

## Steel pipeline systems

**tyco** / Flow Control

**tyco**  
Water



Our communities today depend on the continuity and quality of water supply for a great diversity of purposes.

Satisfying this demand requires pipeline systems, which will consistently deliver good quality water at sufficient quantity and adequate pressure, year after year.

This performance must be achieved under a range of operating conditions embracing static and transient pressures and external loads from earth pressure and vehicles.

To perform as required, pipeline systems must be capable of being handled, transported and installed without undue risk of damage and be resistant to long term loss of strength or damage through corrosion, ageing and other external effects.

Our communities expect these water supply requirements to be met in the most economical way, that is at minimum cost over the lifetime of the pipeline.

The superior strength and ductility of steel, combined with world class corrosion protection systems, ensure that Tyco Water Steel Pipeline Systems provide the answer for water supply and many other applications.

# Tyco Water



Tyco Water – Steel Pipeline Systems is part of the Flow Control division of Tyco International Ltd, a diversified manufacturing and service company operating worldwide.

The Flow Control division manufactures and distributes products that transport, control and sample liquids, gases, powders and substances. The products include valves, pipes, couplings, fittings, meters, pipe hangers and other related products.

In the Australasian region, Tyco Flow Control Pacific has established a solid reputation for making flow control easier, with strategically located manufacturing plants, sales and distribution centres.

Tyco Water has traditionally been at the forefront of developments in the water industry. Now our products and services cover a broad range of industry needs, offering a total solution approach to customers.

# Steel's enduring strength



Throughout the world, steel pipelines have long been used in water supply, particularly where high pressures, difficult laying conditions or security of supply have required a pipe material with strength, ductility and toughness.

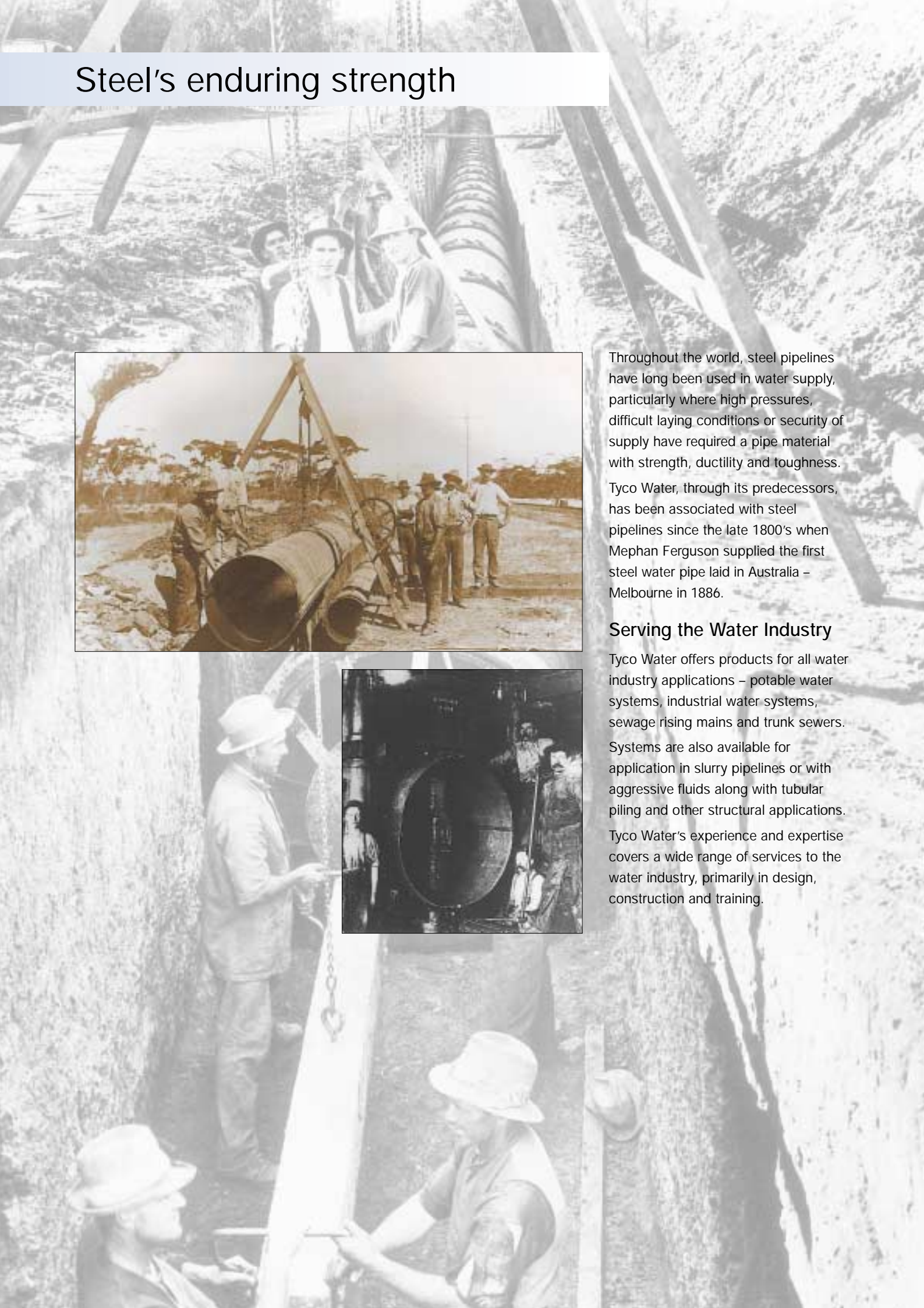
Tyco Water, through its predecessors, has been associated with steel pipelines since the late 1800's when Mephan Ferguson supplied the first steel water pipe laid in Australia – Melbourne in 1886.

