1 – INTRODUCTION

ERCIYAS manufactures Coated and Lined spirally welded steel pipe in the diameter range between 219 mm to 3048 mm.

Over the past 20 years, thousands of kilometres of coated steel pipes from ERCIYAS Pipeline Systems have been laid and remain in operation.

Water pipelines must always be considered as a long-term investment. If the design life of a water pipeline is 50 years, experience shows that, in most cases, the pipeline will actually be in operation much longer than this. It is therefore essential to design water pipelines for a life in excess of 50 years.

Erciyas have two manufacturing centres in Turkey; Duzce and Mersin.

2- DESCRIPTION OF PRODUCT USE

Erciyas has developed a complete range of products in order to satisfy the requirements of water-distribution systems. Erciyas steel water pipes are designed to transport potable water for public and private water companies, over long distances and in safe condition. They are particularly well adapted to the transportation of water from pumping station to the reservoir, and from the reservoir to the distribution network. Our pipes can be designed to operate at very high working pressures combined with a low head loss and are connected via a welded joint.

3- DESCRIPTION OF PRODUCT

Coated steel pipes are typically used for water transport pipelines. In such projects, reliability of the investment and a long lifetime for the pipelines is crucial, due to the level of initial outlay and the consequences of any premature failure of the pipeline.

High quality levels have therefore been developed for the steel raw material (coil or plate), the pipe manufacturing process, and the coating application processes and pipe coating materials employed.

The Erciyas steel water pipe manufactured for the UK water companies is composed of

3 main parts:

- The steel pipe manufactured according to BS/EN 10224, which gives the strong mechanical resistances against the internal pressure, the surrounding soil, the ground movements, the traffic load.
- The outside coating based on 3 layer polyethylene which gives the resistance against the corrosiveness of the environment and is applied according to DIN 30 670 with thickness variations / reinforcement as ordered by the client.
- The internal lining base of Solvent free Epoxy EUROKOTE 468 THIXO applied thickness is nominal 500 microns and minimum 400 microns (Evaluation method is SSPC PA 2 Table 1 level 3) and to a minimum 300µm as recommended by the supplier and as outlined in EN 10339.

The high quality of the ERCIYAS Pipeline Systems coated steel pipes is achieved through adherence to the following standards during the design and manufacture of the pipes:

- Quality management standard : ISO 9001:2015

3.1) Three-Layer Polyethylene Coatings: The most effective protection against external corrosion

Three-layer coatings have been developed to combine corrosion protection with an electrical and mechanical protection for the pipes.

Three-layer coatings comprise:
- A first layer of fusion bonded epoxy, providing corrosion protection for the pipes;
- A second layer binding the fusion bonded epoxy to the outer layer;
- A third (outer) layer of extruded polyethylene providing the electrical and mechanical protection combined with the first layer to ensure long term anticorrosion protection.

This coating protects the steel pipes even in the most aggressive environments for the following reasons:

- High chemical stability
- Very high adhesion of the coating
- Very high electrical insulation
- Excellent resistance to impact and penetration under punch load

- Coating remains tight even in contact with water and steam
- Strong resistance against micro-organisms.

3.2) Solvent free Expoxy Lining : A continuous barrier to secure the quality of water

The internal liquid epoxy is a two-component – resin and hardener – BS coatings product EUROKOTE 468 Thixo which is applied on the internal surface of the pipes after blasting, in accordance with Instruction for Use.
Solvent Free Epoxy Liquid provides the most effective anti-corrosion lining for steel pipes, which prevents any contact between the steel surface of the pipeline and maintains good quality of potable water being transported.

The application of the Eurokote 468 is done in accordance with BS Coatings IFU and their recommendations.

Cure times are in line with the BS Coatings Technical Data Sheet for Eurokote 468 Thixo dated 20/07/2015 as follows:

DRYING TIME (for 800 µm dry film*)

	At 10°C	At 20°C	At 40°C
Dust free	20 hours	12 hours	6 hours
Hard dry	60 hours	32 hours	16 hours
Fully dry**	20 days	10 days	5 days

- *Nominal thickness ranges between 300µm and 1000µm
- ** Depending on the application parameters, the environment and the composition of the systems.

