VICTAULIC® MECHANICAL PIPING SOLUTIONS

FOR MISSION CRITICAL FACILITIES

Victaulic®

MECHANICAL PIPING SOLUTIONS FOR MISSION CRITICAL FACILITIES

Victaulic provides the highest quality piping products that are fast and easy to install but, above all else, durable. The confidence Victaulic provides comes from the ability to design, specify and install piping systems with products that are proven to perform. From HVAC to Fire Protection and Plumbing, Victaulic is committed to continuously innovating and producing products that you can trust.

THAT'S HOW WE ARE ENGINEERING CONFIDENCE INTO EVERY BUILD.

VICTAULIC IS MORE THAN A MANUFACTURER. WE ARE YOUR:

- total partner throughout your next project's lifecycle
- design, estimating and delivery solutions provider
- BIM partner for coordinated drawings, and fabrication
- onsite training, inspection and Quality Assurance (QA) professional

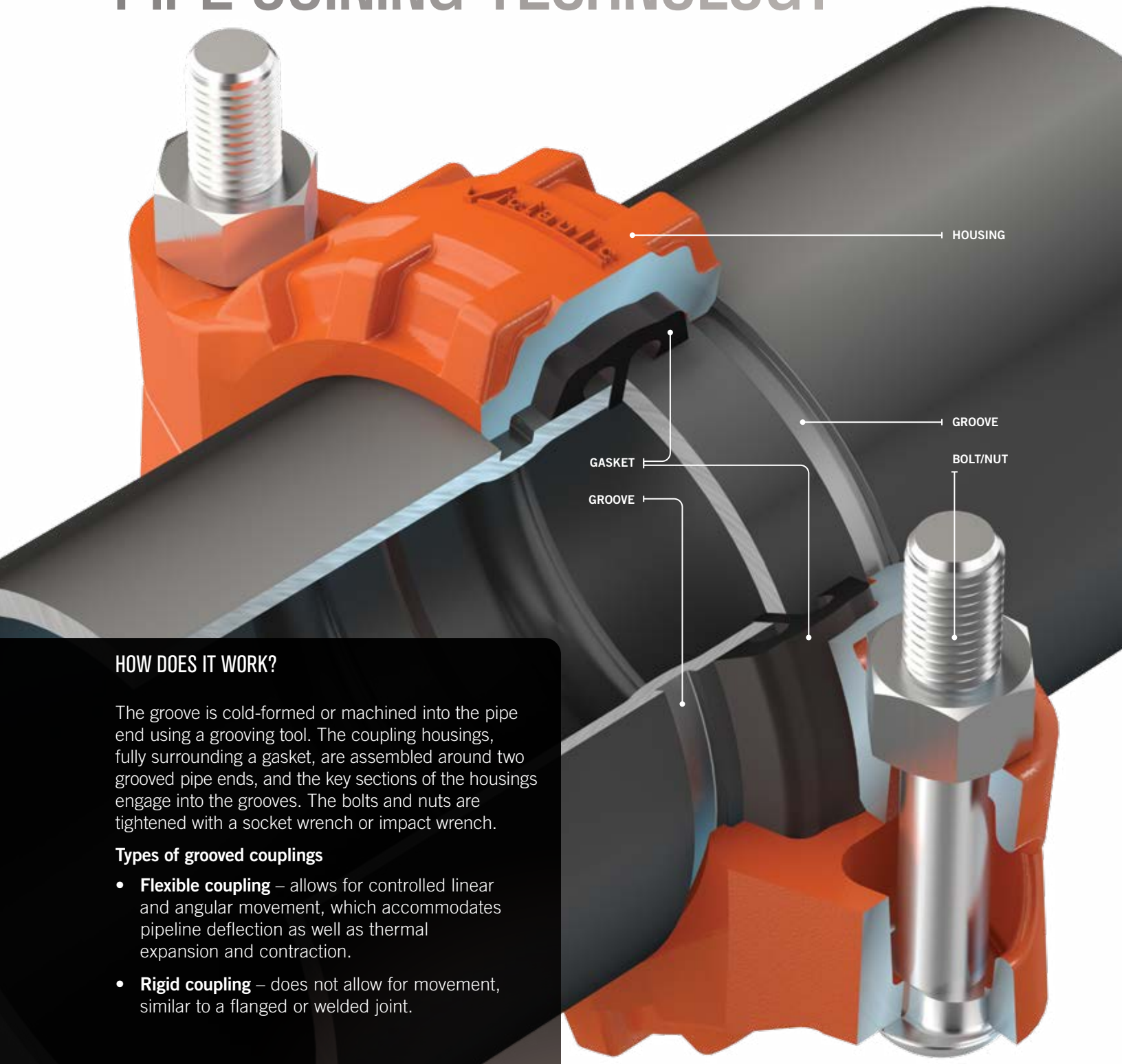
VICTAULIC HISTORY

Grooved End Pipe Joining, or the "grooved" concept, as it is known today, was born in 1919 when Victaulic introduced the first mechanical pipe joint to support the rapid deployment of mission critical piping. They called it the "Victory Joint".

Today, you will find Victaulic's grooved mechanical systems used all over the world on HVAC systems and as the industry's accepted standard for joining pipe in Fire Protection. Nearly a century later, Victaulic continues to change the landscape of pipeline construction with the introduction of Installation-Ready™ Pipe Joining Technology for couplings and fittings. And in recent years, the introduction of products like the Victaulic Vortex™ Fire Suppression System has allowed Victaulic to expand its product portfolio beyond joining technologies and into specialty areas like special hazards. At Victaulic, we are proud of our heritage and committed to building on it through innovation and partnerships to provide our customers with solutions they can trust.

since 1919

GROOVED
PIPE JOINING TECHNOLOGY



HOW DOES IT WORK?

The groove is cold-formed or machined into the pipe end using a grooving tool. The coupling housings, fully surrounding a gasket, are assembled around two grooved pipe ends, and the key sections of the housings engage into the grooves. The bolts and nuts are tightened with a socket wrench or impact wrench.

Types of grooved couplings

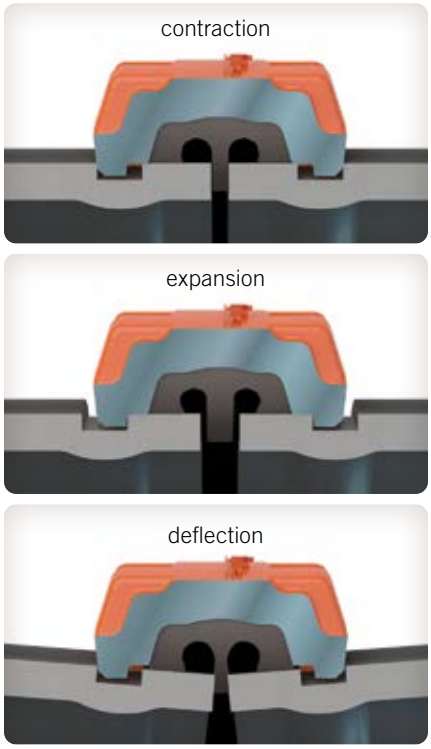
- **Flexible coupling** – allows for controlled linear and angular movement, which accommodates pipeline deflection as well as thermal expansion and contraction.
- **Rigid coupling** – does not allow for movement, similar to a flanged or welded joint.

At the core of all of the benefits that Victaulic® solutions bring to a project – such as productivity, safety, design flexibility and quality – are the unique features of our products.

