives to these accidents. Even in the United States, one of the safest mining industries in the world, an average of 69 people are killed and over 20,000 are injured each year[2].

For each of these dangers, miners go to great lengths to prevent them. Pumping compressed air into all sections of the mine prevents explosions by diffusing any released methane gas to a safe level. Since flooding is typically caused by a burst water main, meticulous planning, installation, and maintenance of the mine's entry/exit water pipelines are critical to ensuring a safe environment for everyone. Likewise, simple structural foresight averts cave-ins first by carving stopes thick enough to support the main drive, then by not exceeding their weight capacity through the mining of too many side chambers.

ANVIL INTERNATIONAL
Building Connections That Last

Western Nevada Supply furnishes 90% of Nevada's hard rock mining operations with a full range of vital products via a progressive customer service campaign that continuously evolves according to the needs of the mining industry.

Pictured left to right at top are Western Nevada Supply owners Rick, Jack, and Ted Reviglio. Pictured to the lower left is Gruvlok couplings and valves installed along the upper wall of a hard rock mine shaft. Pictured to the lower right is a miner actually installing a Gruvlok 7001 coupling with one bolt to complete the assembly – fast and easy.

Even if such mishaps do not prove life-threatening, they can still cost the mine thousands in downtime and worker injuries. Ultimately, the cornerstone of safety in such an environment is selecting the best product for your mining operation. In the case of hard rock mining, grooved-end piping products are essential to adapt to the corrosive atmosphere and facilitate easy installation, preventing costly mining accidents.

It's a Hard Rock Life

Hard rock mining is one of the most dangerous mining operations, as it involves tunnels that extend 15 to 20 miles underground in order to extract the entire ore deposit. Mill processing alleviates little of the danger, as mill workers also have to contend with extremely high temperatures and caustic chemicals as they extract gold, silver, and molybdenum from the ore.

Three parallel networks of compressed air, entry water, and exit water piping must accompany every mile of the drive and branch off into each room. Upkeep for these networks requires a number of s
upport components. Such products include couplings, gaskets, valves, and lubricants, each with its own specific function and rules of placement. Likewise, mill mining utilizes the same components within its flat water, process water, and fresh water systems.

If there is a breakdown along the pipelines in either environment, prompt re-installation is critical. Knowing the best products to install in the first place is crucial to a safe work environment. That is why grooved-end products are ideal to the situation. Grooved-end piping products can be easily installed, then replaced if leakage occurs, without the need of specialized tools or equipment.

Although grooved-end mining products are designed for quick and simple installation, miners may not be aware of all the different product brands and types available to them. Educating all miners on the qualities, functions, and their options is the first – and most important – step
of any successful mining safety program, one that leads naturally into education on the correct installation procedures for each product.

Educating for Safety

Safety education is a chief concern to Western Nevada Supply (Western). In a state that is home to the majority of the nation's hard rock mining activity, Western supplies 90% of Nevada's operations with grooved-end couplings, branch outlets, fittings, and flow control components, as well as high-pressure, HDPE, and stainless steel products. They've achieved this near-total consumer base through 40 years of high-level customer service programs that provide maximum assistance to miners, particularly in the event of an emergency. These programs include 24-hour service, Saturday service, and an express will-call department that guarantees orders within 45 minutes. It is a progressive campaign that continues to evolve according to the needs of hard rock mining operations.

Since opening the Sparks, NV location in 1964, Western has expanded this into a 40,000 square foot facility with a 5,000 square foot showroom. Western has also made itself easily accessible throughout the state by opening satellite facilities in Elko, South Lake Tahoe, Carson City, Bishop, Winnemucca, Susanville, and Truckee, as well as throughout Idaho and Wyoming. In the 1970s, Western was the first company to carry radios in its signature "Blue Team" truck fleet, keeping them in contact with headquarters at all times. The company also pioneered the use of "job vans," large on-site trailers stocked with building materials. In addition to mining, Western also supplies piping for a diverse clientele, ranging from small individual plumbers to large water treatment plants.

Western supplements their extensive product inventory by maintaining a constant presence at the mines they service. Either a Western sales person or driver is on-site daily to make deliveries, offer technical expertise, maintain the inventory's proper minimums and maximums, even bin stock underground at any mines that need it. Rather than merely provide service, Western views their representatives as a service in and of itself.

Mining Application Products

Western determines their product recommendations based on two factors, the right material and the right application. The right material is clear-cut. Components made from either ductile or malleable iron and coated with a rust inhibiting lead-free paint have proven most durable in a corrosive underground environment. Anvil's Gruvlok® product line is made entirely of this material — a major factor in why Western carries Gruvlok exclusively. In terms of the right application, the following products are most frequently recommended, for a variety of reasons.

Couplings are installed at regular intervals of 21 feet to prevent leaks, while numerous valves regulate flow. Typically, they are used on 6 inch pipes, but can be used on pipe sizes that range from 2 inches to 8 inches. Lubrication of the pipe end and gasket will help the gasket to adjust into the proper sealing position during temperature cycles. Miners most commonly use E or T gaskets. E gaskets (more standard for mining) are used wherever there are temperature changes in the piping system ranging from -40° to +230°F (-40°C to 110°C). T gaskets, containing Nitrile (Buna-N), are commonly used when compressed air is treated with petroleum oils or other oils flows through the system. Temperature range is -20° to +180°F (-29°C to 82°C).

