

## **Gasketed Mechanical Joints in the Mining Industry**

Al Heintzelman, Marcel de Vries, Mark Beach

### **Introduction**

Gasketed Mechanical Couplings have been used within the mining industry almost since its inception early in the 20<sup>th</sup> century.

Shurjoint gasketed mechanical couplings are designed to standards of performance by ASTM F1476 for mechanical use applications, UL-213, and FM-1920 for applications in fire protection systems. These standards provide a baseline of requirements in the form of tables, testing, and specified calculations for determining stress forces that can impact a piping system and to ensure the gasketed mechanical coupling can meet and or exceed those requirements.

Piping systems within the mining industry can be vast in length, size diameter, and range of pressure. The media that these piping systems are required to carry can also vary in weight, density, and abrasive characteristic. For this reason, the mining industry has turned to the gasketed mechanical coupling to provide a pipe joint that is dependable, easy to maintain, and quick to assemble, or remove.

### **The Gasketed Couplings**

Shurjoint couplings have been designed to support the mining industry. Whether moving water through grooved end pipe, or slurry through lined steel piping, we have the coupling that can support your pressures, media and provide a secure joint for those pipes.

When considering the choice of what type of mechanical coupling needed, it is first important to consider the media. Air and water are commonly used in mining, as well as slurry which is a mixture of water and aggregate at varying levels of density. Knowing the media will determine the gasket material, as well as which pipe material that would be best for that media.

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Shurjoint couplings can connect pipe with grooved ends, plain ends, or ring-joint styles of end connection. There are grooved couplings, in both rigid or flexible, that are designed primarily for use on carbon steel pipe in either roll-grooved or cut-grooved. Plain end couplings that are designed for use on non-grooved plain end carbon steel. HDPE couplings which are designed to connect plain end HDPE pipe. And there are couplings that can provide a transition between pipes of different materials, or different connection styles. Our Ring-Joint couplings and fittings, which are used on carbon steel, or stainless-steel pipe, connect using an outer ring welded on the pipe ends.

The use of the ANSI class specifications is commonly used when referring to the needed pressures of the piping systems. All of Shurjoint's products are designed to be capable of pressures equal to that of ANSI Class 150 in all sizes up to and including 36" size. Shurjoint also has many models which would fall under the ANSI 300 Class rating up to 12" size, and still others that would fall under ANSI classes continuing up to and including ANSI Class 1500, or pressures ranging from 20bar (300 psi) up to 260bar (3770 psi) working pressures. See table 1.

However, gasketed mechanical couplings, do not technically fall under the design and pressure class standards requirements of ASME B16, which is primarily for steel flanges, or the ASME Boiler and Pressure Vessel Code. The ANSI pressure classification is only a reference alignment to their actual working pressures. The pressure requirement of the system will also influence the pipe material, and in turn the type of mechanical joint used.

The mining industry has wisely adopted the use of mechanical couplings as a quick and dependable means of connecting pipe without the multiple bolt and flange welding that is associated with flange connections, and many mechanical coupling manufacturers have adapters that can convert a flange connection over to grooved, or other mechanical type joints.

Shurjoint also carries a full line of grooved fittings, and elbows in standard radius as well as long radius 3D, 5D, and 6D bends, which are used in many mining applications. We also can provide extra heavy wall fittings for use with higher pressure couplings, and Ring-Joint fittings for use with the Ring-Joint couplings.

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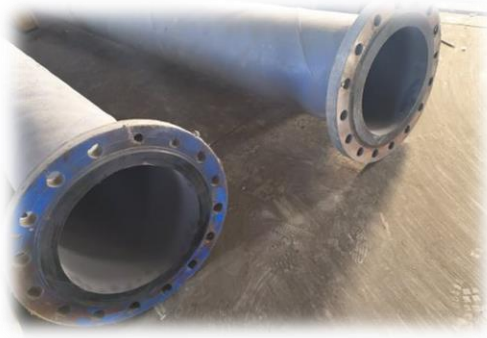
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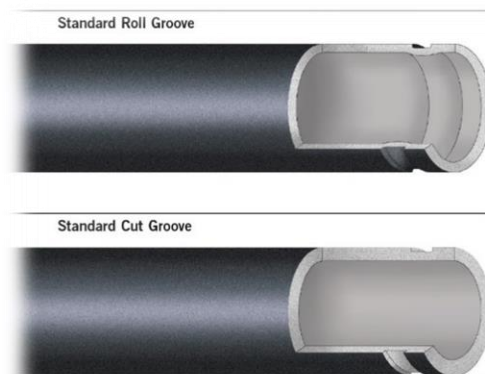
## Flanged connections