VICTAULIC GROOVED END PIPING SYSTEMS PROVIDE:

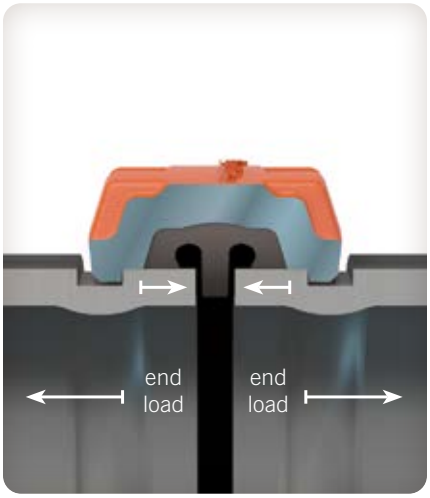
Easy system maintenance and expansion – through simple coupling disassembly that allows for easy access.

Alignment ease – through a design that allows for full rotation of the pipe and system components before tightening.



Flexibility – with the inherent axial movement and deflection properties of flexible couplings in a groove system. May be used to accommodate pipeline thermal expansion and contraction, misalignment and settlement, and seismic stresses.

Noise and vibration attenuation – by isolating the transference of vibration at each joint.



Self restrained pipe joints – couplings engage the pipe grooves to hold the pipes against full pressure thrust loads without the need for supplemental restraints.

Rigidity – with an angled bolt pad design that provides positive clamping of the pipe to resist torsional and flexural loads.

THE BENEFITS OF USING VICTAULIC

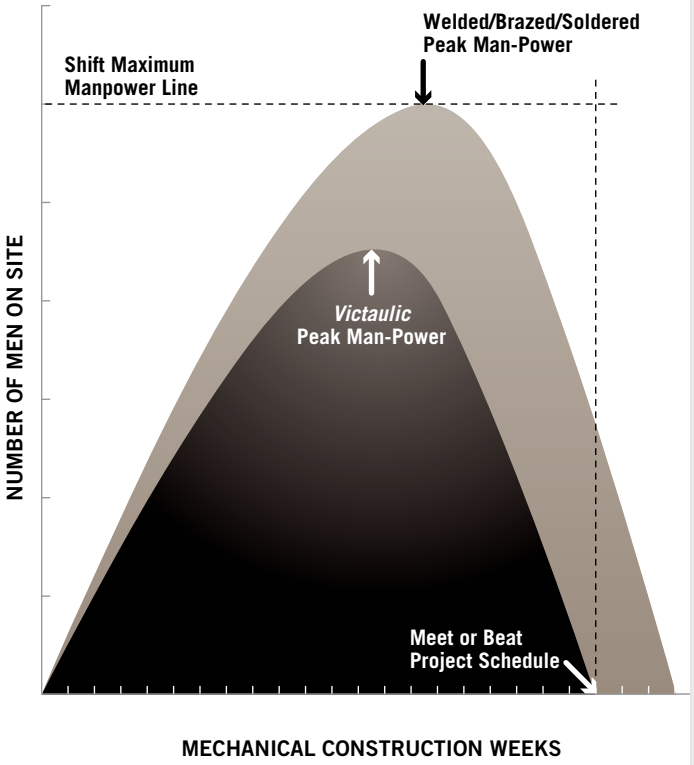
Victaulic® grooved mechanical systems align well with the essential business needs of data centers – fast, easy to deploy, adaptable, scalable, maintainable and safe. At Victaulic, we have gone beyond basic industry testing of our products to verify performance validation. Our products are designed, tested and proven to perform with solution vision and performance in mind.

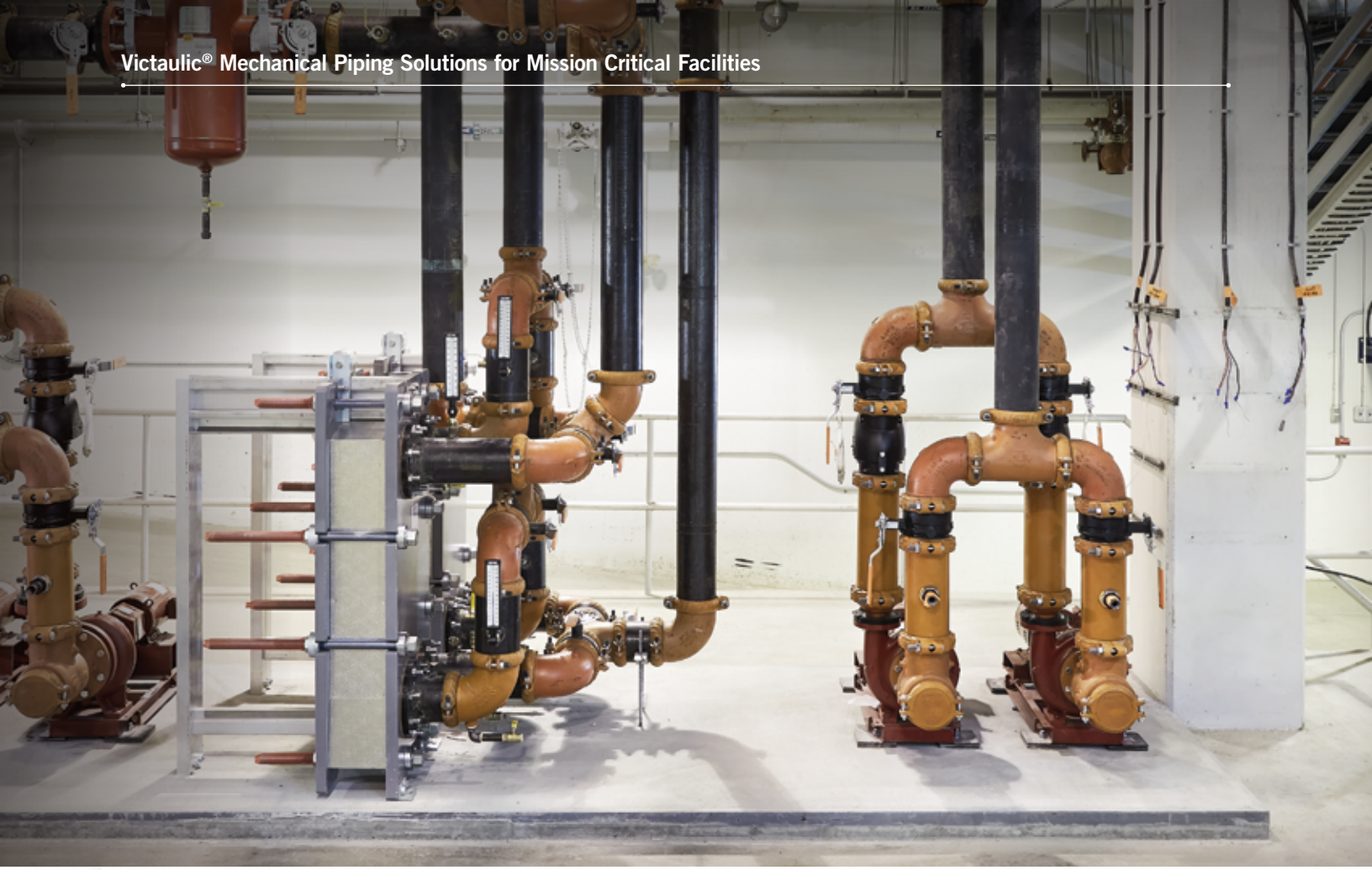
SPEED OF DEPLOYMENT

Piping systems with *Victaulic* grooved products feature a **40–60 percent reduction in installation man-hours** over alternative joining methods, and leverage a worker skill base that can be quickly trained and globally available, greatly reducing the potential for schedule delays.

Innovations, like our patented Installation-Ready™ Technology, make joining twice as fast as standard grooved joints, and our vibration isolation pump drops and outlet fittings take speed of deployment to the next level.