## Serving the Water Industry

Tyco Water offers products for all water industry applications – potable water systems, industrial water systems, sewage rising mains and trunk sewers.

Systems are also available for application in slurry pipelines or with aggressive fluids along with tubular piling and other structural applications.

Tyco Water's experience and expertise covers a wide range of services to the water industry, primarily in design, construction and training.



# Pipeline system overview



Tyco Water has a number of core system elements that have been developed in conjunction with numerous Australian Water Authorities.

## Sintakote®

A factory applied fusion bonded polyethylene coating, recognised by the water industry as the premium corrosion protection system for steel water pipelines. Also widely specified in marine piling applications.

## Sintajoint®

A combination of SINTAKOTE with an integral rubber ring joint and internal cement mortar lining, renowned for its total protection of steel pipelines and rapid construction in the field. Patented worldwide.

## Sintaline®

The application of SINTAKOTE internally, as a lining for gravity sewers or drainage applications.

## Sintapipe®

The use of SINTAKOTE externally as a coating and internally as a lining, complete with our patented rubber ring joint.

## Sintalink®

A new breed of pipeline fitting with SINTAKOTE external coating and internal lining plus SINTAJOINT for ease of construction.

Tyco Water steel pipeline systems come in a comprehensive range covering 100mm to 2500mm nominal diameter, including all ISO and Australian Standard diameters.

Wall thicknesses range from 3mm to 25mm.

Pipes can be manufactured in a range of effective laying lengths from 6.0 to 13.4 metres.

A full range of fittings from simple bends, tees, reducers, and branches to complex trifurcates, valves and other appurtenances can also be supplied.

Joining systems include SINTAJOINT rubber ring joints, welded joints, flanges and other mechanical couplings.

Rated pressures are typically up to 5.0MPa for SINTAJOINT and 6.8MPa for welded joints, depending on diameter.

Pipeline system coatings can be SINTAKOTE, paint or specialist coatings to customer specifications.

Linings can be cement mortar, SINTALINE or specialist linings to customer specifications.

For requirements outside these ranges contact one of our marketing offices.

# Versatility is just one benefit



Whether you're the designer, specifier, purchaser, constructor or operator, Tyco Water products can add value with a complete solution to your pipeline needs.

## Time independent strength

For most water industry applications, the properties of steel are retained indefinitely.