3.3) High-Pressure Pipelines using high strength steel grades

In most projects, a standard wall thickness of the steel pipeline will be suitable for the external loads being applied. Even in the case of a high-pressure water pipeline, it is generally not necessary to increase the standard thickness. Instead, higher grades of steel can be used to manufacture such pipes. It is more cost effective to use a stronger steel grade than to increase the wall thickness.

3.4) Pipe finishing

At the end of production, pipes are identified at one end with a final marking as follows:

- Name of the manufacturer
- Pipe Number
- Production standard
- Unit length
- Weight
- Steel grade
- OD and Thickness

Pipe ends are closed with caps in order to mitigate possible intrusion.

4- INSTRUCTION FOR USE

4-1) Site Offloading

The storage area must be flat, not flooded, stabilsed and free from any contamination including oil. The surface should be sufficient to allow the movement of trucks.

The offloading of coated and lined steel pipes should be done in such a way that it does not cause any damage to the steel, the coating or the lining. Any site damage must be repaired at the expense of The Contractor. It is our preferred method that a vacuum lift is utilised. If this is not available appropriate slings with relevant load bearing ability must be used. (No hooks should be used, unless padded and agreed with the client)

Care must be taken at all times to avoid knocking the pipe in such a way that damage is caused. This extends to the storage of the pipe and transporting of materials around site and includes the laying of the pipes.

Pipes will arrive on trailers, which will require guiding to their drop - off points / pipe storage areas. Loads must be checked by the offloading crews before the straps are released to ensure timbers and /or chocks are not damaged or missing. Damaged or missing chocks could result in an unstable load which must be checked as safe before the straps are released.

The wagon trailer must be on level ground (i.e. not tilted) before unloading begins. Release top traps first, then secure the timbers vertically. After offloading of the top pipes then undo the bottom straps.

THE RELEASING OF THE STRAPS IS TO BE DONE BY THE TRANSPORT DRIVER AND NOT BY SITE PERSONS.

Once the straps are released the pipes are ready for offloading. Do NOT remove the chocks that are securing the pipes. Appropriate slings should be used to lift the pipe or where possible a vacuum pipe lift.

The pipes will be chocked on the inside as well as the outside – however, we do not recommend that the off loaders rely on the inside chocks to hold the remaining pipe in position once the first pipe has been removed. If the wagon is on uneven ground we suggest the highest point is offloaded first. Before offloading the pipe the timbers supporting the pipe must be tied with ropes to the trailer on the same side as that of the pipe that is being offloaded. There are hooks on the trailer bed that allow this to be done. This should be undertaken by the site persons and not the driver. This is to ensure that as the pipe is lifted, the release of loading on the timber does not destabilise the pipes left on the wagon – in particular the pipe remaining on the top layer.

If using slings, the pipe must be balanced between two slings and ropes attached to both ends of the pipe before lifting. The ropes are to be used to help stabilise the pipe during the lifting and moving to the storage area. Each rope is held by a site worker

Care should be taken to avoid excessive swinging of the pipe that could cause collision with other site vehicles or damage the pipe.

Timbers should be provided (minimum 3 number at 170mm x 70mm) by the contractor to support the bottom layer of pipes. Timbers must be as level as possible to help prevent pipes moving or rolling and the ground should be stable. Pipes should be secured once they are on the timbers with chocks to prevent rolling or movement.

Pipes can be stacked no more than 4 high, which is diameter dependant, and should be separated by a minimum of 3 timbers. All pipes must be secured with chocks to prevent rolling or movement. Timbers and chocks supplied on the wagon can be used on site. The timbers and/or chocks should not damage the pipe coating.

Any damaged timbers should not be used. Timbers should be checked for protruding nails that could damage the coating and remedial action taken if required.

4-2) Movement of pipes on site

Pipes must be transported on site by vacuum lift or by a machine with slings. Ideally pipes should also have ropes attached to each end to help prevent swinging of the pipes if using slings.
.(No hooks should be used, unless padded and agreed with the client)

Care must be taken to avoid damage to the coating, lining or the pipe itself.