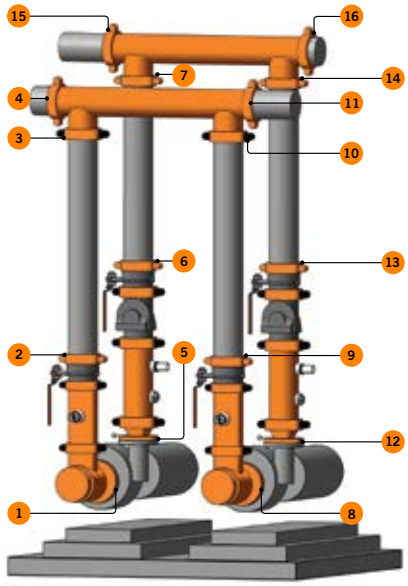
Vibration Isolation Pump Drops





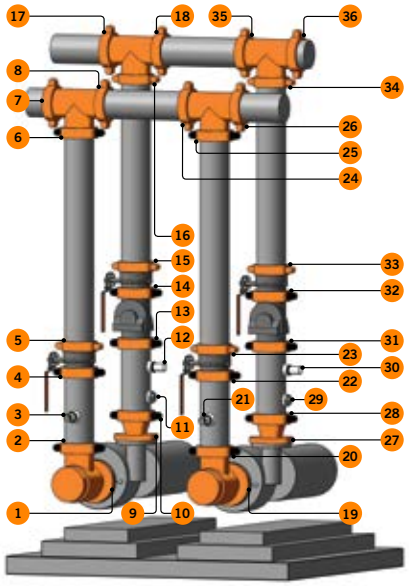
REDUCE THE AMOUNT OF FIELD JOINTS

Victaulic® Equipment Modules



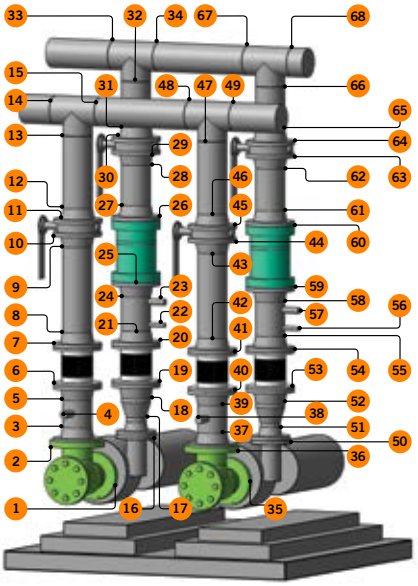
16 JOINTS

Traditional Victaulic® Installation



36 JOINTS

Traditional Installation



68 JOINTS

SIMPLE INSTALLATIONS AND INSPECTIONS

Grooved mechanical couplings are quick and easy to install, but if they aren't installed correctly, the challenges are the same as with a bad weld. That is why Victaulic is committed to technology advancements that further simplify the installation and inspection processes.

Most Victaulic® couplings feature visual verification of proper joint assembly making it significantly easier and less costly than x-raying every joint as with welding. When it comes to the challenges and cost at which 10–20 percent of welded joints can be verified versus the ease at which **100 percent of *Victaulic* pipe joints can be inspected**, the reduction of risk and increased confidence makes grooved mechanical piping systems an ideal solution.

Most recently Victaulic's development of intelligent grooving machines (RG5200i) provides additional confidence and further reduces the already minimal chance for installation error.

SUSTAINABILITY

Victaulic products are carefully crafted to reduce waste wherever possible throughout the manufacturing process. Made of 90% recycled materials, these products can be removed and reused in a variety of ways from relocation to retrofit.

CONCURRENT MAINTAINABILITY

Data center maintenance and repairs conducted in operational environments can prove difficult. With Victaulic® grooved mechanical couplings and components, repairs can be supported in a highly efficient manner, with minimal and predictable Mean Time to Repair (MTTR). As *Victaulic* solutions are not dependent on hot work, the pressure of gaining access to highly skilled welders in an emergent situation is alleviated. Support of concurrent maintainable operations and associated service level agreements is more predictable, with significantly lower business risk.

JOB SITE SAFETY

Welding in an operational data center is high risk – smoke and fumes contribute to pollution evolution. OSHA cautions that the "welding process produces visible smoke that contains harmful metal fume and gas by-products" Piping systems installed with *Victaulic* grooved mechanical couplings not only eliminate exposure to harmful metal fumes and gas by-products produced from the welding process, they also require less workers to be present at each joint thus optimizing safety conditions on the job site.

COMMITMENT TO QUALITY

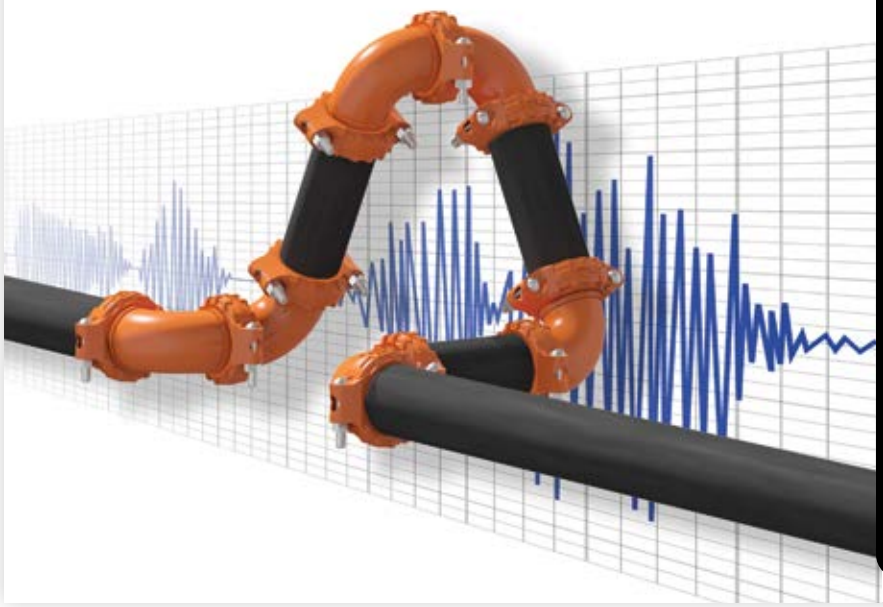
At the heart of our pipe joining products is the seal. That is why all of our gaskets/seals are subject to stringent quality control, precision engineering and exhaustive testing before they ever make it into our customers' hands. Why do we spend so much time on seal technology? Because failure is never an option.

Using advanced element analysis, our staff of world class materials engineers are able to predict the performance of materials in numerous configurations and in countless field conditions.

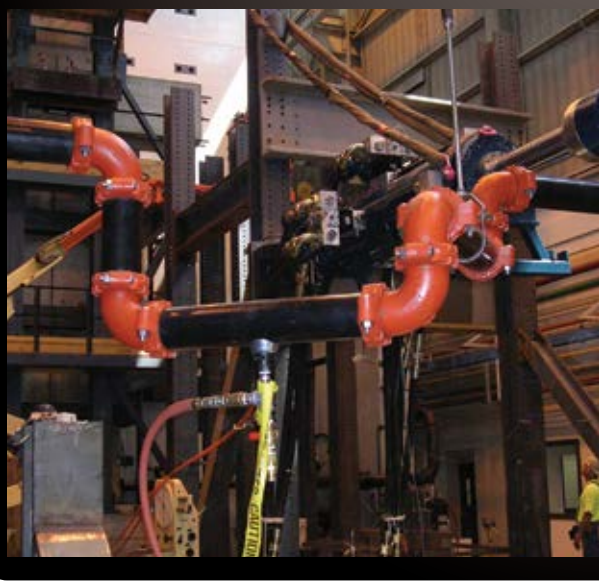
We then back up that analysis with in-field testing. In fact, years of this type of analysis and testing has led to the development of our own proprietary seal compounds such as the Victaulic® Grade "EHP" EPDM Gasket.

The *Victaulic* Grade "EHP" EPDM Gasket is the only 250°F | 121°C rated EPDM gasket on the market. That is a 20 degree increase in temperature from standard industry EPDMs (rated at 230°F | 110°C). Our engineering customers know that an increase in temperature ratings for a gasket translates into increased confidence in their piping systems.

