

SINTAKOTE®

THE SUPERIOR COATING SYSTEM FOR CORROSION PROTECTION





SINTAKOTE®

Steel Mains' Proprietary Solution

Solving Corrosion Challenges

With over 125 years of local and international supply experience, Steel Mains has managed to solve corrosion challenges by providing pipes and fittings with a proprietary thermoplastic corrosion protection coating system known as SINTAKOTE. This coating system provides complete corrosion protection, as well as encompassing a unique rubber ring pipe jointing system, thereby minimising the associated construction, installation and maintenance costs in comparison to all alternative pipeline systems.

Sintakote is a tough, black, fusion-bonded medium density polyethylene coating applied externally. Sintakote provides engineers with a reliable, tough, top-grade coating which offers economic long term corrosion protection for steel pipeline systems. Corrosion protection coatings should be impervious to moisture absorption, be able to withstand handling damage, resistant to long term aging and ultraviolet radiation, be of consistent high quality and provide an economic solution to corrosion protection of steel pipes. Steel Mains steel pipe externally corrosion protected with Sintakote is the system to meet these demands. Sintakote has been used on pipes for 50 years, is available in diameters ranging from 114mm OD to 2159mm OD and is suitable for all soil types from neutral balanced soils to that of adverse corrosive ground conditions such as acid sulphate soils.







HISTORY & DEVELOPMENT OF SINTAKOTE®



Brief History of Coatings

During the history of steel water supply pipelines, a wide variety of systems have been used to provide external corrosion protection for both above-ground and below-ground installations. Above-ground treatments have consisted of various paint systems. For buried applications, bitumen coatings were commonly used in the early days. Coal tar enamel became the preferred coating in the 1950s and was in common use for underground applications through the 1960s and 1970s. It generally performed well, however, there were occasional problems during storage, handling and deterioration in service.



Development of Sintakote

Steel Mains and its forerunners have traditionally been at the forefront of developments in the water industry since the beginning of steel pipe manufacture in Australia. Over that period steel pipeline design, manufacturing processes and technology have evolved into the SINTAKOTE® steel pipeline system, providing Solutions for Life™.

Performance issues with coal tar enamel led Steel Mains, in conjunction with an Australian Water Agency, to undertake a worldwide research project to find the best coating system available. The result of that was the introduction of SINTAKOTE in 1972. Once the performance of this coating was recognised, coal tar enamel was progressively phased out.



SINTAKOTE® Recognised as World-leading Coating Technology

By the late 1980s, Sintakote was being used on all steel water pipelines produced in Victoria. Research and development in the early 1980s led to the availability of Rubber Ring Joint (RRJ) pipe with the Sintakote coating. Full corrosion protection of the steel pipe was achieved by extending the polyethylene coating around both the spigot and socket ends of the steel pipe, to underlap a dense, centrifugally spun cement mortar lining which was applied internally to provide corrosion protection. This product is sold under the trade name SINTAJOINT® - a high quality, factory applied coating and lining which alleviates the need for field reinstatement of coating and lining at joints. Further research by Steel Mains led to the phased in introduction in 1993 of an improved Sintakote which used medium density polyethylene. This improved the adhesion, damage resistance and temperature resistance of Sintakote.

Steel Mains Sintakote technology has also been incorporated in a new steel pipe joint technology known as SINTALOCK® which consists of a welded rubber ring joint and an external site fillet weld. This joint technology provides longitudinal axis restraint for steel pipelines when required and during construction there is no need to enter pipes for welding or lining reinstatement

Welded SINTAKOTE and spiral welded SINTAJOINT and SINTALOCK steel pipe are now recognised in the Australian water industry for having technical superiority over alternative protections and jointing systems for steel pipelines. Further developments have maintained SINTAKOTE as a world leading coating and lining system for steel water pipelines. Steel Mains Sintakote Steel Pipeline System coupled with the best practice construction, ensures the security of Australia's water supply for many decades to come. Steel Mains is proud of its involvement in the development in Australia of fusion bonded polyethylene coatings for large diameter steel pipelines. Steel Mains research and development has led these unique products to be accepted by the water industry as the optimum in corrosion protection.