Individual pipes and/or pipe strings should be lowered into the trench under control and the spigot end inserted into the socket. The pipe/or pipe string should be supported along its length in such a way that it remains stable during the welding process.

Pipes that are welded together outside of the trench must, once the shrinkable sleeve has been installed, be lifted in a uniform way so as not to stress the pipes and lowered into the trench together. Steel pipe has a bending radius of 500 times the diameter and this must not be exceeded.

4-3) Unit Pipe lengths

Standard steel pipes can be produced in 12m nominal lengths, but pipe lengths of up to 18m are possible when transportation options permit. These longer lengths can provide cost savings both for transportation and also welding cost.

4-4) Jointing Methods

Steel pipes can be produced with butt welded joint or slip joints (spigot and socket) to ease the assembly of the pipes. In any cases, pipes have to be welded by the contractor according to the requirement of the water company and the Standard for Field Welding.

The type of welding joint will be chosen dependent on the diameter.
When it is not possible to come inside the pipes small diameter pipes up to (including) 800mm the joint “Bell and spigot connection with E joint” will be chosen.
For the diameter 900mm and above, it is possible to to come inside the pipes and make repairs at the welding connection. In this case the following 3 types of joint may be used:

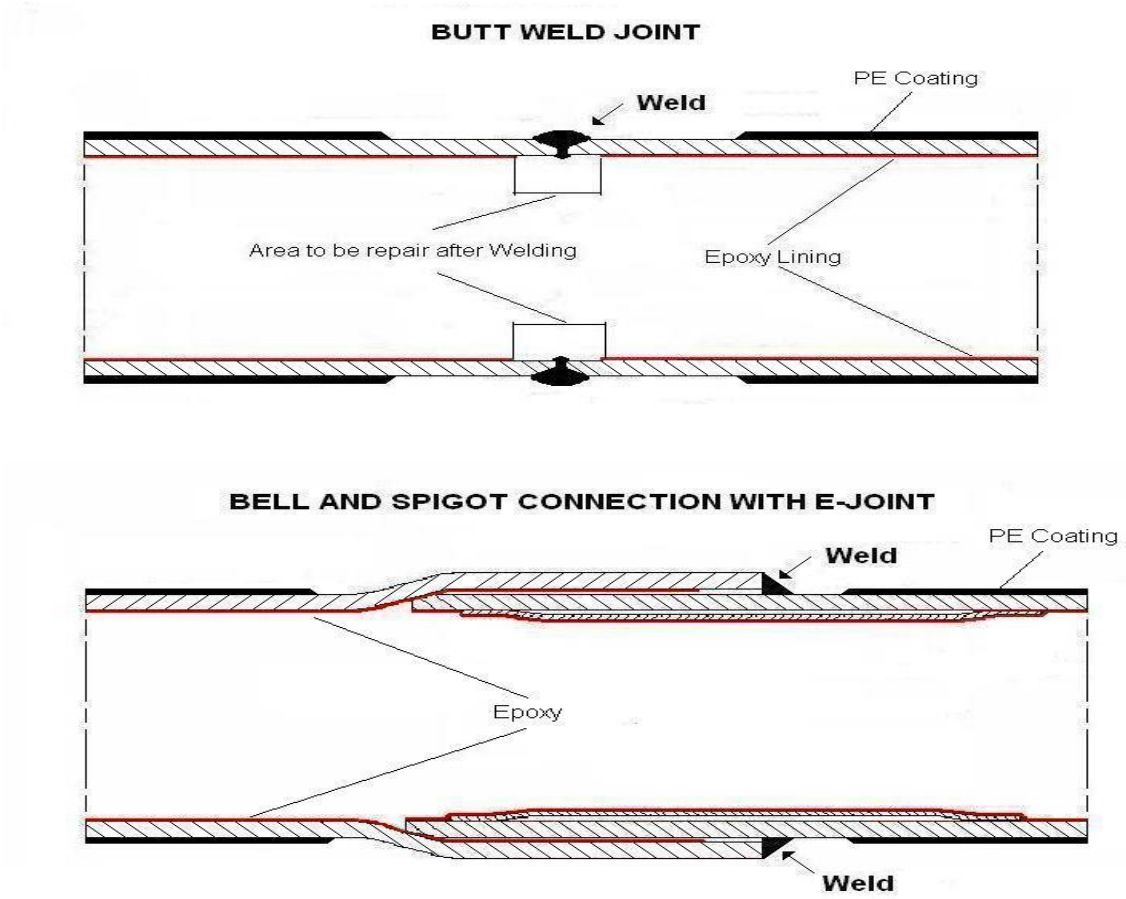
- Butt weld joint
- Bell and spigot connection – single weld
- Bell and spigot connection – Double weld inside and outside