By contrast, the load response of plastic based products is time and temperature dependent. Plastics are strain rate sensitive under load and are subject to creep at ambient temperatures.

The structural capability of steel is a constant. Proof testing demonstrates both short and long term fitness for purpose.



## Lower costs through strength

Steel stands alone in offering the greatest strength in proportion to wall thickness of any commercial piping material available.

This feature not only enables the use of higher operating pressures but also optimises installation costs through high ring bending and beam strength.

Compaction requirements are not as demanding as those for pipes of low ring stiffness. The higher beam strength of steel pipes also provides protection against poor bedding and settlement.

In above ground installations steel pipe spans can be significantly longer than those of alternative materials, minimising piers and other supports.



### **Ductility for performance in extreme conditions**

Through its ductility, steel pipe is able to locally yield and plastically deform under extreme load while maintaining resistance to that load. Stresses caused by unforeseen loads including impact, earth movement, wash-outs and extreme temperature changes can readily be accommodated. Service performance can thus be maintained in such conditions.

### **High impact resistance minimises accidental damage costs**

Steel pipe is able to absorb shock loadings transmitted due to surface vibrations, pressure surges or water hammer, as well as those that may be experienced during handling and installation.

### **Reliability of long term performance**

Because it retains its strength and stiffness characteristics, regardless of age, steel pipe can be relied upon to maintain its original performance over generations.

Steel pipelines operating today, with over a century of service, are a real testimony to this capability.

### **Boosting capacity for the future**

In many instances it is necessary to increase the capacity of a water supply pipeline some years after installation. This may be as a result of unforeseen population growth or industrial expansion. Steel pipelines designed on the basis of initial ring stiffness requirements often have capacity for a significant increase in pressure without reducing safety factors.

### **Faster laying rates and field hydrostatic test success**

Tyco Water steel pipes can be supplied in effective laying lengths up to 13.4 metres, depending on diameter. This means less pipes to be handled and installed and fewer field joints compared to alternative materials.

### **Welded or rubber ring joints give design flexibility**

Welded joints provide total structural integrity and eliminate the need for thrust blocks.

Rubber ring joints allow simple, rapid construction and provide a capacity for minor changes in alignment and settlement.

# The manufacturing process



The manufacture of steel pipe is carried out in several stages

- shell forming
- end preparation
- hydrostatic testing  
(not for structural or piling)
- coating
- lining

## Shell forming

Steel pipe shells are generally manufactured by spiral forming, although from time to time short production runs may be made using bending rolls.

The spiral forming process uses hot rolled steel coil as a raw material. The steel is uncoiled, levelled and passed through a forming station that spirals the steel to the required outside diameter.

The spiral seam is then welded both internally and externally as part of the one forming operation. The pipe shell thus formed is cut to the required length as it travels out of the forming and welding machine.

In the bending roll process, flat steel plate is rolled into 'cans' and welded longitudinally. Cans are welded end to end to the desired pipe length.

All welding for pipe forming is carried out using the automatic submerged arc process.



## End preparation

Pipes have their ends prepared to the specified jointing system, be it a rubber ring or welded jointing system. The rubber ring sockets are roll formed, whilst spigots and welded sockets are pressed.



## Hydrostatic testing

Pipes for water supply pressure applications are hydrostatically tested to prove their strength and water tightness. The strength test is carried out at 90% of the steel minimum yield strength, with a maximum of 8.5MPa, whilst the hydraulic leak test is carried out at the pipe rated pressure which is equivalent to a stress of 72% of the steel minimum yield strength, with a maximum of 6.8MPa for welded joints and 5.0MPa for rubber ring joints.

Pipes for structural purposes are not normally hydrostatically tested.

# World class coatings



SINTAKOTE, (FBPE) has been in use since the early 1970s and has replaced all other coatings for the vast majority of steel water supply pipelines laid in Australia.

## Sintakote

SINTAKOTE is a medium density polyethylene which is applied to the pipe by a fusion bonding process. The polyethylene, supplied as a powder, is fusion bonded onto a preheated steel shell. This process provides a continuous and holiday free layer, with a smooth surface, which is suitable for many coating and lining applications.

