SLOVENSKI STANDARD
SIST EN 10300:2006

01-januar-2006

Jeklene cevi in fitingi za obalne in priobalne cevovode – Bitumenski materiali za zunanje prevleke

Steel tubes and fittings for onshore and offshore pipelines - Bituminous hot applied materials for external coating

Stahlrohre und -formstücke für erd- und wasserverlegte Rohrleitungen - Werksumhüllungen aus heiß aufgebrachtem Bitumen

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Tubes en acier et raccords pour canalisations enterrées et immergées - Revetements externes au moyen de matériaux hydrocarbonés

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Ta slovenski standard je istoveten z: **EN 10300:2005**

ICS:

25.220.60	Organske prevleke	Organic coatings
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2003-01.Slovenski inštitut za standardizacijo. Razmnoževanje celote ali delov tega standarda ni dovoljeno.

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EUROPEAN STANDARD

NORME EUROPÉENNE

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English Version

Steel tubes and fittings for onshore and offshore pipelines - Bituminous hot applied materials for external coating

Tubes en acier et raccords pour canalisations enterrées et immergées - Revêtements externes au moyen de matériaux hydrocarbonés

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This European Standard was approved by CEN on 25 March 2005.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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Foreword

This document (EN 10300:2005) has been prepared by Technical Committee ECISS/TC 29 “Steel tubes and fittings for steel tubes”, the secretariat of which is held by UNI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2006, and conflicting national standards shall be withdrawn at the latest by May 2006.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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1 Scope

This European Standard specifies requirements for the application of factory applied external bitumen based hot applied coatings for the corrosion protection of steel tubes and fittings for onshore and offshore pipelines.

This specification covers the use of bitumen based enamel when the design temperature of the pipeline is within the following limits:

— oxidized bitumen – 15 °C to + 75 °C;

— modified bitumen – 30 °C to + 90 °C.

The coatings described in this European Standard can be applied to longitudinally or spirally welded tubes or to seamless tubes and fittings used for the construction of pipelines for the conveyance of liquids or gases.

NOTE Tubes coated with bitumen based enamel may be further protected by means of cathodic protection.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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EN 1426, *Bitumen and bituminous binders - Determination of needle penetration*

EN 1427, *Bitumen and bituminous binders - Determination of softening point - Ring and ball method*

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EN 1849-1, *Flexible sheets for waterproofing - Determination of thickness and mass per unit area - Part 1: Bitumen sheets for roof waterproofing*

EN 12311-1, *Flexible sheets for waterproofing - Part 1: Bitumen sheets for roof waterproofing - Determination of tensile properties*

EN ISO 2431, *Paints and varnishes - Determination of flow time by use of flow cups (ISO 2431:1993, including Technical Corrigendum 1:1994)*

EN ISO 2592, *Determination of flash and fire points - Cleveland open cup method (ISO 2592:2000)*

EN ISO 8501-1, *Preparation of steel substrates before application of paints and related products - Visual assessment of surface cleanliness - Part 1: Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings (ISO 8501-1:1988)*

EN ISO 13736, *Petroleum products and other liquids - Determination of flash point - Abel closed cup method (ISO 13736:1997)*

ISO 719, *Glass - Hydrolytic resistance of glass grains at 98 °C - Method of test and classification*

ISO 2591-1:1988, *Test sieving - Part 1: Methods using test sieves of woven wire cloth and perforated metal plate*

ASTM *D737*-96, *Test Method for Air Permeability of Textile Fabrics*

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3 Terms and definitions

For the purposes of this European Standard, the following terms and definitions apply.

3.1
coater
company responsible for applying the coating material to the components to be coated in accordance with the provisions of this document or the special requirements given in the tender specification and in the order

3.2
bitumen
viscous liquid or a solid, consisting of hydrocarbons and their derivatives, which is soluble in carbon disulfide or trichloroethylene

NOTE It is substantially non-volatile and softens gradually when heated. It is black or brown in colour and possesses waterproofing and adhesive properties. It is obtained by refinery processes from petroleum.