SINTAKOTE®

Steel Mains Corrosion Protection System

Sintakote is supplied in accordance with AS 4321 - Fusion bonded medium density polyethylene coating and lining for pipe and fittings

Features of SINTAKOTE

Product	SINTAKOTE Cement Mortar Lined Steel Pipe
Manufacturing Standard	AS/NZS 1579
Coating	
SINTAKOTE	Medium Density Polyethylene manufactured in accordance with AS 4321 Standard
Medium Thickness	1.6 - 2.3 mm
Density	940kg/ m ³
Service Temperature	-40 ° C + 70° C

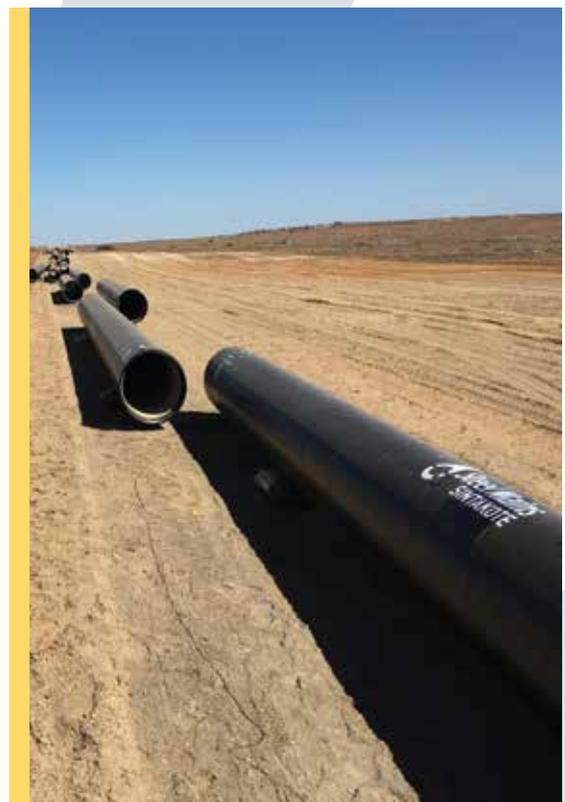
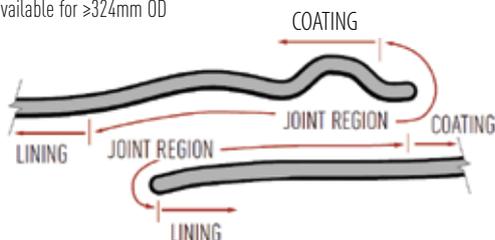
-  Excellent adhesion
-  High impact and load resistance
-  Excellent chemical resistance
-  High dielectric strength
-  High electrical resistivity
-  Low water absorption
-  Resistance to soil stresses
-  Wide service temperature range with temperatures from - 40°C to +70°C having no detrimental effect on SINTAKOTE
-  Ability to accept cold bending of the pipe in accordance with AS 2885 without damage to the coating
-  Inbuilt ultra-violet stabiliser

SINTAKOTE Coating and Lining Thickness

Pipe Outside Diameter (mm) (Note 1)	Minimum Thickness (mm)		
	Coating	Lining	RRJ (Note 2)
≤273 (250 DN)	1.6	1.0	(Note 3)
>273 ≤508 (500 DN)	1.8	1.0	0.8
>508 ≤762 (750 DN)	2.0	1.0	1.0
>762	2.3	1.0	1.0

Notes:

1. Nominal pipe sizes are shown in brackets
2. Refer to diagram below for joint region
3. RRJ available for ≥324mm OD





Benefits of **SINTAKOTE®**

Low Installation and Maintenance Cost

The toughness and durability of the coating and lining systems combined with the strength of steel reduces the total cost of ownership. Sintakote steel pipelines are easy to install resulting in low installation costs and requires little if any maintenance.



Ease of Installation

Due to the toughness of steel pipe and Sintakote MDPE coating, the pipeline can be easily handled in the field.

As part of the Sintakote Steel Pipeline System, Steel Mains offers innovative and unique jointing systems to be used on Sintakote coated pipes.

▲ SINTAJOINT® Rubber Ring Joints (RRJ) in standard lengths of 12.2 and 13.3 metres to maximise pipe lay productivity.

▲ SINTALOCK® - combining the strength of a welded connection with the ease of a RRJ, eliminating the need to enter the pipe.



Long Service Life

Durability and excellent corrosion resistance is provided by Sintakote.

Sintakote has excellent resistance to long term ageing, ultra-violet radiation, handling damage, soil stress and resistance to moisture absorption.



Quality Control

Quality control is maintained through tests as specified in AS 4321, "Fusion bonded polyethylene coating for pipes and fittings"

All pipes are 100% continuity tested by high voltage testing at a minimum of 12kV.



Pipe Fittings and Specials

All conventional fittings can be coated in a similar manner as the pipe itself, to achieve the same high quality finished coating. The fusion-bonding process provides a continuous and holiday free coating, with a smooth surface, ideally suited to the contours and shapes of steel pipe fittings.