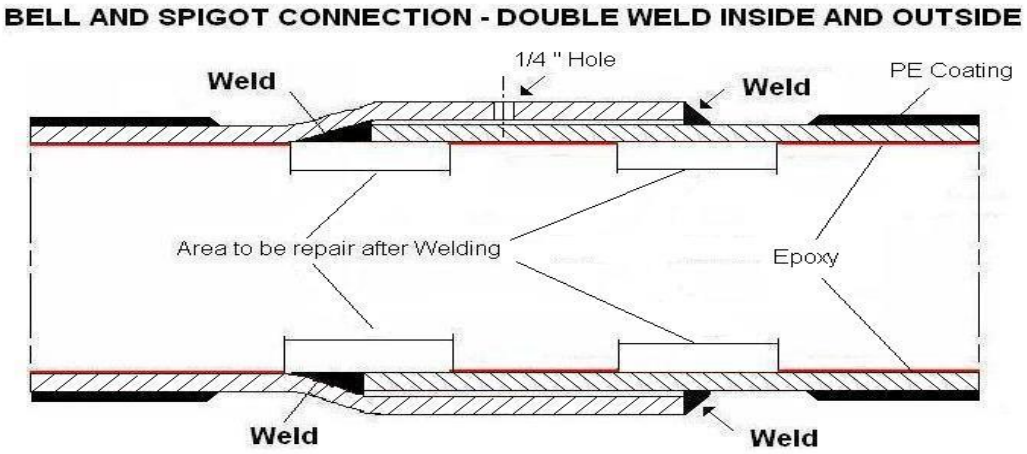
Water steel pipelines are continuously efficient thanks to the main properties of steel – good elasticity, high tnsile strength, and high ductility (tensile elongation in excess of 20%) combined with the high efficiency of jointing by welding.

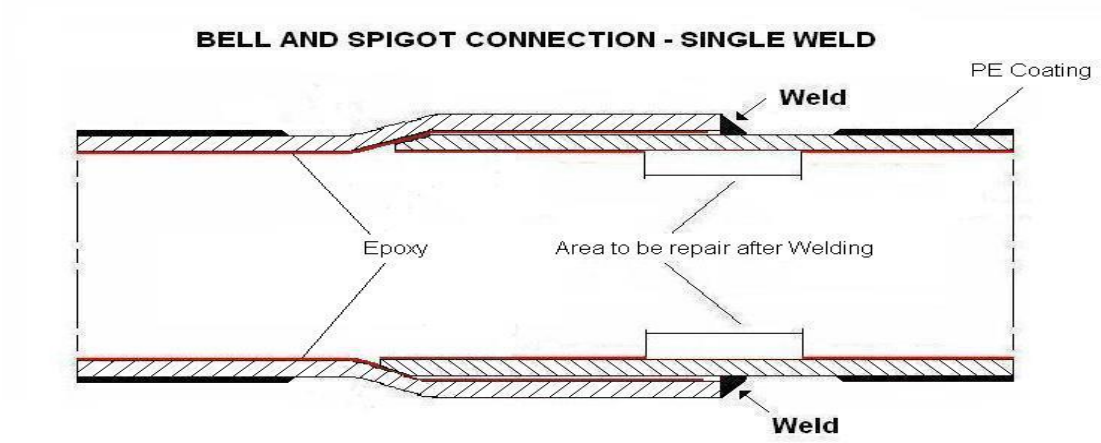
- Water steel pipelines have therefore the following advantages over other product forms:
- Continuous mechanical resistence without any weak points
- Perfect and long-lasting water-tightness without any risk of movement at the joints : any risk of leakage, polution or water entry is eliminated
- Continuous flexibility of the water pipeline, without risk of leaking or deformation, providing a perfect product in areas where the ground is susceptible to subsidence.
-

4-5) No need for thrust blocks

Steel water pipelines are self anchored due to the welded joints. Therefore, no thrust blocks are required.