3.3
oxidized bitumen
bitumen which has been rheologically changed by the action of blowing air through the bitumen

3.4
modified bitumen
bitumen which has been rheologically changed by the addition of polymers

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3.5
bitumen based enamel
coating material which is substantially comprised of either oxidized bitumen and filler or modified bitumen and filler

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3.6
bitumen based tapes
pre-fabricated tape coating material which is substantially comprised of bitumen based enamel with a carrier

3.7
hot applied material
material which is solid at ambient temperature and becomes fluid on heating to application temperature

3.8
primer
material applied as a thin film to metal in order to ensure adhesion of the subsequent protective coating

3.9
non-woven glass fabric
continuous sheet of randomly arranged glass fibres in an open porous structure bonded by a suitable resin and reinforced by continuous longitudinal glass yarns

3.10
woven glass fabric
regular woven glass fabric made from glass yarns held together by a binder

3.11
composite glass fabric
one layer of glass fibre tissue and one layer of woven or lock welded glass mesh held together by a binder

3.12
composite polyester/glass fabric woven polyester
glass mesh with a layer of glass fibre tissue held together by a binder

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3.13
inner-wrap
porous reinforcement of glass fibre which is buried within the bitumen based enamel coating in order to improve its mechanical performance

3.14
outer-wrap
continuous sheet of reinforced glass fibre fabric or glass fibre/polyester composite fabric impregnated by a suitable bitumen based material which is compatible with the bitumen based coating and fused into the outer surface to improve its mechanical performance

4 Composition of the coating

4.1 Description of coating

A coating generally shall comprise a number of layers or components as follows:

— primer which shall be compatible with the chosen enamel coating;

— enamel comprising a bitumen based material containing a filler;

— reinforcing glass fabric inner-wraps as required by the category and thickness of the coating enamel;

— glass or composite fabric outer-wraps as required by the category of coating enamel;

— solar protection, i.e. weather resistant material to protect the coating from sunlight.

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NOTE In special cases (for example, for onshore use, due to the nature of backfill material, or for offshore use) additional mechanical protection or a concrete weight coating may be applied by agreement. The type and grade of outer-wrap may be influenced by the presence or absence of the additional mechanical protection.

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4.2 Constituent materials

4.2.1 General

All constituent materials shall be supplied with the following identification:

- name of manufacturer;

- date of manufacture;

- batch number/letter(s);

- reference to this European Standard;

- type and grade of material;

- expiry date (where applicable).

4.2.2 Primers

4.2.2.1 General

Any primer without the required identification shall be rejected and replaced with approved material. The primer shall be supplied in suitable airtight containers.

The primer shall be compatible with the chosen bitumen based enamel coating.

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4.2.2.2 Primer Type 1

Primer Type 1 for cold application shall consist of chlorinated rubber and plasticizer and, when required, colouring matter, together with solvents needed to give a consistency suitable for application by spray, brush or other approved method. Primer Type 1 shall conform to the requirements given in Table 1.

4.2.2.3 Primer Type 2

Primer Type 2 for cold application shall consist of hydrocarbon resins and plasticizer and, when required, colouring matter, together with solvents needed to give a consistency suitable for application by spray, brush or other approved method. Primer Type 2 shall conform to the requirements given in Table 1.

Table 1 — Characteristics of synthetic primers

Characteristics	Primer Type 1	Primer Type 2	Method of test
Flow time (Flow cup n°4 at 23 °C), seconds	35 to 60	35 to 60	EN ISO 2431
Flash point (Abel closed cup), minimum °C	23	23	EN ISO 13736
Volatile matter, maximum % loss by mass	75	75	Annex H

4.2.2.4 Other primers

Primers based on other materials (e.g. epoxy resin based aqueous primers) may be used providing that, when used in combination with the selected bitumen based enamel coating, they fulfil the performance criteria given in 4.2.4.

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4.2.3 Filler

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The filler shall comprise a finely divided mineral powder which is not hygroscopic, not electrically conductive and is inert with respect to the other constituents of the tube coating and is resistant to attack by the medium to which it will normally be exposed. It shall be physically and chemically stable at the maximum application temperature of the coating material.

NOTE Powdered slate and talc are typical examples of suitable filler types.

The filler grading shall meet the following requirements:

— passing 90 µm: not less than 93 % by mass;

— passing 250 µm: not less than 99 % by mass;

when tested using the wet sieving method in accordance with 7.3 of ISO 2591-1:1988.

4.2.4 Bitumen based coating enamels

NOTE 1 Bitumen based coating materials are classified into two categories:

— Category 1: oxidized bitumen enamel containing filler;

— Category 2: modified bitumen enamel containing filler.

NOTE 2 Bitumen based coating materials are further sub-divided into a number of grades according to the conditions of application and service, see Annex J.

4.2.4.1 Oxidized bitumen enamel (Category 1)

Category 1 coating materials shall consist of a uniform mixture of oxidized bitumen and filler. The grading of the filler shall be as described in 4.2.3.