Above-ground Storage of Sintakote

Most projects for underground pipework will involve above ground storage of the coated pipes prior to installation where they will be exposed to weathering e.g. ultra-violet light, heat or cold etc. Note that Sintakote will remain unaffected when stored above ground for many years.

Coating of Field Joints with Sintakote

Where Sintakote pipe without RRJ is used, satisfactory protection of the field joints can be achieved by the application of heat shrink sleeves or other feild joint coatings.



Handling & Laying Sintakote Pipes

Sintakote prevents aggressive soils from coming into contact with the steel pipe. Sintakote reduces the risk of damage under normal conditions of laying and handling, as resistance to mechanical damage, through pressure and impact is extremely high.

Nonetheless, during transport and storage, coated pipes should be suitably supported. Trench bedding for laying Sintakote pipes is also not as critical as that required for other coating types.



Properties and Performance of **SINTAKOTE®**

Properties and Performance of Sintakote

Property	Test Standards	Typical Test Result
Coating Material	AS 4321	Complies
Colour		Black: To impart maximum protection against UV radiation when used above ground
Service Temperature Range	AS 4321	-40 ° C to 70° C
Thermal Stability 100° C for 100 days	AS 4321	<35% change in MFI
Bond Strength	AS 4321	5-10 N/mm
Tensile Strength at Yield	AS 4321	18 MPa
Indentation Hardness	ASTM D2240	61 Shore Hardness D
Penetration Resistance -23° C -70° C	AS 4321	0.1mm indentation 0.2mm indentation
Thermal Conductivity (Compression moulded specimen)	ASTM C177	0.34Wm ⁻¹ K ⁻¹
Environmental Stress Crack Resistance	AS 4321	F50 >100 hours
Density	AS 4321	940kg/m ³
Water Absorption	AS 4321 (100 days, 23°C)	<0.1% m/m water absorbed
Electrical Resistivity	DIN 30670	>1 x approx. 10 ¹⁰ ohm m ²
Dielectric Strength (Specimen 2.3mm thick on base polymer)	ASTM D149	>20kV/mm
Impact Resistance (limestone drop test)	ASTM G13, 219mm OD coated pipe av. thickness 1.6mm	No holidays after 10 successive drops
Impact Resistance (falling tup test)	AS 4321/ASTM G14, 219mm OD coated pipe, 2.3mm thick	Mean impact strength 20J
Abrasion Resistance (Tabor)	ASTM D4060 (C17, 1000g, 1000 cycles)	8mg loss due to abrasion
Cathodic Disbondment	AS 4321	8-14mm radial disbonded length

Chemical Resistance: SINTAKOTE is resistant to all normal chemicals, compounds and solutions commonly encountered in water industry applications including muriatic acids, as well as marine organisms and compounds found in aggressive soils.

Application of **SINTAKOTE®**

Sintakote is Steel Mains trade name for a black medium density polyethylene proprietary coating which is applied directly on steel pipe using a fusion bonding process.

The bare steel surface of the pipe is cleaned by grit blasting to ensure an excellent bond between the steel and the coating.

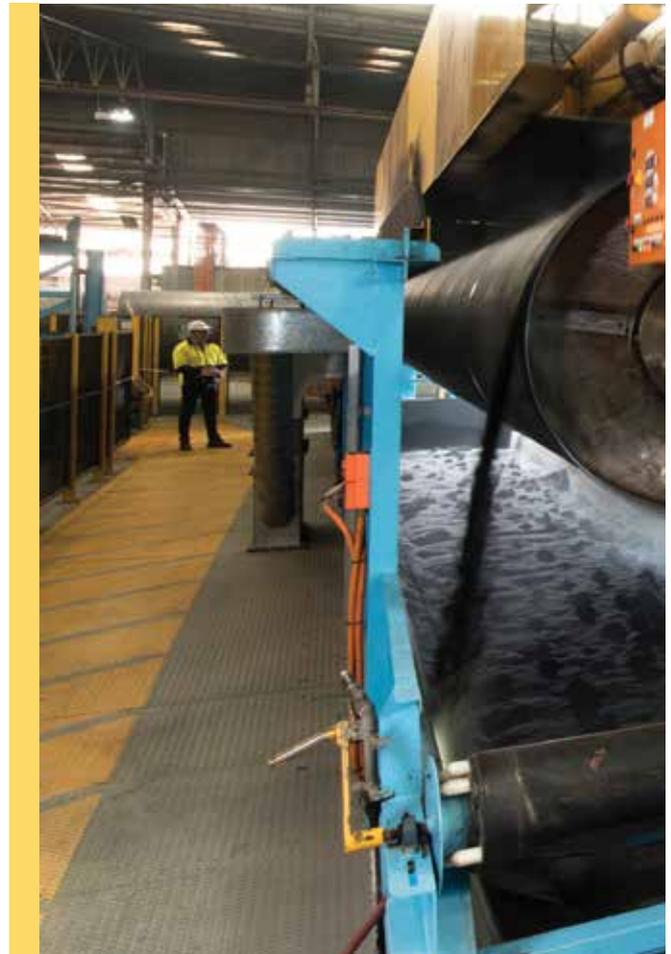
The pipe is heated and then dipped into a fluidised bed of medium density polyethylene powder which bonds directly onto the heated surface.