4-6) Trenching

The depth and width of the trenches have to be calculated by the project team.

Where the sides of the trench will afford reasonable side support, the trench width at the top, which must be maintained regardless of the depth of excavation, should be the narrowest practical width that will allow proper distribution of bedding and backfill materials around and below the pipe.

If the sides of the trench remain vertical after excavation, and if bedding and backfill are to be consolidated by hydraulic methods, then, the minimum trench width at the top should be pipe OD plus 50 cm. If the pipe zone-bedding and backfill are to be compacted, the width of the trench bottom should be sufficient to enable the proper and effective use of tamping equipment, but it should never be less than pipe OD plus 50 cm.When pipes are being welded externally in the trench,(the most

common procedure,) it will be necessary to excavate more where the pipe joints are located in order to provide a minimum space of 50 cm all around the pipe assembly for clearance purposes.

4-7) Welding Procedure

Irrespective of the pipe/pipes being on the trench side or within the trench, sufficient room should be provided around the joint to allow the welding contractor access to the pipe joint in order to carry out the welding procedure.

The contractor and the welder must agree on the space required.

A welding procedure must be provided by the welding company, tested and verifed as suitable for use.

It is recommended that the welder uses pipe wedges to provide as equal space as possible all around the joint area. This is to ensure an even welding gap and to prevent the spigot from resting on the bottom of the socket.

Laying by strings of pipes: increasing the working rates
Steel pipes can be pre-assembled and welded in strings of 3 to 7 pipes on the side of the trench. These strings can then be manoevred into the trench and welded there to the previous string. The advantage of this procedure is the ability to separate assembly of pipes.

4-8) Cutting of pipes

Steel pipes can be cut at any point along their length due to the tolerance control. Pipes should be cut using appropriate cutting equipment.

There is no requirement to remove the external coating prior to cutting the pipe.

If the cut end of the pipe is required as a spigot or for a slip-on flange, the polyethylene coating requires removing.
Heat the inside of the pipe, the heat will transfer along the metal reactivating the adhesive that bonds the PE coating to the pipe. Once the adhesive activates, cut the PE with a sharp knife circumferentially and to the newly formed end, and lift the PE to enable it to be peeled away. Do not heat the PE directly for any length of time as it will cause the PE to blister. Light heating can help the process of removing the PE.

Pipes can also then be bevelled if required as a spigot (although this is not esential) and tidied up as necessary.

See section 4-10 for internal lining repairs on site

Externally, coatings must be repaired by using canusa heat shrinkable sleeves or WrapidBond. Cold tapes must be used on flanges for the field applied corrosion protection.

4-9) Outside field joints coatings: a continuous anti-corrosion protection of the pipeline.

After the assembly and welding of the pipes (and fittings) on site, external and internal joints must be coated and protected.

The recommended external field joint coating methods consists of applying a Canusa heat shrinkable sleeve around the pipe according to the IFU from the sleeve manufacturer.

The adhesion of these products to the existing external coating on the pipes ensures a continuous external protection for the pipeline.
The principal features of these field joint coatings are as follows:

- High adhesion of the coating onto the pipe
- Very high electrical insulation
- Excellent resistance to impact and penetration under punch load.

Outside Coating inspection before laying:
Before laying, PE coating must be checked visually and by Holiday detector to the relevant kV according to the coating finish.
Damage on PE must be repaired by Canusa Melt Stick method, Patch kit method or Full field Cover method (depending on the size of damage)

4-10) repairing linings during laying – site processes

<u>Manufacturer's recommendations</u>

Eurokote 48-20 is the recommended repair product by BS Coatings, the manufacturer. Eurokote 468 is available in blue, red and ivory and should be used in line with the TDS in Annex 5.2

DESCRIPTION Two component solvent free high build epoxy coating, applied by twin-feed hot airless spray or by syringe for the repair of small areas.