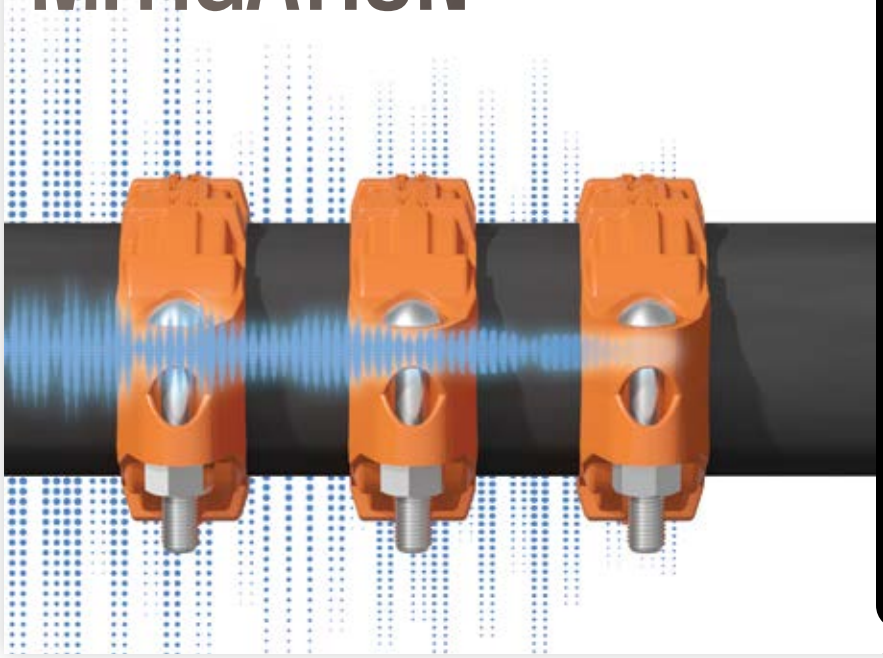
ACCOMMODATES FOR SEISMIC MOVEMENT



In 2008, ATLSS (a member of the Network for Earthquake Engineering Simulations) and Victaulic® exposed piping joined with grooved product to accelerations up to 50% greater than the Northridge, California earthquake. The testing results concluded that there was no pressure lost and no water leaks.

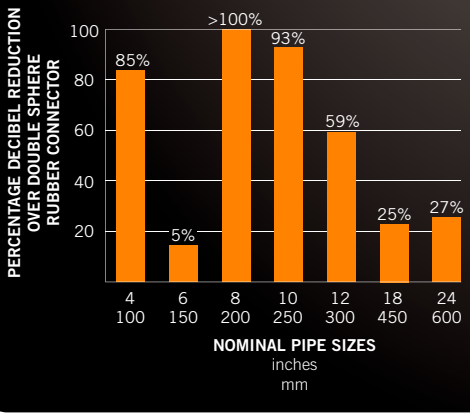


NOISE AND VIBRATION MITIGATION



In 2013, Victaulic reached out to NASA to leverage their facilities to test the ability of its grooved mechanical couplings to attenuate noise and vibration over several specialty devices. The results concluded that for every size tested, three *Victaulic* flexible couplings installed near the vibration source outperformed the flex connectors.

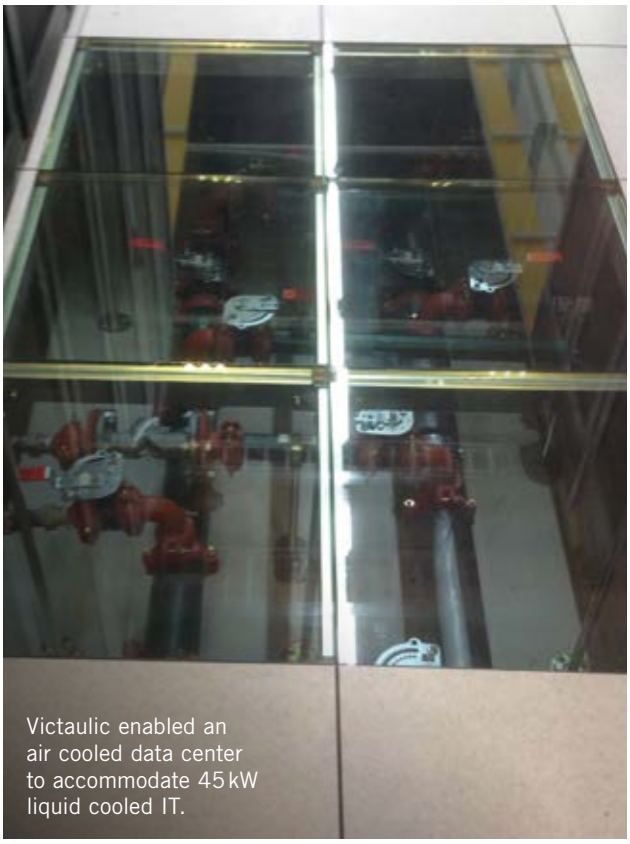
Relative Vibration Attenuation Performance Over Double Sphere Rubber Connector



SCALABILITY

The data center of today is being designed with an eye toward the future, but how can an engineer design a building to support unknown infrastructure needs? The answer is to design systems that are scalable and/or adaptable to change.

Changes to pipe systems leveraging Victaulic® products can be **engineered, delivered and safely installed in an operating environment** without the environmental, drainage and health and fire risks associated with welding. For example, adding liquid cooling or another "module" can happen quickly without hot work (as with welding) and with minimal, if any, alignment issues (as with flange bolt ups.



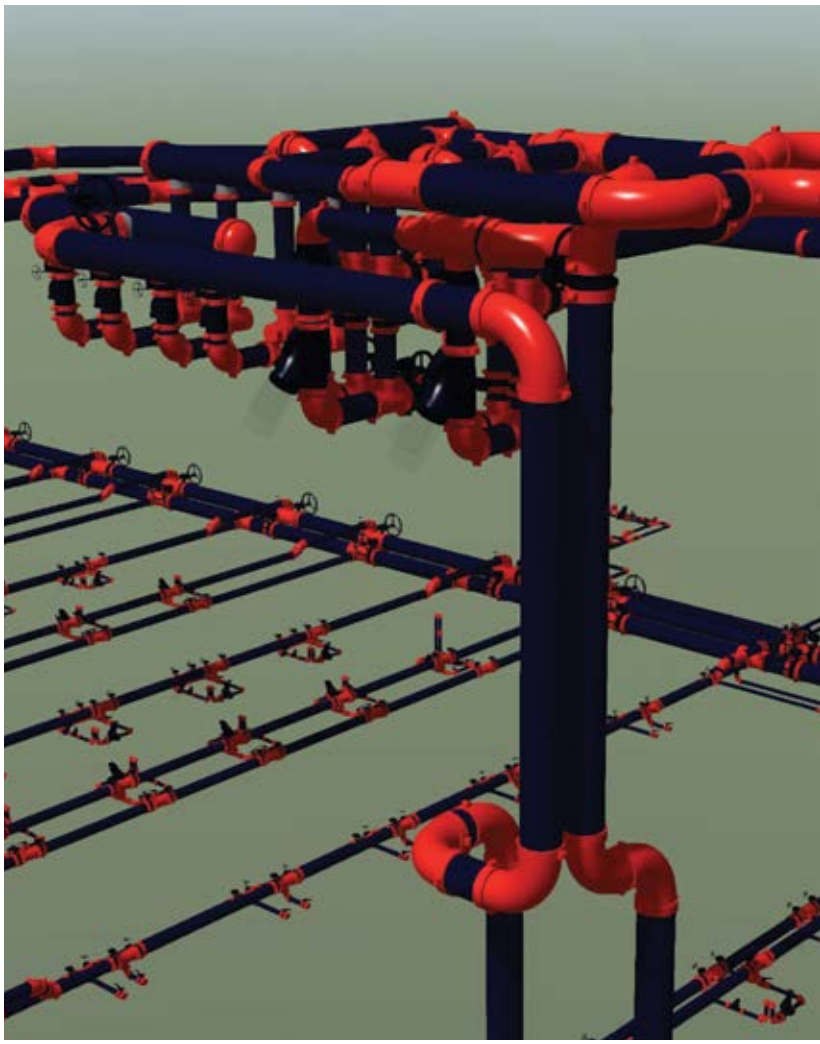
Victaulic enabled an air cooled data center to accommodate 45 kW liquid cooled IT.