This process provides a continuous and holiday free coating, with a smooth surface, ideal for above and below ground applications even in aggressive soils and when exposed to direct UV sunlight.

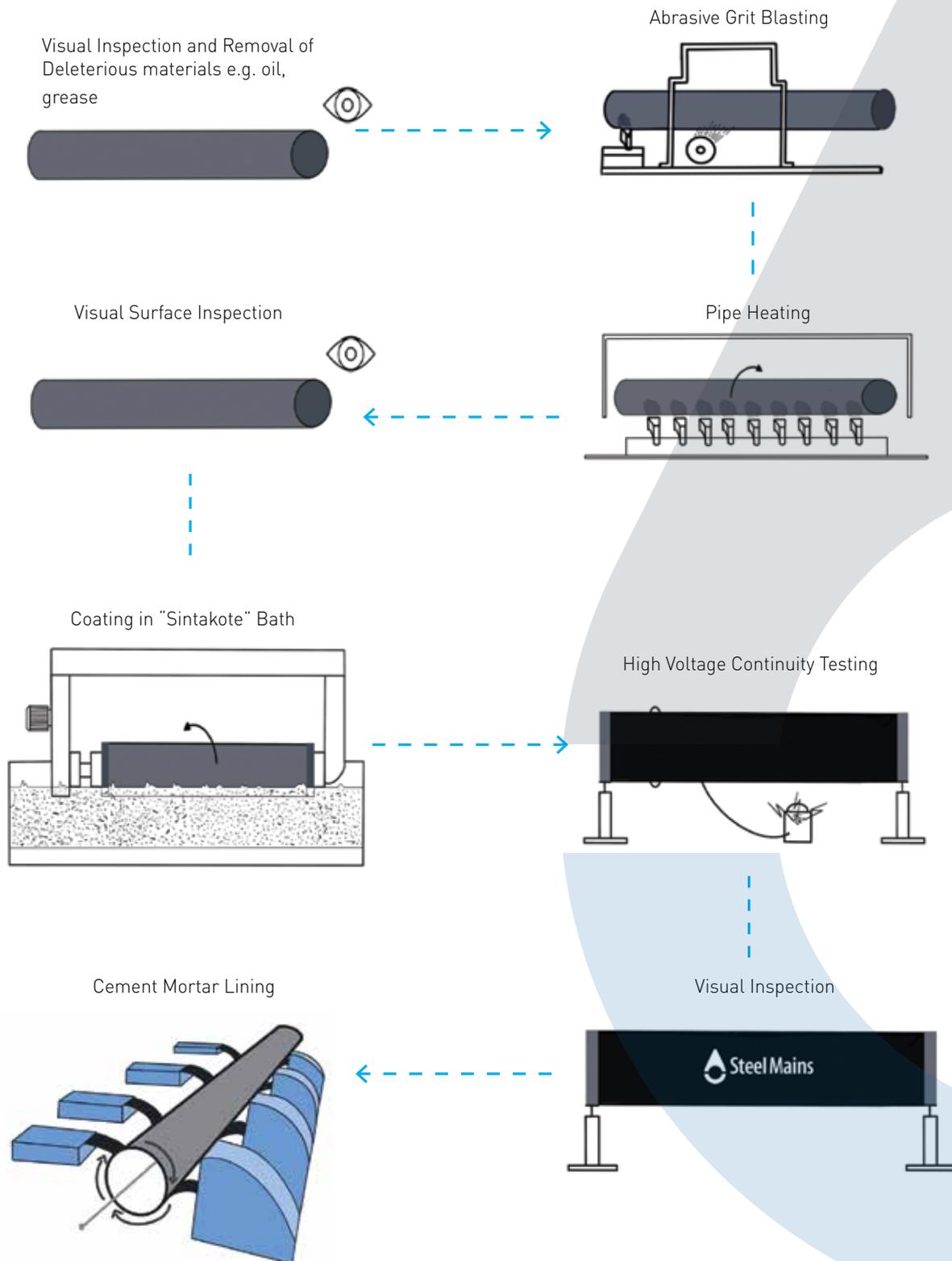
The recommended thickness of the coating varies with the diameter of the pipe.