EUROKOTE® 48-20 is designed for the protection of pipes, accessories and storage vessels in contact with drinking water, sea water, waste water and industrial water.

EUROKOTE® 48-20 is recommended as repair product for EUROKOTE® type liquid epoxy coatings.

See the Eurokote 48-20 data sheet for more details.

Preparation of the surface to be coated:

Surface preparation is a very important phase and must be carried out with particular care. The quality of the stripping and dust removal phases has a considerable influence on the adhesion performance of the coating. Before applying the coating, the surface to be coated must be dry and free of any soiling (such as existing coatings, paints and non-adherent particles, grease, oil, etc.) that can adversely affect surface preparation. Contaminants should be eliminated by any appropriate means using products that are compatible with the coating to be applied.

▪ All non-adherent parts of the existing coating should be removed with a knife, scraper or any other suitable means.

The surface temperature of the substrate prior to application and during the drying of the Eurokote 48-20 should be +3°C above the dew point. Gentle heating of the area to be repaired is therefore permitted as long as the temperature is not above 50°C, as detailed in section 2.1 of the 84-20 TDS.

▪ Grind or wire brush the stripped surface to remove any remaining adherent parts of the coating and eliminate any traces of oxidation and soiling so as to obtain a ST3 degree of surface finish as per the ISO 8501-1 Standard. This may be done using an abrasive flap wheel with 40 grain abrasive.

▪ Chamfer the existing coating adjacent to the area to be repaired and roughen the surface over a width of 50 mm. Ÿ Carefully remove all traces of dust from the area to be repaired

Cold Application:

EUROKOTE® 48-20 is a two component product supplied in separate predosed non divisible packaging, available in 1kg and 50ml syringe kits.

MIXING RATIO VOLUME BY WEIGHT

Part R (Epoxy) 100 parts 68 %
Part D (Hardener) 50 parts 32 %

The temperature of the substrate should be between + 10 °C and + 50°C and maintained at least 3°C above the dew point during the application and drying of EUROKOTE® 48-20 in order to avoid any condensation on the substrate to be painted

The ambient temperature should be between + 10°C and + 40°C and the relative humidity should not exceed 85 %.

▪ The temperature of the product should be between + 10°C and + 30°C.

▪ Mix components R and D, which are predosed, with a spatula until completely homogeneous.
▪ Apply a thick coat of around 500 µm of the homogeneous mixture with a spatula or brush, without dragging the product so as to avoid reducing the thickness.
▪ Cover both the steel surface and the adjacent roughened existing coating

POT LIFE:
- At 20°C: around 30 minutes for 1 kg
- At 40°C: around 15 minutes for 1 kg

	At 10°C	At 20°C	At 40°C
Dust free	6 hours	3.5 hours	1.5 hours
Hard dry	12 hours	6 hours	3 hours
Fully dry	72 hours	24 hours	12 hours

The coating may be brought into contact with drinking water 24 hrs after application, wihtout any alteration of the water quality

QA Controls:

When the film has attained a sufficient degree of hardness (12h at 10°C, 6 h at 20°C, 3 h at 40°C), the following controls should be carried out:

- The appearance and the continuity of the entire coating should be visually inspected. The coating should have a uniform colour and appearance, exempt of any defects that could adversely affect the quality of the coating.

- The thickness of the coating measured using, for example, method n° 7C or 7D of the EN ISO 2808 Standard should comply in every respect with the contract or the specification.

- The non-porosity of the coating should be checked. The applied voltage should be that given in the specification employed and should be at least 5 volts per micron of dry film thickness and should not exceed 8 volts per micron.

In service repairs should be in line with regulatory requirements .

Advicesheet8-1.pdf (dwi.gov.uk)

4-11) Handling pipe during laying

Care similar to that exercised during loading, transporting, unloading, and stringing should be observed during installation of the pipe in the trench. The pipe should not be dragged

along the bottom of the trench or bumped. Fabric slings should be used for handling and placing pipe in the trench.