A typical connection that can still be found in the mining industry is the flange connections. These are still commonly used to connect pumps and flanged pipe, but they do have some disadvantages such as:

- » Allows no angular deflection and therefore the supports structure needs to be aligned and levelled for a uniform connection
- » Ground movement settling can cause plinths to move / sag and create pipe stresses at the flange connection.
- » Re-tightening of the bolts is required regularly due to compression set of the gasket sealing surface.
- » Time consuming installation due to the number of bolts in the flanges (increase downtime)

Grooved coupling can overcome some of the disadvantages associated with flanged connections. Due to the ability to absorb angular deflection it will reduce pipe stress at the joints. Also, the installation of a grooved connection is up to 70% faster than flanged joint which will reduce downtime on scheduled and unscheduled maintenance. The sealing of a grooved coupling is accomplished by use of a C-shape gasket which is pressure responsive and does not require re-tightening as is the case with flanged connections. Roll grooving of pipe can also be done quickly on the jobsite, or in a fab shop allowing for quick repairs of water lines or other non-abrasive media.

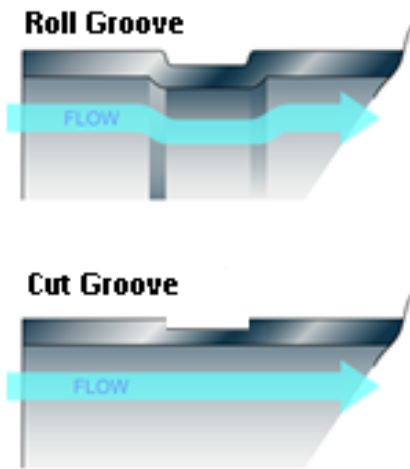


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## Pipe Jointing Systems for Tailing / Slurry lines

Tailing pipelines run overland to tailing ponds which are located remotely and can span distances of many miles. These often run over rough terrain and are supported on concrete plinths.



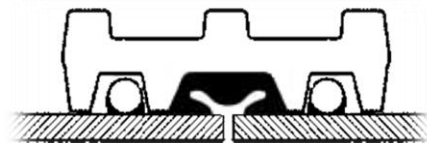
Roll grooved connections are less suitable for abrasive media as the protrusion in the pipe is subject to excessive wear. For these applications a cut groove would provide a smooth inner flow path that would improve pipe life. This smooth pipe interior would also be suitable for linings which could provide even longer pipe life, and easier lining replacement with aggressive slurries.

Cut grooved pipe could be the solution for many diameter sizes in both lined and unlined, however, there are things to consider. One of these is that cut grooving requires specialized tooling which can be expensive and difficult to operate on site. Another characteristic of cut grooving is that it affects the pipe integrity in that the pipe wall is reduced at the cut-groove, leaving less material for wear allowance, which would need to be considered with very aggressive slurries in an unlined state.

## Shurjoint Ring-Joint Couplings

To overcome the issues associated with cut-grooving, but still benefitting from the advantages of mechanical couplings, Shurjoint has developed The Ring Joint System.

The Ring-Joint is a mechanical gasketed coupling which is similar to a shouldered connection. This coupling



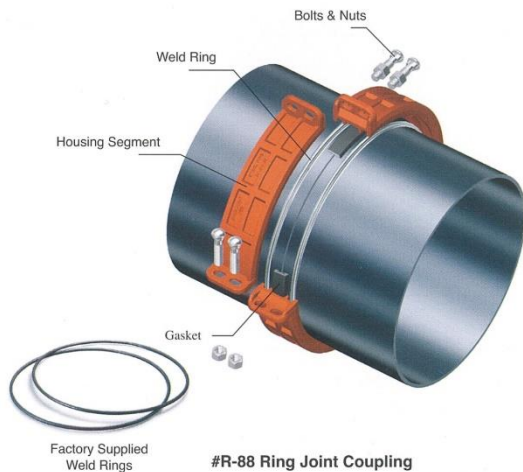
utilizes a ring which builds on top of the pipe surface as opposed to the cut-groove that reduces

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the wall thickness at the groove. The media is not in contact with the rings and therefore do not require a pipe weld. The pipe interior has a smooth inner flow path suitable for lining and the pipe wall remains fully intact.