Conventional fittings can be coated in a similar manner to the pipe to achieve the same high quality finished coating.

By comparison with other methods of protection, the excellent resistance of Sintakote to impact and tear reduces the risk of damage during below ground installation. This inbuilt strength of Sintakote and the smooth glossy finish provides a low coefficient of friction to resist soil movements.



Manufacturing Flow Diagram of **SINTAKOTE**[®]





Technical Features of **SINTAKOTE®**

Resistance to Impact and Indentation

Sintakote is applied in thicknesses to give optimum resistance to impact and indentation. AS 4321 requires that the coating provide a high resistance to impact, at least 18J. The coating can withstand the impact of sharp objects, such as stones, in transport, and in service. Laboratory tests to ASTM G13 (involving dropping sharp stones onto the coating) results in no failure after ten successive drops.

Indentation resistance is high. A compressive stress of 10 MPa onto the coating results in a depression of less than 0.1mm after 24 hours at 23°C. At a temperature of 70°C under the same conditions the indentation is less than 0.2mm. Hence the application of high loads does not significantly reduce the thickness of the coating.



Soil Stress Resistance

Sintakote has a smooth, low friction surface to prevent soil stresses from thinning, cracking or removing the coating. In soil box tests, simulating expansive clay environments, "Sintakote" has demonstrated its excellent resistance to these stresses.

Coating Ductility

The high elongation of polyethylene and the excellent adhesion of Sintakote are combined to provide a coating system that prevents coating failure. This is due to elastic or permanent pipe bending.



Water Absorption

The water absorption of Sintakote is 0.1% after 100 days at 23°C. This extremely low water absorption means that Sintakote properties do not change, even when fully immersed in water. Many alternative coating materials experience significant long term water absorption, resulting in reduced properties such as reduced strength, indentation resistance, electrical resistivity etc.



SINTAKOTE®

Steel Pipelines Training

At Steel Mains, we don't just manufacture Steel pipe. We offer a complete system and service to ensure that your investment in our Sintakote pipe provides you with the service life required and expected for your infrastructure project.

Over the course of many years, Steel Mains has designed, developed, and further enhanced our installation training program for Sintakote steel pipe-laying construction. This program provides training in the correct installation of Sintakote steel pipe to competent pipe-laying construction personnel and is delivered in all states and territories of Australia and New Zealand. A manual is also provided to provide detail on handling, storage and installation of Sintakote steel pipes.

With an optimal mix of theory and hands-on practical, our training course is designed to cover all aspects of pipe-laying requirements, from delivery and unloading, all the way through to commissioning of your Sintakote pipeline.

Research has shown that by following proper installation procedures, Steel Mains Sintakote Steel Pipeline Systems can readily achieve forecast operational lifetimes in excess of 150 years. Most Australian water authorities now regard such training of pipe-layers as a mandatory competency requirement.

The objective of Steel Mains Sintakote Pipeline Program is to achieve the highest probability of correct installation of Sintakote Pipeline systems for all water authorities. The intended end result is to provide the water industry unsurpassed confidence in the long life and low maintenance requirement of Sintakote Steel Pipelines.



Ensuring 150+ Years Service Life

Cathodic Protection

The risk of damage to the coating, and consequently exposing the steel to the environment is very small. Where there is exposed steel, the use of cathodic protection is an additional measure to provide protection.

In determining the current required for cathodic protection, the electrical resistivity of the pipe coating is important. Hence the current required to provide cathodic protection for Sintakote steel pipeline is extremely small (typically of the order $5\mu\text{A}/\text{m}^2$). Thus by comparison with other protective coatings, the costs of installing and operating a cathodic protection system for a pipeline coated with Sintakote is very much lower.

Repairs

Despite care during transport, handling and laying operations, some damage cannot always be avoided. However repair of damage to polyethylene coated pipes is relatively easy.

Any damaged areas can be successfully repaired depending on the severity and size, by adopting one of the methods for field coating:

- Heat Shrink Sleeve Application
- Tape Wrap Application
- Adhesive Patch Repair
- Drader Welding Repair Method

The application of heat shrink sleeves will give the optimum field protection (particularly protection from soil stresses). For detailed procedures, see the Steel Mains Handling and Installation Manual.





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