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Category 1 coating materials shall conform to the requirements for the appropriate grade given in Table 2 when tested by the corresponding methods.

Category 1 coating materials detailed in Table 2, in conjunction with an appropriate primer, shall also conform to the requirements for the appropriate grade given in Table 3 when tested by the corresponding methods.

Table 2 — Characteristics of Category 1 coating enamels

Characteristics	Grade a	Grade b	Grade c	Method of test
Filler content by ignition, % by mass	25 to 35	25 to 35	45 to 55	Annex K
Density at 25 °C, g/cm^3	1,2 to 1,4	1,2 to 1,4	1,4 to 1,65	Annex L
Softening point (ring and ball), °C	100 to 120	110 to 130	120 to 150	EN 1427
Penetration at 25 °C, 0,1 mm	10 to 20	5 to 17	5 to 15	EN 1426
Flash point (Cleveland open cup), minimum °C	250	260	260	EN ISO 2592

Table 3 — Tests for Category 1 coating enamels

Property		Grade a	Grade b	Grade c	Method of test
Sag, maximum mm	60 °C, 24 h	1,5	—	—	Annex D
	75 °C, 24 h	—	1,5	1,5	
Impact disbonded area, maximum mm^2	0 °C	15 000	—	—	Annex E
	25 °C	—	6 500	6 500	
Peel initial and delayed, maximum mm	30 °C	3,0	3,0	—	Annex F, F.4.1
	40 °C	3,0	3,0	3,0	
	50 °C	3,0	3,0	3,0	
	60 °C	3,0	3,0	3,0	
Bend at 0 °C, minimum, mm		20	15	10	Annex G
Cathodic disbonding, disbonded radius after 28 d, maximum, mm		10	10	10	Annex I

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4.2.4.2 Modified bitumen enamel (Category 2)

Category 2 coating materials shall consist of a uniform mixture of modified bitumen and filler. The grading of the filler shall be as described in 4.2.3.

Category 2 coating materials shall conform to the requirements for the appropriate grade given in Table 4 when tested by the corresponding methods.

Category 2 coating materials specified in Table 4, in conjunction with an appropriate primer, shall also conform to the requirements for the appropriate grade given in Table 5 when tested by the corresponding methods.

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Table 4 — Characteristics of Category 2 coating enamels

Characteristics	Grade a	Grade b	Method of test
Filler content by ignition, % by mass	20 to 30	25 to 35	Annex K
Density at 25 °C, g/cm^3	1,1 to 1,3	1,2 to 1,4	Annex L
Softening point (ring and ball), °C	115 to 135	130 to 160	EN 1427
Penetration at 25 °C, 0,1 mm	10 to 30	5 to 15	EN 1426
Flash point (Cleveland open cup), minimum °C	260	260	ISO 2592

Table 5 — Tests for Category 2 coating enamels

Property		Grade a	Grade b	Method of test
Sag, maximum mm	80 °C, 24 h 90 °C, 24 h	1,5 —	— 1,5	Annex D
Impact disbonded area, maximum mm^2	0 °C - 10 °C	— 6 500	6 500 —	Annex E
Peel initial and delayed, minimum N/20 mm	30 °C 40 °C 50 °C 60 °C	80 50 30 20	80 50 30 20	Annex F, F.4.2
Bend at – 10 °C, minimum mm		20	15	Annex G
Cathodic disbonding, disbonded radius after 28 d, maximum mm		7	7	Annex I

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4.2.5 Inner-wrap

The inner-wrap shall be a non-woven glass fibre tissue which comprises a continuous sheet of randomly arranged glass fibres in an open porous structure bonded by a suitable resin and shall be reinforced by continuous longitudinal glass yarns at maximum 30 mm spacing.

The inner-wrap shall have a uniform appearance and be free from holes and tears.

The inner-wrap shall be compatible with the bitumen based enamel coating material with which it is used and shall have a texture such that it may be embedded completely within the coating material.

The glass shall be of Hydrolytic Class 3 quality as a minimum when tested in accordance with ISO 719.

The inner-wrap shall conform to the requirements of Table 6.