SINTAKOTE was developed by Tyco Water, in conjunction with Australian Water Authorities, as a response to inadequacies of past corrosion prevention systems. A worldwide research project was undertaken to find the best system available. The adopted system superseded best practice at the time and further developments have made SINTAKOTE a world leader in coatings and linings for steel water pipelines.

The bare steel surface of the pipe is cleaned by grit blasting to ensure an excellent bond between the steel and the coating. The pipe is heated and then dipped into a fluidised bed of polyethylene powder that fuses directly onto the heated surface.

Pipes may also be coated with a paint system to the customer's specification.

# Fitness for purpose linings



The functions of an internal lining are to provide a smooth bore to maximise flow capacity and minimise internal corrosion. In potable water applications, linings should not unduly affect the quality of the water.

## Sintaline

SINTALINE is a fusion bonded polyethylene lining applied to the bore of steel pipes. SINTALINE is ideal for aggressive water applications such as high CO<sub>2</sub>, septic sewage, trade wastes and highly saline waters and can operate at temperatures up to 50°C. The SINTAJoint rubber ring jointing system is recommended for use with SINTALINE.



## Cement mortar linings

Cement mortar linings have met the required standards of performance, at low cost, over long periods of service. The lining actively prevents corrosion by passivating the steel and can be expected to achieve a service life in excess of 100 years.

The lining is applied by spinning the pipe in a centrifugal process that results in a dense lining with a smooth surface. The lining is cured for a minimum of four days before the pipe is transported for installation.

Reinstatement of field joints or repair work is a simple task.

# Fittings for any application

Tyco Water's pipeline system fittings are often manufactured to suit the specific needs of customers and a wide range of steel fabricated fittings can be supplied in addition to the standard range. For example, expansion joints, bellows, support assemblies and complex fittings such as trifurcates. Fittings are typically coated in SINTAKOTE and cement mortar lined, with welded, flanged or rubber ring joints.

The SINTALINK range of fittings is a recent development designed to further enhance pipeline performance and reduce supply and installation costs.



Fittings are generally fabricated from pre-tested pipe manufactured by the spiral forming process. Where coated and lined pipe is used to form fittings, the coating and lining are reinstated manually. Notwithstanding the range of standard fittings available, fittings often require

reinforcement to meet design pressures and loadings. This reinforcement must be designed for the particular application. Tyco Water has the capability to assist you in selecting and designing the optimum pipe and fitting arrangement for your application.



## Sintajoint fittings

SINTAJOINT fittings allow construction of a complete rubber ring jointed pipeline system. This eliminates welding entirely while taking full advantage of the benefits of SINTAJOINT. Tapers, bends, tees and valve and scour offtakes are available as standard system components.

'Hockey Stick' SINTAJOINT pipes feature a rubber ring jointed socket at angles up to 15°. Coupled with the available angular deflection in the joint, (up to 3°), significant changes in direction can be accommodated by using several 'Hockey Sticks' in series.

## Sintalink fittings

Tyco Water's range of rubber ring joint steel pipeline components brings new economies to fittings manufacture and field construction.

SINTALINK fittings have a steel shell which is both coated and lined with SINTAKOTE.

SINTALINK steel pipeline fittings are manufactured through the size range of 324 to 1125mm OD.

Pipeline bends can be supplied to any angle from 1° to 90°. Bends larger than 610mm, requiring a deflection angle greater than 60°, can be provided in two smaller angle bends that together meet the required deflection.

Tee branches can be supplied in any standard diameter not larger than the body of the tee. Branches may be flanged or provided with either spigot or socket for rubber ring jointing to suit the demands of your pipeline system. Reinforcing of tee branches is available as required.

# Joining systems to suit



Pipes can be supplied with any of the joining systems or configurations described here.

Fittings can also be supplied in these configurations. However, they are subject to geometrical and practical considerations.

A variety of mechanical joining systems to suit specialist requirements can also be supplied.

