JCM Industries, Inc.
Mechanical Joint Tapping Sleeve
Design Features and Functions

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For more than 125 years, the American Water Works Association had a profound affect on the quality of life in North America and the world by creating a minimum set of industry standards that performs as basic guidelines for a successful, healthy and safe system to provide drinking water. Compiled over decades by dedicated water professionals who volunteered their service and knowledge to the association, this set of standards has become the "how to" manual for the industry. While the standards are not all encompassing specifications, industry leaders as a whole have eagerly adopted and applied these principles as their acceptable minimum to best provide their systems with quality processes, components and procedures.

The AWWA standards address a wide scope of issues in the industry including pipe, valves, hydrants, coatings, gaskets, meters, joints, fittings and hundreds of other topics. These standards have attained such significance in the industry that their adoption by engineers, municipalities and water system leaders is now an unspoken absolute. AWWA works in collaboration with the American National Standards Institute (ANSI) which oversees and facilitates the development of American National Standards (ANS) by accrediting the procedures of standards developing organizations (SDOs). This accreditation ensures that the procedures used by the standards body in connection with the development of American National Standards meet the Institute's essential requirements for openness, balance, consensus and due process.

Stipulating that products and processes incorporated into the water system comply with its associated AWWA Standard insures that those components meet a minimum quality of design, material and performance expectations. In brief, if the proposed component is important enough to have an applicable AWWA standard, then that component should meet the standard.

The mechanical joint principle is a design that has been utilized in the piping industry for decades and is both a time and field proven method of ensuring a watertight connection between pipe ends, fittings, hydrants, accessories and tees. The explanation of the mechanical joint connection is described in detail in the AWWA C-110/111, ANSI21.10/21.11 Standards. The parameters of dimensions are explicit and manufacturers using the term "mechanical joint" are held to the expectation that their product meets or exceeds this standard.

History

Excerpt from the Foreword of the ANSI/AWWA C111/A21.11 Standard From the American Water Works Association (AWWA)

Introduction

The mechanical joint was developed for gas industry use in the late 1920s but has since been used extensively in the water industry. This joint has standardized dimensions and uses the basic principle of the stuffing box and gland, with a rubber gasket being compressed by the gland.

I.B. *History*.

American National Standards Committee A21 on Cast-Iron Pipe and Fittings was organized in 1926 under the sponsorship of the American Gas Association (AGA), the American Society for

Testing and Materials (ASTM), the American Water Works Association (AWWA), and the New England Water Works Association (NEWWA). Between 1972 and 1984 the cosecretariats were AGA, AWWA, and NEWWA, with AWWA serving as administrative secretariat. In 1984, the committee became an AWWA committee titled AWWA Standard Committee A21 on Ductile-Iron Pipe and Fittings.

Bolt On Mechanical Joint Tapping Sleeves were developed to provide a full encapsulation on the ends and along the side fully sealing off the tap area should the pipe experience a beam break or crack during or after the tapping procedure. This sealing capability would prevent the necessity for removal of the sleeve or pipe replacement. The retrofit "bolt on" application eliminated the need of cut-in tees which reduced downtime and two "pipe joint" ends that had potential future leak possibilities.

There are several designs of tapping sleeves in the waterworks industry that have been labeled as "mechanical joint." The traditional fitting is the cast iron mechanical joint tapping sleeve, a poured casting with the same MJ dimensions and configurations as the hydrants, tees, elbows, accessories and pipe joints. Universal adherence to the set AWWA C-110/111, ANSI21.10/21.11 Standards allows interaction of manufacturer's products. These fittings are assembled and installed in the same sequence and manner as the other accessories in the piping system.

With the evolution of manufacturing materials quality, strength and accessibility the concept of the mechanical joint tapping sleeve was made available in lighter weight, stronger steel and stainless steel fabrications. These fittings are available with the same dimensions, and design parameters of the original mechanical joint to ensure equal or greater performance in water tightness, ease of technician installation and the same piping system service.