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Table 6 — Characteristics of inner-wrap

Characteristics	Unit	Specification	Method of test
Mass per area	g/m^2	50 ± 3	Annex M
Loss of mass on ignition (binder content), maximum	%	20	Annex M
Tensile strength, minimum - longitudinally - transverse	 N/50 mm N/50 mm	 150 50	EN 12311-1 modified as in Annex N
Thickness, minimum	mm	0,33	EN 1849-1[a]
Porosity	Pa	6 to 19	ASTM D737-96, Annex O
[a] Modified to give a cross-sectional area of 645 mm^2 and a pressure of 13,8 kPa.			

4.2.6 Outer-wrap

The outer-wrap shall have a uniform porosity which allows the air and fumes to escape and the hot coating to bleed through the outer-wrap ensuring it is fused into the outer surface.

The outer-wrap shall have a uniform appearance free from holes, slits and other visible faults. The reinforcement yarns shall be spaced evenly across the width.

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At the time of unrolling at ambient temperature the successive layers of outer-wrap shall not stick to each other.

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The bitumen based material used for impregnation shall be compatible with the bitumen based enamel coating material. The outer-wrap shall meet the requirements of the type selected from Table 7.

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NOTE For Guidelines on the use of outer-wrap, see Annex J.

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Table 7 — Characteristics of outer-wrap

Characteristic	Unit	Type						Method of test
Base glass/carrier		A	B	C	D	E	F	
Type of base glass/carrier		non-woven glass fibre tissue	non-woven glass fibre tissue	woven glass fibre	composite glass fibre	composite glass/ polyester fibre	composite glass/ polyester fibre	
Mass per area of base glass before impregnation, minimum	g/m^2	50	80	170	90	70	110	Annex M
Outer-wrap								
Mass per area, minimum	g/m^2	450	550	250	500	450	450	Annex M
Thickness, minimum	mm	0,6	0,76	0,76	0,76	0,5	0,6	EN 1849-1 [a]
Tensile strength, minimum								EN 12311-1 modified as in Annex N
- longitudinal	N/50 mm	300	300	800	700	400	800	
- transverse	N/50 mm	150	230	800	700	200	800	

[a] Modified to give a cross-sectional area of 645 mm^2 and a pressure of 13,8 kPa.

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4.2.7 Hot applied bitumen based tapes

NOTE Tubes may be coated by the use of pre-formed hot applied bitumen based tapes. The process is analogous to flood coating or extrusion coating but differs significantly in its detail. For guidelines on the use of hot applied bitumen based tapes, see Annex J.

Composition, use and application of hot applied bitumen based tapes shall be in accordance with Annex P.

5 Method of application

5.1 Surface preparation

5.1.1 General

Tubes and components shall be maintained at least 3 °C above the dew point temperature at all times during the cleaning and coating process.

NOTE At the time of application, particularly when the weather is damp and cold, it may be necessary to pre-heat the tubes and components, and this operation should not be prejudicial to the cleanliness of the surface or to the conditions required for the application of the primer.

5.1.2 Pre-blast requirements

Immediately prior to blast cleaning, the tubes shall be inspected for surface contamination (oil, grease, temporary corrosion protection, etc.). Where oil, grease or other surface contaminants are present they shall be removed (without spreading over the surface) with a suitable solvent (e.g. Xylene) or a biodegradable emulsifier.

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All surface defects (slivers, laminations, etc.) detrimental to the surface or to the adhesion of the coating shall be removed.

When necessary, tubes shall be washed with fresh potable water before blast cleaning to remove surface contaminants including mud, salts and other loosely adhering mineral matter. The tubes and components shall then be preheated to a minimum of 30 °C in order to remove moisture and to prevent contamination of the abrasive media.

5.1.3 Blast cleaning

Tubes and components shall be blast cleaned. The grade of abrasive shall give a blast peak to trough surface profile of 75 µm ± 25 µm. The degree of cleanliness shall be to Sa 2½ in accordance with EN ISO 8501-1.

Only dry abrasive techniques shall be employed. The abrasive shall be reusable chilled iron grit or steel grit or a mixture of grit and shot. The abrasive shall be kept free from dust, salts and other impurities.

Sand shall not be used.

5.2 Priming

The primer shall be applied to a dust free, clean, dry, prepared surface. The primer shall be applied in accordance with the primer manufacturer's recommendations.

The primer film applied at the thickness specified by the primer manufacturer shall be uniform and continuous. The dry film thickness shall be measured at least once per shift. The primer shall be free from runs, drips, sags, misses, holidays and bare areas. Tubes not primed correctly shall be re-cleaned and re-primed.

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Tubes on which the primer has deteriorated, or become contaminated shall be rejected and shall be re-cleaned and re-primed.