ADAPTABILITY

Accounting for rapid change and technological advancements, data centers are being built by incorporating Building Information Modeling (BIM) into the design and up-front construction. Collaboration around a data-rich model provides a wealth of information, allowing the owner to simulate future adaptions to the build, such as: identifying potential clashes before work gets underway, or locating where new equipment may be placed.

Grooved mechanical solutions are the preferred joining method for adaptable and scalable data centers since installations and expansions can be made safely, quickly, and without interruption. Grooved pipe end systems allow for easy re-configuration in the field, thanks to easy disassembly and field cutting and grooving tools.

When change is inevitable, future-proof your systems by utilizing Victaulic® grooved products.

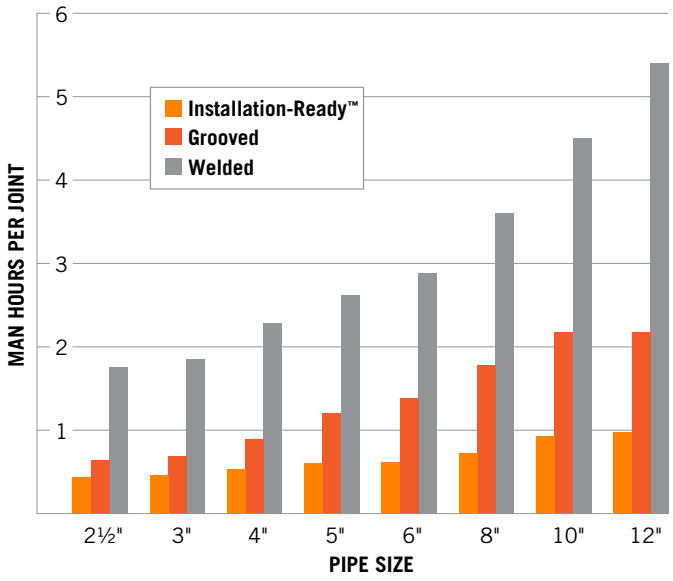


"Being able to use a system that's quite flexible was a cost saver and allowed us to build in phases, without having to make assumptions."

Tor Christian Gyland, Green Mountain CEO

VICTAULIC® SYSTEM SOLUTIONS

Victaulic offers joining and flow control solutions for any piping material used on your project. And all of our product lines offer the same advantages that Victaulic is known for – they are fast, easy to deploy, adaptable, scalable, maintainable and safe.




Installation-Ready Coupling


Advanced Grooved System (AGS)

GROOVED FOR CARBON STEEL

Victaulic offers systems for both HVAC and fire protection applications. Both systems include a full line of grooved couplings, fittings, valves and accessories, as well as a line of tools for roll grooving.

- They require 45 percent less man-hours on average over welding
- They eliminate costly fire watch and hazardous fumes and flames
- They reduce material handling by 30–70 percent
- Joins ¾–60" | DN20–DN1525 carbon steel pipe

Our grooved solutions for carbon steel pipe include Victaulic's propriety Installation-Ready™ couplings for even faster and easier installations on 2–12" | DN50–DN300 pipe and Victaulic's patented large diameter solutions, the Advanced Grooved System (AGS) for 14–60" | DN350–DN1525 pipe.

GROOVED FOR COPPER

The Victaulic® grooved copper system features a full line of couplings, fittings and valves, as well as a line of tools for roll grooving. The *Victaulic* grooved copper system is cold-formed, eliminating the need for soldering or brazing.

- Joins 2–8" | DN50–DN200 Type K, L, M or DWV copper
- Rated up to 300 psi | 2068 kPa | 21 bar

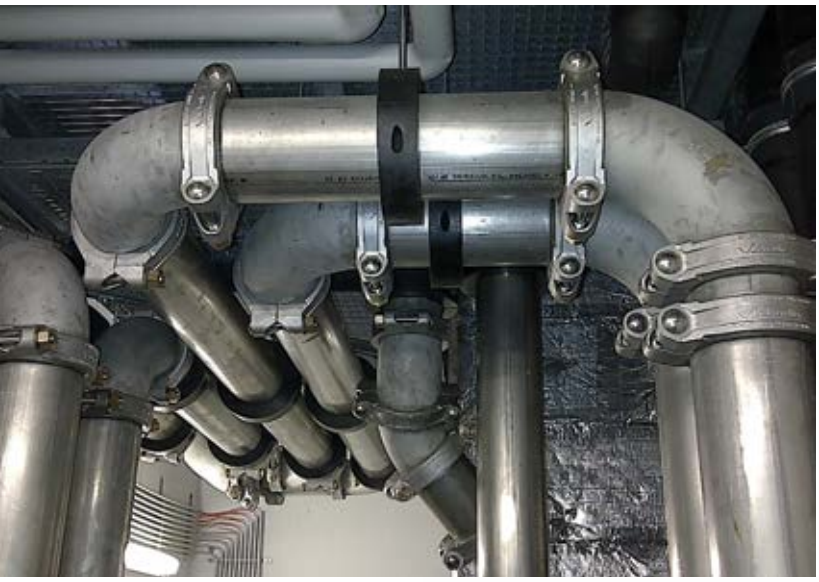
GROOVED FOR GALVANIZED CARBON STEEL

Victaulic also offers galvanized grooved joining products for joining galvanized carbon steel pipe. Victaulic's galvanized products are ideal for use in corrosive environments such as roof drain systems.

Many of Victaulic's ductile iron products can be supplied as galvanized. Contact Victaulic for details.

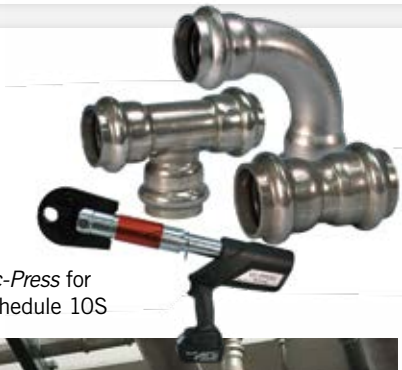
- Joins up to 24" | DN600 pipe
- Performance varies by product, see *Victaulic* product publications for more information

GROOVED FOR STAINLESS STEEL



For an alternative to copper, choose Victaulic® grooved couplings, valves and fittings made of, or designed for use on, Types 304/304L and 316/316L stainless steel pipe.

- Joins ¾–24" | DN20–DN600 Types 304/304L and 316/316L stainless steel pipe
- Performance varies by product, see *Victaulic* product publications for more information



Vic-Press for Schedule 10S

PRESS FOR STAINLESS STEEL

The revolutionary Vic-Press™ System for Schedule 10S pipe provides quick, easy and safe installation and maintenance. The *Vic-Press* System is UL Classified in accordance with ANSI/NSF 61 for cold +73°F | +23°C and hot +180°F | +82°C potable water service and ANSI/NSF 372 when utilizing a *Victaulic* Grade "E" or "H" seal. A *Victaulic* Grade "O" seal is also available.