Customers are advised to contact our marketing offices to discuss detailed requirements for fittings and specialist systems.



## Rubber ring joints

SINTAJOINT rubber ring joint is available in pipe sizes 324mm OD to 1440mm OD. Larger sizes may be accommodated on request.

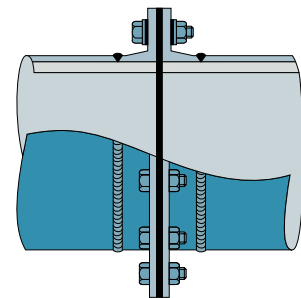
Each joint provides angular deflection up to 3°, depending on diameter.

Since the joint is quickly and easily made and requires no reinstatement, laying rates are considerably faster than for a welded joint pipeline.

In some special situations where ground strains are expected to be high, e.g., in a mine subsidence area, modified rubber ring joints can be provided to accommodate the higher angular rotation and greater axial displacements expected. Designers should contact our marketing offices with their requirements.

## Flanged and other mechanical joints

Flanged joints are available in a complete range of pressure ratings and types as required by the application.

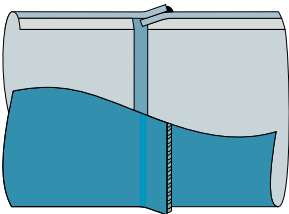


# Materials research

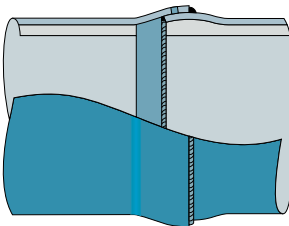
## Welded joints

Welded joints are available in a number of configurations depending on diameter and application.

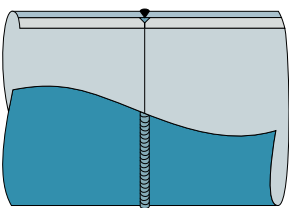
### Spherical slip-in joint



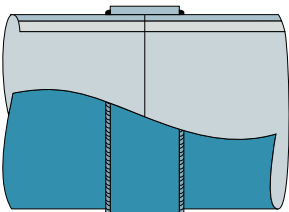
### Ball and socket joint



### Plain butt joint



### Butt joint with collar



Tyco Water's research facility specialises in the development of materials specifically for water industry applications.

The facility provides a wide range of research in the areas of pipeline materials, welding technology, metallurgy, pipeline performance and protective coatings.

Pipelines Research is dedicated to the continual improvement of our pipeline systems. Highly qualified staff with expertise in materials science and engineering disciplines keep abreast of and, in some cases, lead world technology in steel pipe coatings manufacture and performance.

SINTAKOTE is among the many products developed by this facility.

The services of Tyco Water's Pipelines Research are available to help solve your particular pipeline problems.

# Recognised installation training

It is widely recognised that by following proper installation procedures, steel pipeline systems can readily achieve operational lifetimes of over 100 years.

For almost a decade, Tyco Water and its predecessors have promoted quality pipeline installation through our formal training program for steel pipes – SINTAKOTE Pipelines Program. Most Australian water authorities agree and insist on accreditation to the Program as mandatory competency requirements.

The Program has been accredited to the Vocational Education and Training Accreditation Board of New South Wales.



The Program is available to pipe layers involved in the installation of Tyco Water steel pipeline systems.

## Pipeline performance is assured

All Tyco Water design and manufacturing facilities operate under accredited QA systems, producing premium pipeline systems to Australian or other specified Standards. This assures that our products are fit for purpose. Our accredited training courses in pipeline installation go further to provide added insurance that the installed product will continue to perform for its design life and beyond. Manufacturing systems are accredited to AS/NZS ISO 9001 – Quality Systems for Design/Development, Production, Installation and Servicing and AS/NZS ISO 9002 – Quality Systems - Model for Quality Assurance in Production, Installation and Servicing.



### Standards

Pipe shells are manufactured to AS1579 – Arc Welded Steel Pipes and Fittings for Water and Wastewater.