Before lowering the pipe in the trench, the coating on the underside of the pipe should be inspected while it is suspended from the sling, and any visible damage to the coating should be repaired.
Holiday test should be done before lowering the pipes in the trench.

If the method of assembling pipe above ground prior to lowering it into the trench is used, care must be taken to limit the degree of curvature of the pipe during the lowering so as to not exceed the yield strength of the pipe material and/or damage the lining. Pipe deflection should be limited to the engineering's recommendation.

4-12) Backfill

The back fill material should always comply with the water industry Specification
WIS 4-08-02.

However, the following is a typical pipe bed and surround method:

Flat-bottom trenches should be excavated to a depth of a minimum of 10 cm below the established grade line of the outside bottom of the pipe. The excess excavation should then be filled with loose material from which all stones and hard lumps have been removed. Natural soil can be used if it fulfils this condition. The loose subgrade material should be graded uniformly to the established grade line for the full length of the pipe. Steel pipe should not be set on rigid blocks on the trench bottom that would cause concentration of the load on small areas of pipe coating or cause deformation of the pipe wall.

Where the bottom of the trench is covered with solid, hard objects that might penetrate the protective coating, a bedding of crushed rock or sand, 10 to 15cm thick, should be placed under the barrel of the pipe.

Embedding of the pipeline shall be made with natural soil if it is one of the following types:

- Gravel graded (GW):
- Sand and course grained soil with less than 12% fines (GP, SW, SM).
- Coarse grained soil with more than 12% fines (GM, GC, SM).

The symbols in brackets are Casagrande symbols.
No grain sizes shall exceed 25mm.
These soils are compacted to reach at least 90% of the optimum Proctor density.

When natural soils cannot be used such as in rocky areas, Type A granular material X1 (according to Standard Specification for Water and Sewerage Schemes clause 342 shall be used).

90 – 100% passing 20mm sieve
30 – 60% passing 10mm sieve
0 – 10% passing 5mm sieve

These soils are compacted to reach at least 90% of the optimum Proctor density.
Height of initial backfill shall be at 100mm to 150mm.

However the UK Water Industry Standard WIS 4-08-02 should be adhered to.

4-12) Cathodic monitoring : to confirm lack of corrosion

The high resistance to mechanical and corrosion resistance of the three-layer external coating is normally sufficient for most water pipelines. Nevertheless, some minor damage can occur if care is not taken during pipe handling and laying or if additional work is performed in the vicinity of the pipeline whilst it is in service.

Cathodic protection of the coated steel pipeline is simple and cost-effective. It prevents any risk of corrosion and is also a useful monitoring device for the pipeline. Cathodic monitoring enables the state of the coated steel pipeline to be assessed and can confirm a lack of corrosion during the operation of the pipeline.

4-13) Commissioning and disinfection of pipes

After welding and the external coating of the pipe joint area, the contractor can proceed to the hydraulic test of a section of pipeline, according to the requirement of the project, in order to check the water tightness and stability of the pipeline. Before testing, all debris and foreign bodies must be removed from the pipeline.

Commissioning and disinfecting of the pipeline is to be carried out in line with the UK Government Regulations: Principles of Water Hygiene 2017 and technical guidance notes, publised by WATER UK and available from www.water.org.uk

4-14) Safety, Regulations and Environmental recommendation

All applicable UK laws and regulations should be carefully observed, together with all of the Water companies/project material and construction specifications and working practises should be carefully observed.

The disposal of the water used for disinfecting the pipeline and unused/ waste pipe material should be recycled, if appropriate, and/or disposed of in accordance with the protocol set out by the Environment Agency Policy.

4-15) CONTACT

For any questions please contact the office number or Email address:

ERCIYAS
00 90 216 410 82 30
Email: erciyas@erciyas.com.tr

5.1) Annex 1 – Canusa TDS

PDS_K60 rev 15.pdf

5.2) Annex 2 – BS Coatings 468 TDS

Eurokote 468
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5.3) Annex 3 – BS Coatings 84-20 TDS

eurokote_48_20.pdf