- Joins ½–2" | DN15–DN50 off-the-shelf ASTM A312 Schedule 10S pipe
- Rated up to 500 psi | 3450 kPa | 34 bar
- FM Approved to 175 psi | 1205 kPa | 12 bar
- Accepted for use on ASME B31.1, B31.3 and B31.9 systems

GROOVED FOR CPVC

Victaulic offers the industry's first and only grooved solution for Schedules 40 and 80 CPVC/PVC pipe. It is the fastest and cleanest method to install CPVC/PVC. It eliminates cure time and the chemical and odors associated with traditional methods.

The Victaulic® PGS-300 system for CPVC/PVC features couplings, fittings and transitional products, along with a shop and field-ready grooving tool. The system also features one of Victaulic's propriety Installation-Ready™ couplings for even faster and easier installations.

- Joins 2–12" | DN50–DN300 Schedules 40 and 80 CPVC/PVC

SYSTEM SOLUTION FOR HDPE

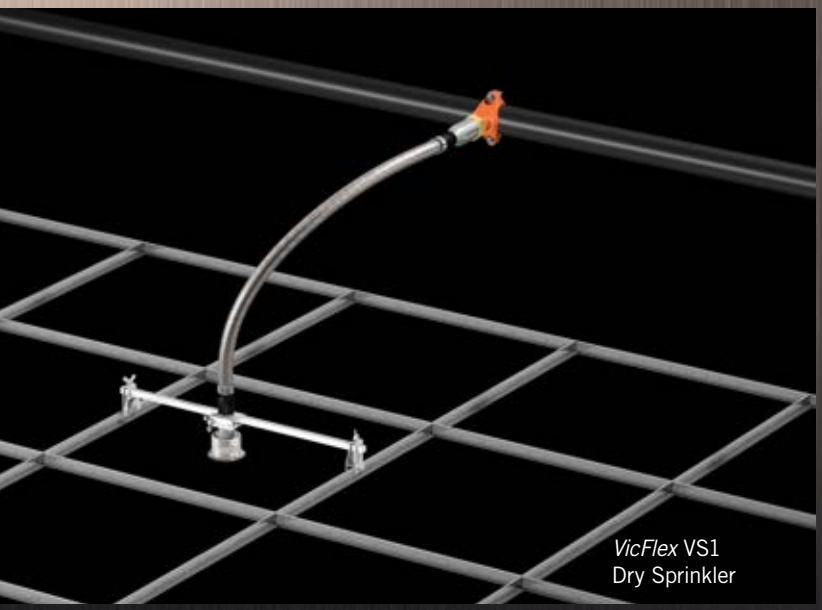
Strong, durable, and easy to install, the *Victaulic* system solution for high-density polyethylene (HDPE) offers a complete line of *Installation-Ready* plain end and grooved products. Installation is up to ten times faster than fusion, weather agnostic, and requires only simple tools. *Victaulic* couplings for HDPE can be buried or submerged, offer pressure ratings that meet or exceed pressure ratings of HDPE pipe, and offer visual verification of proper joint assembly.

- Joins 2–36" IPS HDPE and 63–900 mm ISO HDPE pipe
- Pressure rating meets or exceeds the performance capability of the pipe

VICTAULIC® FIRE PROTECTION SYSTEMS

If you are looking for the fastest, safest and most durable products for your fire protection system, Victaulic offers all of that, plus the latest innovations in fire protection technology. Just like data center technology is always being improved, Victaulic is committed to continuous innovation in the area of fire protection, and our product line reflects that. You will see it in our patented system designs for special hazards, all the way through to our patented joining technologies like Installation-Ready™.

VicFlex™ VS1 DRY SPRINKLER



VicFlex VS1 Dry Sprinkler

When flexible fitting technology meets dry sprinkler technology, the result is simpler, safer sprinkler systems from Victaulic.

- No more issues with sprinkler head alignment
- Change your layout and the VicFlex™ Dry Sprinkler moves with you
- No more water over your racks
- No more rigid pipe

If a ceiling sags or moves over time, the *VicFlex* Dry Sprinkler stays in place, and the sprinkler's performance won't be compromised.

Victaulic Vortex™

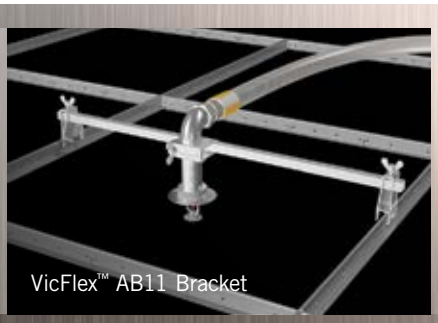
Hybrid Fire Extinguishing System

The Victaulic Vortex™ Hybrid Fire Extinguishing System combines the best characteristics of both water mist and inert gas systems.

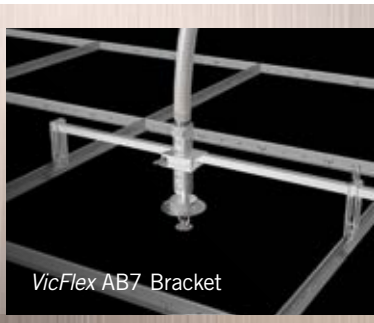
Water is introduced to a jet stream of nitrogen creating a uniform blend of water droplets and nitrogen up to 10 times smaller than a traditional water mist system, resulting in nearly zero wetting of protected surfaces and 50 percent better heat absorption.

Unlike other systems, there is no need for assurance of tight room integrity; fires are extinguished in open, naturally ventilated areas.

SPRINKLER FITTING SYSTEMS



VicFlex™ AB11 Bracket



VicFlex AB7 Bracket

Confidence

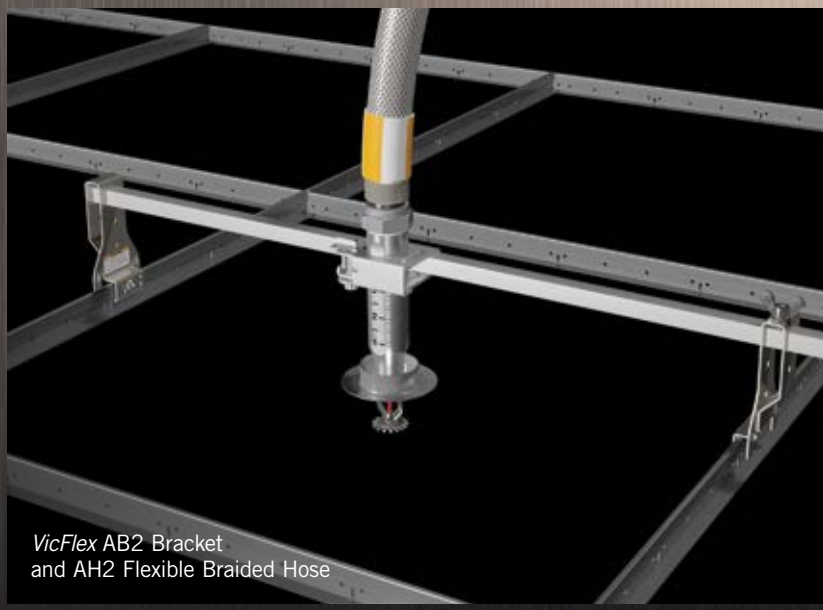
- 100 percent kink resistant
- Tightest bends in the industry
- 100 percent Victaulic® design and manufacturing

Speed

- Up to 10 times faster than threading black pipe
- Eliminate messy cutting tools
- Eliminate custom arm-over fabrication

Performance

- One-piece bracket — no lost parts
- Eliminate sprinkler positioning problems due to ceiling sag or shift
- Tamper-resistant installation



VicFlex AB2 Bracket
and AH2 Flexible Braided Hose

INSTALLATION-READY™ COUPLINGS

Victaulic listened to contractors looking for a fast, easy-to-install coupling that provides a direct wrench feel while improving battery life. The FireLock EZ™ Style 009N rigid coupling has no loose parts to drop or cause injury, ships to the jobsite ready to install, and promises fast installation and no rework, saving the contractor both time and money.