Miners visited by Rob Emrich, Industrial Division Manager of Western, cite convenience as a key factor in their choice of couplings. "Couplings are so easy to install, because they only have one bolt to assemble the coupling. You just swing the housing over the gasket and into the groove," says Emrich. "Using Anvil's Gruvlok 7001 coupling saves tons of labor and cost during installation."

The **Gruvlok 7001 Coupling** is a standard product used throughout the mining industry. Due to its extreme flexibility and versatility, it is well-suited to a variety of applications. The 7001 works just as well within an underground mine's three air/water networks as it does within a mill mine's five separate water grade pipelines. Its design supplies optimum strength for working pressures up to 1000 psi without casting excessive weight, and reduces pipeline noise and vibration transmission without the need of specialized components.

The **Gruvlok 7305 Coupling** is designed specifically for high-density polyethylene pipes (HDPE). The 7305's pressure capability exceeds that of the pipe itself, making it ideal for high-pressure areas. Each coupling uses four bolts to drive the sharply machined housing teeth into the outside of the pipe. The teeth themselves are arranged in two banks of three rows, each positioned away from the gasket to enhance its seal.

Pictured above are some of the Western Blue Team fleet of trucks that keep the mines stocked with a variety of Gruvlok® mining products for easy access to the miners when product is needed on demand.

This eliminates the need for fusion equipment. The 7305's low profile contoured housing also has a ramp along the outside diameter so that the coupling can glide over obstacles while long lengths of pipeline are being relocated.

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>
> *—Rob Emrich*
> *Industrial Manager, Western*

Anvil recommends these **Gruvlok®** products for mining applications.

7001 Coupling
Standard used throughout the industry. Flexible, versatile, optimum strength.

7700 Butterfly Valve
10 position lever lock, one gear operator

7305 Coupling
Designed specifically for high-density polyethylene pipes. Low-profile contoured housing

7042 Outlet Coupling
Pressure responsive, reinforced with steel ring, leaktight seal.

Xtreme Lubricant
Silicone-based, fills any voids and keeps gaskets in proper seat.

Pictured above is a Western large "on-site" trailer stocked with the mining products needed for a hard rock mining project.

The **Gruvlok 7700 Butterfly Valve** is made with a 10 position lever lock and one with a gear operator. The 10 position's spherical bore facilitates a constant disc-to-seat loading that maintains a leaktight stem seal regardless of disc position. This stem sealing force is constant through the full disc cycle and operating torques are kept low, which increases valve life. The design provides a bubble-tight seal from full vacuum to 300 psi when the valve is closed, and the valve is rated for dead-end service to a full pressure rating of 300 psi. Mines tend to use this valve for low-pressure areas of the piping systems with a maximum psi of 100. For anything greater than 100 psi, mines opt for the gear operator. The gear operator's stem-to-disc connection provides zero backlash. The 416 stainless steel stems are high-strength, corrosion-resistant, and blowout-proof, making them ideal for high-pressure areas of a mine. As a result, they are frequently used in the lowest drives and chambers, where the pressure is greatest. On average, three or four valves can be found along every 2000 feet of piping in a mine. However, their placement depends entirely on the unique design and needs of the mine.

The **Gruvlok 7042 Outlet Coupling** is used to form reducing outlet connections where two sections of grooved-end pipe connect. The 7042 creates a gap between the pipe ends that allows space for the introduction of an outlet connection. The 7042's gasket design is pressure-responsive, providing a higher sealing force as pressure is increased. The gasket seal is reinforced by a steel ring and mated to a machined housing surface to assure a leaktight overall seal. Center ribs inside the gasket ease pipe positioning during installation.

Gruvlok Xtreme Silicone-Based Lubricant and similar lubricants are sometimes necessary to further aid in providing a tight seal. Gaskets can harden with decreasing temperatures, and a lubricant will fill any resulting voids and keep the gasket in a proper seat. Silicone-based lubricants tend to work best in mining climates because water doesn't wash the lubricant away, nor allow the gasket to dry up or erode. Although a Nevada mine's temperature can range from 70 to 130 degrees Fahrenheit, a pipe with silicone lubricant stays lubed virtually forever and will maintain its seal despite any change in gasket size.

All of these specialized components come together to create a system greater than the sum of its parts. The miners within this system must be equally comprehensive in their installation and future maintenance of it. There can be no specialized roles in this regard. All miners in every part of the mine must know how to install all components in order to ensure overall safety — at all times.

Knowledge is the Key to Safety

Complete on-site safety requires the right material and the right application, delivered and serviced by the right people. When these three aspects come together, the results have an overwhelmingly positive effect on the entire project. However, these products and procedures are futile if miners don't understand how to implement them effectively.

Ultimately, the best safeguard against disaster is education, keeping the miners themselves informed of their product options and of proper installation and maintenance techniques. This includes an understanding of the mine at both a micro level (the role of each individual part within the piping networks) and macro level (the role of the networks as a whole), as well as how this structure contributes to overall mine safety. Instituting this comprehensive understanding could have a massive effect on the industry, resulting in a lower annual mortality rate, and an increase in both the efficiency in the mines and the overall well-being of miners.

Visit *www.goblueteam.com* for more information. If you'd like to speak to a Western Nevada Supply representative about Anvil's Gruvlok product lines, please call the Western office at (800) 648-1230.

The Anvil Experience is about partnerships between the distributor, contractor & Anvil manufacturing and service. Anvil believes in service after the sale and strives to build lasting relationships that connect pipe to pipe and people to people.

1. International Labour Organization, *Safety in Numbers*, 2003
2. U.S. Department of Labor, MSHA

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