SINTAKOTE is applied according to AS 4321 – Fusion Bonded Medium Density

Polyethylene Coating and Lining for Pipes and Fittings.

Cement mortar lining is applied according to AS1281 – Cement Mortar Lining of Steel Pipes and Fittings

Rubber ring gaskets are manufactured to AS 1646 – Elastomeric Seals for Waterworks Purposes.

# Major project expertise



Tyco Water has an extensive history in Australia's major water pipeline infrastructure projects. This involvement has not been limited to manufacture and supply. In some instances the design, project management and construction have been Tyco Water's responsibility. Think of any recent, major water pipeline project and Tyco Water was involved. Either in design, supply, construction or commissioning and in some cases, all of these functions.

For all your water industry pipeline needs, Tyco Water has the solution.

## Stirling-Harvey Redevelopment Scheme

The Stirling-Harvey Redevelopment Scheme is a major water supply initiative by the Water Corporation of Western Australia to significantly increase the capacity of Perth's water supply.

The scheme includes the construction of a major dam at Harvey, located some 100 kilometres south of Perth and a DN 1400 diameter pipeline to Tamworth, a Perth suburb. The dam is connected by pipeline to the existing Stirling and Harris dams.

The main pipeline consists of 106 kilometres of a DN 1400 steel pipeline utilising both SINTAJOINT and welded joints. The pipeline has the capacity to deliver 160 megalitres per day. There is provision to upgrade to 200 megalitres per day with pumping.

The connection between the existing Stirling and Harris dams consists of 16 kilometres of DN 750 SINTAJOINT pipe and fittings.

Tyco Water manufactured and supplied all pipes for this project at its Kwinana, Western Australia facility. The superior corrosion protection afforded by SINTAKOTE was a significant factor in this project being awarded to Tyco Water as the pipeline traverses country subject to a high ground water table and flooding in winter. The SINTAJOINT feature offering increased laying rates, limits the time for which trenches must remain open.



### Baroon Pocket Scheme

The Baroon Pocket Scheme provides water to one of Australia's most beautiful regions, the Sunshine Coast of Queensland. Additional water supplies were required to satisfy the area's tremendous growth in both housing subdivisions and tourism related construction. Consisting of over 38 kilometres of large diameter pipelines, including a 2.5 kilometre long tunnel section, Tyco Water worked closely with the designers and constructors to ensure the most cost effective products and systems were utilised throughout the project.



### Olympic Dam

Western Mining Corporation's Olympic Dam mine at Roxby Downs in South Australia is one of the largest copper/uranium mines in the world. The mine and associated township require significant quantities of water for mineral extraction purposes as well as domestic consumption.

The nearest reliable source is groundwater from a series of wellfields at the Great Artesian Basin near Lake Eyre, a distance of some 200 kilometres.



The pipeline system ranges from DN 375 to DN 600 and the conveyed water places significant technical demands on the pipeline, particularly the high temperature of the water. Installation rates in excess of 2 kilometres a day were achieved. Tyco Water has been continuously involved with development of the pipeline system, providing over 300 kilometres of pipeline over more than ten years, in capacities ranging from designer, supplier, project manager to constructor.

### North West Queensland Water Pipeline (Ernest Henry)

This project was developed by the Queensland Government as owner and operator to assist in the development of this north west Queensland mining area.

The pipeline includes 47 kilometres of DN 600 SINTAJOINT pipe and SINTALINK fittings. This was the first major project to take advantage of SINTALINK fittings, which offered an increase in construction rate and significant cost reductions.



### Eungella

Expansion of Central Queensland coalfields has led to the provision of a new, major water pipeline from Eungella Dam some 100 kilometres west of Mackay to Moranbah. The 124 kilometre DN 700 pipeline traverses widely varying country, from rainforests to river gorges. The demanding terrain and operating pressure regime necessitated a pipeline system of utmost integrity. SINTAKOTE steel was chosen in wall thickness from 5 to 8mm.

The Queensland Government is the owner and developer of the new pipeline system, which in some parts duplicates an original steel pipeline supplied back in 1968.

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