- Joins 1¼–12" | DN32–DN300 sizes

INSTALLATION-READY™ FITTINGS

The convenience of a one piece fitting with the simplicity of the Victaulic® Style 009N Installation-Ready™ coupling. Designed for fire protection systems.

- No loose parts
- Reduce installation time
- Smaller takeout dimensions
- Avoid the cost of internal galvanized fittings
- Joins 1¼–2½" | DN32–70.3 mm sizes

DEVICES AND CABINETS

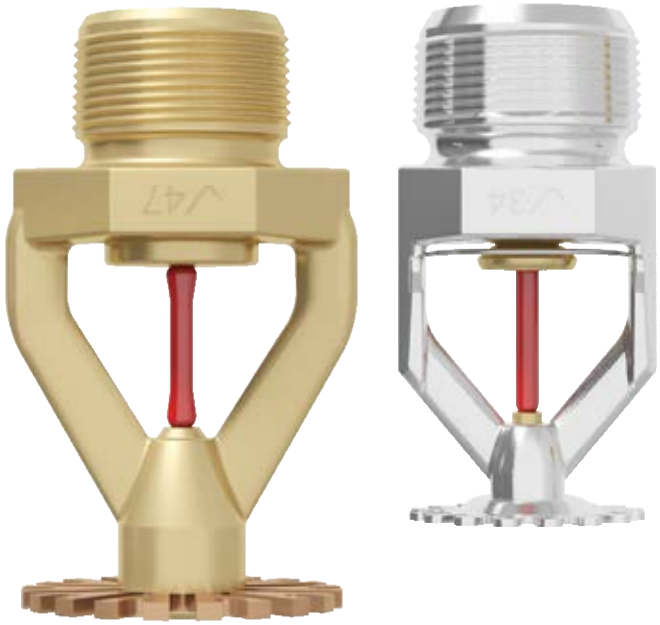
FireLock NXT™ devices feature a lower operating pressure and ultra-fast trip time, due to the elimination of the air-to-water differential. They deliver greater operational dependability and are easier to install, service and maintain. In addition, the compact trim and diaphragm design reduces the valve's center-to-back take out distance up to a full 8" | 178 mm when compared with competitive valves.

The FireLock™ Series 745 Fire-Pac is a completely pre-assembled and tested fire protection valve with trim and optional components enclosed in a metal cabinet, making it ideal for data center applications where space is limited.

AUTOMATIC SPRINKLERS

Victaulic® *FireLock* sprinklers are designed for a wide variety of applications and are available with a broad range of finishes and temperature ratings, aesthetic and performance requirements. Ask about our proprietary corrosion resistant sprinkler coatings that fully encompass each *FireLock* sprinkler to provide increased corrosion-resistance while maintaining functionality.

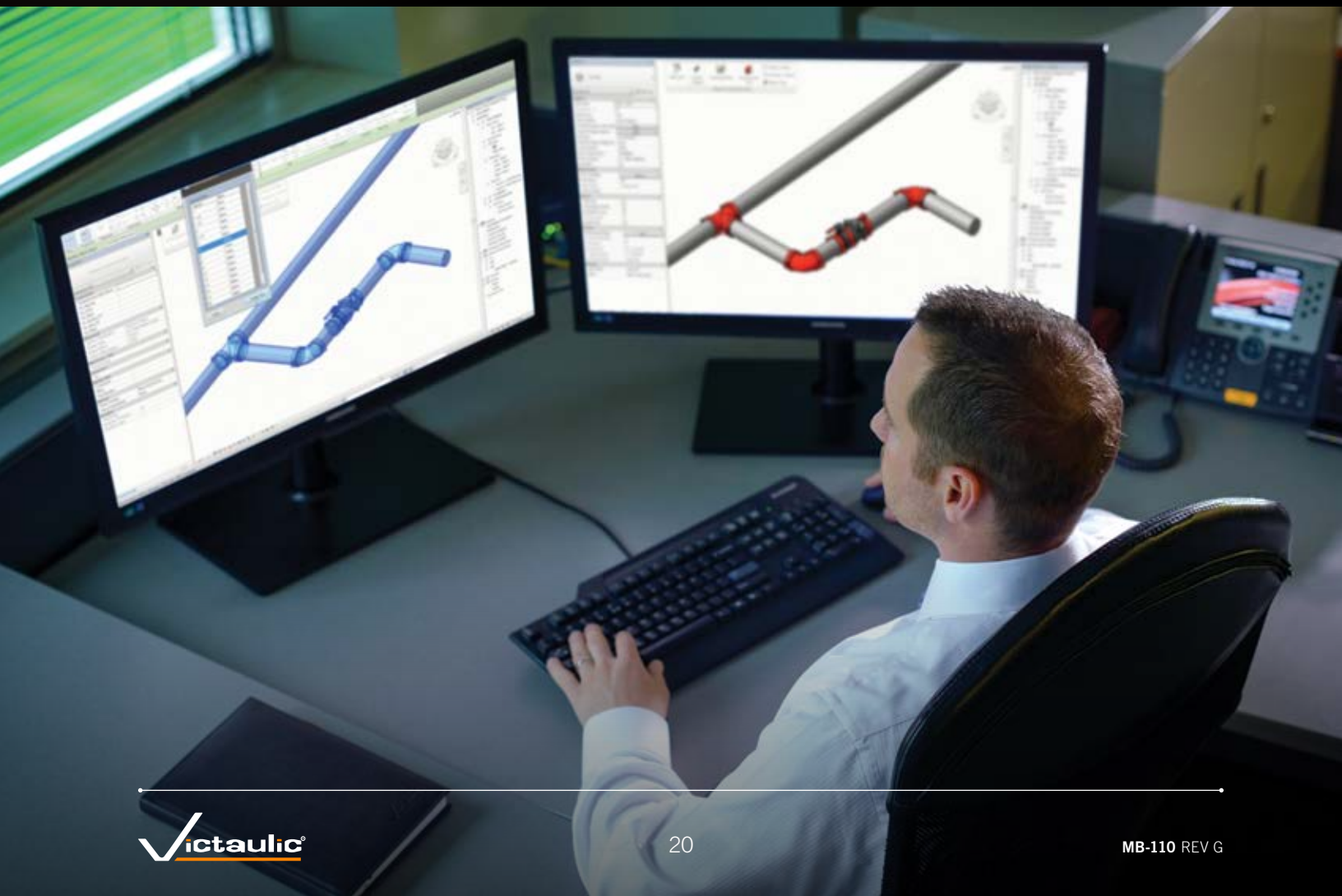
Victaulic offers a complete line of accessories, guards, shields, escutcheons, expansion and cover plates – all designed to provide you with a single source for your next sprinkler project.