Other fittings in the water and gas industries have assumed the "mechanical joint principle" without incorporating any/or all the design features and benefits of the "true" MJ design. The front runner of this replicated principle is the bolted compression coupling. These products use the design theory of the wedged gasket being compressed by a flat follower flange into a flared cavity creating a water tight seal. This concept has been utilized in the joining of plain end pipe and fittings within a system (bolted couplings, flanged coupling adapter, etc.). Yet while adaptations and modifications of the Mechanical Joint design enjoy a widely accepted and purposeful application, they have limited benefits and are NOT considered a Mechanical Joint unless they follow the standard set forth by ANSI/AWWA.

As it's minimum the, JCM Industries Model 414 Mechanical Joint Tapping Sleeves incorporates the dimensions, tolerances, bolt patterns and design features of the AWWA C-110/111, ANSI21.10/21.11 Standards to ensure the performance and function requirements of the application and expectations of the end users specifying mechanical joint fittings. Other manufacturers promoting tapping sleeves with "end and side seal gaskets" without citing the AWWA C-110/111, ANSI21.10/21.11 Standards criteria do not meet that standard and are not equal to the JCM 414 MJ Tapping Sleeve or the aforementioned cast iron/ductile iron mechanical joint sleeves and should not be compared as such. Acting in accordance with the set standard requires additional fabrication and workmanship, proving a superior product.

Other designs offered in the industry are commonly referred to as a “split coupling” design. Historically the design incorporates a “bolted coupling” that is a cross cut section and welded onto a longer body with an outlet. This fabrication provides the compressed end gasket and attachment for side gaskets. While useful, these should not be confused with a “true mechanical joint” tapping sleeve. Basically, the simple presence of end ring gaskets and side gaskets does not classify a fitting as a “mechanical joint.”

Specifying agencies, engineers, end users, the pipeline owners and involved entities to municipal and project specifications requiring Mechanical Joint Tapping Sleeve meet the AWWA C-110/111, ANSI21.10/21.11 Standards should be aware of the designs offered and the application of the generic term “Mechanical Joint.” Manufacturers who furnish a “true” MJ sleeve will provide documentation of their design and certify that their products meet or exceed the set standard.

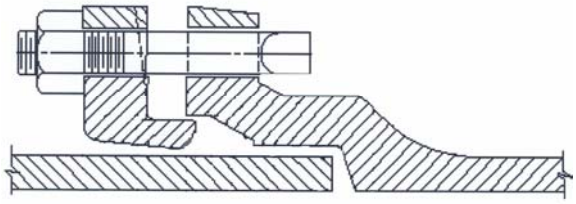
The following illustrations and chart provide a cross cut view of the differences in these end joints:

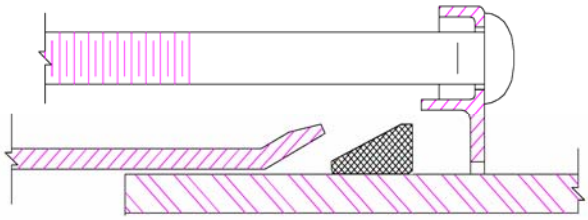
Mechanical Joint End Seals

- Reinforced cross section area around gasket cavity
- Size and quantity of bolts standard
- Receiving cavity with gasket stop
- Bolt Pattern accommodates additional restraint fittings
- AWWA C-110/111 flanges add reinforcement when stressed during and after tapping process
- MJ gasket allows for future movement (longitudinal and angular deflection) because of design of stored gasket compression
- MJ gasket and pusher ring in combination are easier and more reliable sealing method
- Heavy duty body flange provides housing for gasket cavity and mechanical joint pusher ring, provides rigid base for efficient transfer of bolt torque energy to gasket compression

Split Coupling End Seals

- Thin body material can flex and undergo material fatigue or lose a seal
- Size and quantity bolts may vary per manufacturer; less than AWWA C-110/111, ANSI21.10/21.11 Standards requirements
- Simple flared ends – no gasket stop, does not provide base for transfer of bolt torque
- Wedge shaped gasket can loosen or travel forward
- Wedge shaped gasket and simple flare may not insure initial and long term seal
- Thin coupling style push rings provide minimum reinforcement especially for high pressures should pipe break
- Thin body material can flex and undergo material fatigue or lose a seal





COMPARISON

JCM 414 FABRICATED MECHANICAL JOINT TAPPING SLEEVE TO CAST IRON MECHANICAL JOINT TAPPING SLEEVE

1. **STRENGTH OF FITTING** - Uneven or high stress loads will cause cast fittings to crack and break.