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5.3 Application of enamel coating, inner-wraps and outer-wrap

5.3.1 Enamel preparation

The enamel shall be heated in kettles fitted with mechanical stirrers providing continuous agitation of the enamel, and accurate, easily readable recording thermometers, which extend to within 100 mm of the bottom of the kettle. The thermometers shall be calibrated and maintained in working order.

NOTE Bulk deliveries of molten enamel can be transferred directly to the kettles.

Solid enamel shall be broken up into small pieces, not exceeding 10 kg, in a suitable place free from contamination. The heat setting may be increased once a quantity of molten enamel forms in the kettle bottom, but the heat initially shall be applied on a low setting. Whilst the enamel is molten it shall be stirred and the lid of the kettle kept firmly closed, unless to withdraw molten enamel or to add fresh material. The quantity of enamel remaining in the kettle, which may be reheated, shall never exceed 10 % of the fresh loading. The enamel shall be heated to the manufacturer's recommended application temperature and shall not be held for a longer period than that recommended by the manufacturer.

Enamel that has been heated in excess of the manufacturer's maximum recommended temperature or held at application temperature for over 6 h shall be tested for softening point and penetration which shall conform to Table 3 or Table 4 depending on the category of enamel. Further tests shall be conducted at regular intervals, agreed at the time of ordering, to confirm that the material continues to conform to Table 3 or Table 4, otherwise it shall be rejected and discarded.

All application kettles shall be equipped with screens to exclude particles of foreign matter or other materials that may cause coating flaws. Ensure there is no mixing of material from different sources or of different categories unless experience has shown that the final product has satisfactory properties. In particular it shall be recognized that the chemical and physical characteristics of coal-tar-based coatings differ from those of bitumen-based coatings and that the two kinds of coating shall not be blended together in protective coatings. The plant shall be

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cleaned out thoroughly when the use of bitumen coating materials follows that of coal-tar coating materials or vice versa. The same precaution shall be taken when interchanging between different types of bitumen enamels. The residual material removed from the kettles during cleaning shall be discarded, not blended with other enamel.

5.3.2 Application

5.3.2.1 General

Coat and wrap application shall follow priming within 2 h, and the primed surface shall be dry and free from surface contamination prior to enamel application.

NOTE Thickness recommendations for Category 1 and Category 2 coatings are given in Annex J.

5.3.2.2 Category 1 enamel

Category 1 enamel shall be applied by flood coating or pouring with equipment for spirally wrapping the inner-wrap(s) and outer-wrap under controlled tension using trained operators. Such equipment shall be approved prior to commencement.

The flood coat of enamel shall have the inner-wrap(s) pulled in and the outer-wrap pulled on immediately following flood coating. The inner-wrap(s) shall not touch the surface of the pipe and shall be embedded in the middle third of the enamel thickness. If two inner-wraps are required, they shall be separated at spacings to be specified at the time of ordering, see 6.2.2. The outer-wrap shall be pulled onto the enamel and be well bonded with some bleed through of enamel occurring.

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All wraps shall be wrinkle-free with minimum overlap of 12 mm. The enamel shall be applied at a temperature in accordance with the manufacturer's recommendations. The enamel shall flow evenly onto the pipe and be free from any solid particles which may cause irregularities in flow.

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The coating shall be cut-back where necessary to meet the specification. The method of removal of cut-back shall be approved prior to commencement of coating.

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5.3.2.3 Category 2 enamel

NOTE 1 Due to their higher viscosity, Category 2 materials are not suitable for flood coating.

Category 2 materials shall be applied by an extrusion process.

Equipment shall be used for spirally wrapping the outer-wrap under controlled tension using trained operators.

NOTE 2 Category 2 materials do not require the use of inner-wraps.

The extruded enamel shall have the outer-wrap pulled on immediately following enamel application. The outer-wrap shall be pulled onto the enamel and be well bonded with some bleed through of enamel occurring.

All wraps shall be wrinkle-free with minimum overlap of 12 mm. The enamel shall be applied at a temperature in accordance with the manufacturer's recommendations. The enamel shall flow evenly onto the pipe and be free from any solid particles which may cause irregularities in flow.

The coating shall be cut-back where necessary to meet the specification. The method of removal of cut-back shall be approved prior to commencement of coating.

5.4 Solar protection

When specified, a weather resistant solar protection which is compatible with the coating shall be applied to the total coated pipe prior to stockpiling. Surplus solar reflective coating shall be removed from the uncoated ends of the pipe.