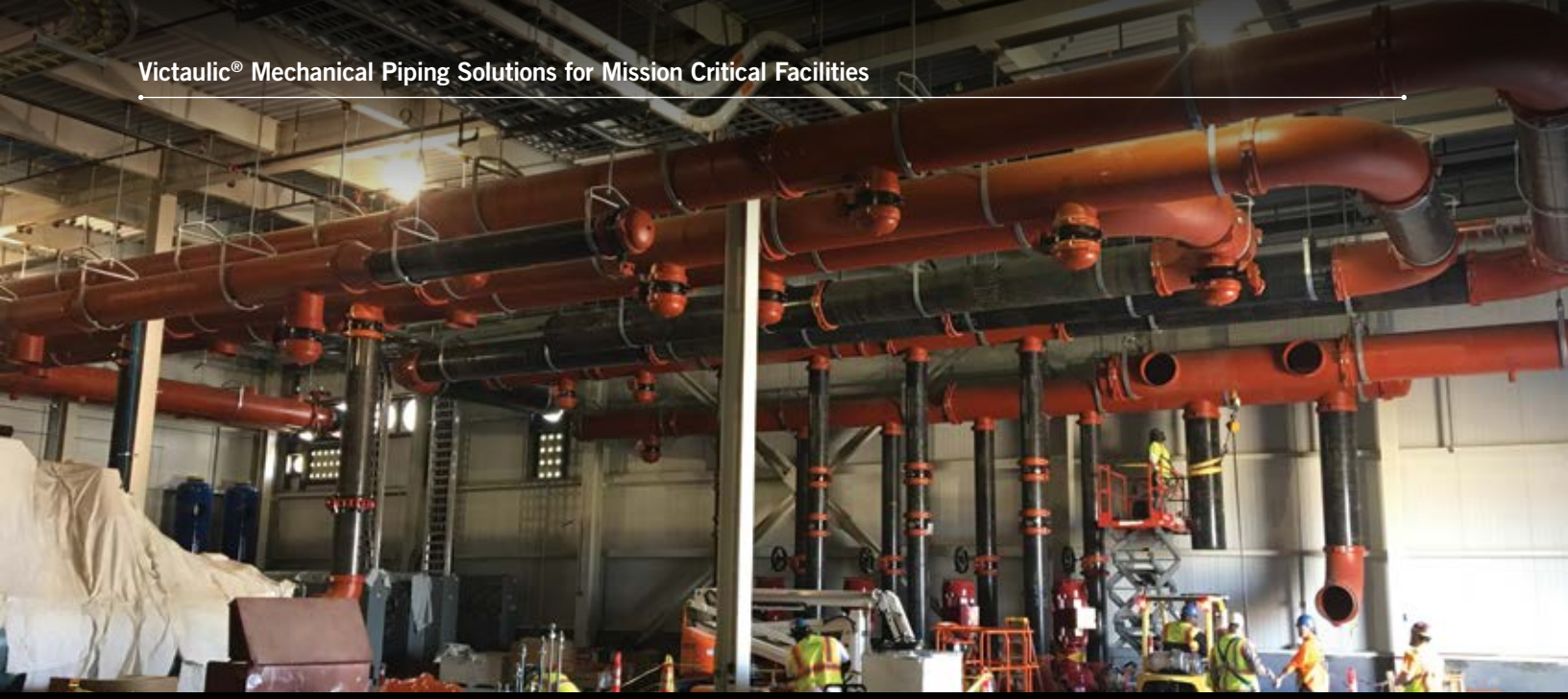


INTEGRATED PROJECT DELIVERY PARTNER

Minimize risk to your schedule and your bottom line.

Victaulic works with your business from design through construction to ensure your project runs as efficiently as possible.





DESIGN TO CONSTRUCTION

Estimating

3D modeling for multiple platforms (Revit, MEP, etc.)

BIM coordination packages can help to reduce man-hours, calendar days and unexpected costs.

Product specification and selection services

Value engineering such as accommodating system movement, vibration attenuation, system flexibility, alignment ease, etc.

LEAN CONSTRUCTION

Lean prefabrication concepts can increase through-put by removing bottlenecks.

- Lean manufacturing concepts applied to fabrication shop and field
- Lean fabrication shop evaluations
- Victaulic® fabrication cell

INTEGRATED SUPPLY CHAIN

Safer system installations translate to fewer man-hours, lower costs and less exposure to risk.

Bag and tag services minimize material handling.

Coordinated shipments deliver products when and where you need them.

Training and continuing education opportunities

Inspection services places a guarantee on the pipe installation for the life of the system.

Full scope product offering

VICTAULIC OFFERS A FULL SUITE OF IPD SERVICES TO ASSIST WITH THE BUSINESS DEVELOPMENT OF POTENTIAL NEW PROJECTS, IMPLEMENTING LEAN PROCESSES FROM PRE-CONSTRUCTION THROUGH INSTALLATION.

CASE STUDY
TELEFÓNICA DATA CENTER

The new Telefónica Data Centre in Madrid is a 72,000 m^2 behemoth that upon completion will be one of the largest buildings of its kind in the world. This enormous data processing center will function as the cloud base for Telefónica in Spain and Southern Europe, as well as hosting platforms for UK clients.

PROJECT

Type of Facility:

Data Center

Victaulic® Solutions:

Compressed Schedule
Job-site Safety
Ease of Maintenance
Sustainable System
Virtual Design and Construction (VDC)

Owner:

Telefónica

Contractor:

EMTE HVAC + Ryasa

Engineer/Consultant:

Ferrovial + PQC

Faced with a tight time schedule, a need for ease of maintenance and the highest possible safety requirements, engineering procurement and construction contractor (EPCC) Ferrovial Agroman and mechanical contractor EMTE Engineering turned to Victaulic. The *Victaulic* Virtual Design and Construction (VDC) department built up a full schematic 3D plan using *Victaulic* components. These 3D plans helped to highlight collisions that 2D drawings didn't show and enabled problem solving at an early, "virtual" design stage. The greatest design challenge of all involved the two 12 meter high pipe bridges connecting the technical rooms to the main building.

A linear system movement of approximately 1.18" | 3 cm had to be accommodated and *Victaulic* flexible grooved couplings operating as expansion joints were used instead of expensive bellows and compensators. The *Victaulic* flexible couplings provided a lower-cost, more efficient and a more easily maintainable alternative. The first phase of the project involved both stainless steel and carbon steel pipe, and specified roughly 17,000 *Victaulic* couplings — both flexible and rigid — with sizes up to 16" | DN400. In addition to couplings, 2,200 *Victaulic* grooved-ended butterfly valves were specified in the installation as well as other mechanical pipe-joining products and accessories, including *Victaulic* Series 732 strainers, *Victaulic* Series 716 check valves and a variety of fittings.

Ferrovial Agroman, who had previously worked with Victaulic on the piping system design for London's Heathrow Airport, understood the advantages that high quality mechanical piping systems deliver and decided that installing *Victaulic* products would be the best solution for this large scale project.

SPECIFICATIONS

Services:	Pipe Materials:	Pipe Size Range:
Condenser Water	Stainless Steel	4 – 12" | DN100 – DN300
Cooling Water	Carbon Steel	2 – 16" | DN50 – DN400

CASE STUDY
GREEN MOUNTAIN DATA CENTER

In response to a rising demand for sensitive data storage, Green Mountain Data Center was built into the side of a mountain to provide maximum security for sensitive data. Formerly a NATO Ammunition storage facility, Green Mountain has become a well-known facility which is both secure and energy efficient.

PROJECT

Type of Facility:

Data Center

Victaulic® Solutions:

Ability to Retrofit
Ease of Maintenance
Eliminate Fire Hazard
Space Constraints

Owner:

Green Mountain

Contractor:

Sig Halvorsen

Engineer/Consultant:

COWI

Completed Date:

2013

A project of this magnitude required utmost innovation from start to finish. For example, the owner decided to leverage the chilly mountain air to naturally cool the server racks. They could also leverage nearby hydroelectric power to reduce single-use energy means which would save on costs and resources. Turning these ideas into a reality proved to be a substantial challenge, but by turning to contractor Sig Halvorsen and Victaulic the owner was able to do just that.

Energy efficiency and green practices were and continue to be at the forefront of Green Mountain's priority list, Victaulic was a natural choice for the cooling system's piping solution. *Victaulic* products are manufactured from 90% recycled materials and can be removed and replaced with minimal to no harmful or wasteful effects. Visual verification also played a major role because it saves time and resources on the jobsite, and flexible technology eliminated the need to hire certified welders who would have introduced hot works and the challenges that come with it.

"It is a simple system to learn and has simple check methods to ensure proper installation," said Frode Horpestad, operations manager at Sig Halvorsen. "Our employees also received close follow-up from Victaulic's representatives on the construction, so it has worked very well."

SPECIFICATIONS

Services:	Pipe Materials:	Pipe Size Range:
Cooling	Carbon Steel and Stainless Steel	1½–12" | DN40–DN300

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