   JCM MJ Fabricated sleeve is made of high strength steel that eliminates stress problems.

2. **LOAD OF FITTING ON PIPE** - Cast Sleeve, especially 12" and larger, is considerably heavier than fabricated sleeve due to the extra material required for strength.

   JCM MJ Fabricated sleeves provide more strength with significantly reduced weight. The lighter sleeve reduces the load on pipe and aids installation and handling.

3. **AVAILABILITY OF FITTINGS** - Cast fitting with non-standard sizes have a delivery schedule of six to nine months.

   JCM MJ Fabricated fittings with non-standard sizes have a delivery schedule of four to six weeks.

4. **FIT ON PIPE** - Cast sleeves are available in only standard sizes. Oversize, undersize, or irregularities in the pipe O.D. cause problems in fitting the pipe. Poor fit causes lower safety factor and failures.

   JCM MJ Fabricated sleeves can be made to fit the exact O.D. of all types of pipe. This increases performance and safety factor.

5. **APPLICATION** - Heavier cast sleeves are difficult to handle during application in the field. Exact alignment and bolt torquing is required to avoid stress points that will cause sleeves to crack or fracture.

   JCM MJ Fabricated sleeves reduced weight aids in adjusting fitting on the pipe during application. High strength steel construction eliminates stress fractures.

COMPARISON

JCM 414 FABRICATED MECHANICAL JOINT TAPPING SLEEVE TO SPLIT COUPLING DESIGN TAPPING SLEEVE

1. **STRENGTH OF FITTING** - Split coupling sleeve uses lighter material, pusher rings, side bars and coupling gasket and is susceptible to twist, bends and warpage during bolt tightening.

   JCM MJ Fabricated sleeve incorporates heavy body flange, thick side lugs and mechanical joint pusher rings, to provide a heavy duty, rugged sleeve. Fittings resist twist and warpage during bolt tightening and under line pressure

2. **TRUE MECHANICAL JOINT DESIGN** - Split coupling design sleeves use lighter weight coupling components which incorporate a modified MJ principle of gasket compression, thin gasket, pusher ring and body flare are not in compliance with AWWA C-110/111, ANSI21.10/21.11 Standards

   JCM MJ Fabricated sleeve employs design criterion and tolerance of AWWA C-110/111, ANSI21.10/21.11 Standards featuring the properly sized cavity, gasket, push ring toe and bolting patterns cited for reinforcement of gasket compression.

3. **MECHANICAL JOINT PERFORMANCE** - Split coupling design sleeves do not utilize the Mechanical Joint design criterion and as a result, the sleeves do not provide the longitudinal and angular deflection provided for by a true MJ.

   JCM MJ Fabricated sleeves deliver the design performance expectations of the mechanical joint fitting, allowing for the longitudinal and angular deflection and flexible joint a true MJ connection is expected to achieve and accommodate.

4. **FIELD ADAPTABLILITY** - Split coupling design varies between sizes and manufacturers. Bolt circles, sizes and configurations have no set standards.

   JCM MJ Fabricated sleeves adhere to the AWWA C-110/111, ANSI21.10/21.11 Standards and adapt easily to replacement MJ gaskets, push rings and additional restraint devices.

5. **REINFORCED GASKET CAVITY** – Split coupling design provides a simple flared end to accept the wedged gasket (mechanical joint principle).

   JCM MJ Fabricated sleeves have as a standard feature a heavy duty body flange that houses the gasket cavity. This body flange provides a rigid base for efficient transfer of bolt torque to gasket compression.