The Shurjoint R, RH, and RX series of Ring-Joint couplings provide a unique and reliable means of connecting pipe in sizes 6” through 104” in diameter. Unlike other ring type systems



that may require a ring with a grooved style design, and requires a watertight pipe weld, the Shurjoint Ring-Joint has a smaller ring which means less weight and lower cost.

This makes it an excellent choice for tailing lines in which joints typically require removal for pipe cleaning, rotation, and sometimes lining replacement. Pressures in tailing lines can sometimes exceed 40 bar (580 psi) so the RH and

RX styles can be used for these high pressure needs.

Other manufacturers groove style ring requires that the next larger size of groove style coupling be used. For example, an 18” grooved ring welded onto the 18” pipe would require a 20” grooved style coupling be used. This is not necessary with the Shurjoint Ring-Joint models. The rings are also more economical, less weight, and the couplings adapt to the ring in the same pipe size. This makes the Ring-Joint a more cost-effective alternative.

Shurjoint Ring-joint couplings can also be used with lined pipe and make a quick and easy joint to remove and re-install when liners wear and need replacement, or if you just need to rotate the pipe for more even wear.

## Summary

Shurjoint Piping Products have been used in the mining industry for decades and have a reputation of providing a safe and reliable joint for whatever your system requirements may be.

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Shurjoint is a part of Aalberts Integrated Piping Systems. Our foundry and engineering team are available to help with any unique piping and pipe joining need you may have.



If you have questions or require further detailed information regarding Shurjoint products, please reach out to us. Our contact information can be found on our website at:

<http://www.shurjoint.com/eng/contact.aspx>

**Table 1**

Shurjoint Models listed by ANSI Class						
Working pressure by class, psig						
ANSI Class	150	300	400	600	900	1500
Pressure / psig	285	740	985	1,480	2,220	3,750
Shurjoint models	All to 36"	Z07 - 1¼" to 5" XH-1000 - 2" to 12" 7707 - ¾" to 12" 7043 - 2" to 12" SS-8X - 2" to 5" RH-1000 - 8" to 12" 79 - 1" to 2"	XH-1000 - 2" to 12" XH-70EP - 2" to 12" SS-1200 - ¾" to 4" RX-3000 - 8" to 12"	XH-70EP - 2" to 8" RX-3000 - 8" to 12"	XH-70EP - 2" to 4" RX-3000 - 8" to 12"	RX-3770 - 6" to 12"
*All HDPE couplings are rated to the pressures of the HDPE connected pipe.						

**About the Authors**

<b>Mark Beach</b>	
	A 45-year veteran of the PVF industry and expert in grooved piping products and applications. Mark has worked with owners, engineers, distributors, fabricators, and contractors around the globe.
<b>Marcel de Vries</b>	
	Over 20 years of experience with Grooved piping systems. Working with EPCs, Consultants and Mining Companies to add value to their projects.

### Al Heintzelman



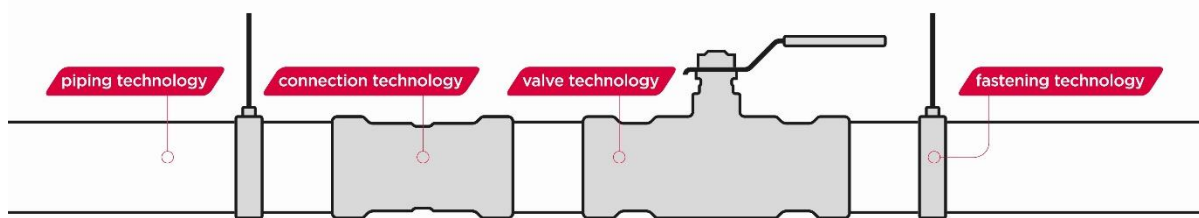
Bachelor of Science Degree in Mechanical Engineering Technology and 25 years in testing, design, and development of grooved products, as well as directly working with customers to trouble-shoot systems and create solutions.

### We are Aalberts integrated piping systems

Aalberts integrated piping systems engineers the most advanced integrated piping systems for the distribution and control of liquids and gases for key verticals, like industrial, utilities, commercial and residential. We offer fully integrated piping systems in valve, connection, fastening and piping technology.

We work hand-in-hand with our customers to create the perfect integrated piping system, that meets their requirements. Our piping systems are easy to specify, install, control and maintain, saving important preparation and installation time. We meet the highest quality and industry standards needed in the selected verticals.

We are the only business that truly offers its customers a single sourced and complete integrated piping solution, each and every time. **Don't just buy products, buy solutions.**



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