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شرکت ملی گاز ایران

مدیریت پژوهش و فنآوری

امورتدوین استانداردها

IGS

دستورالعمل

سیستم پوششی تقویت شده اپوکسی و وینیل استری برای محافظت از خوردگی خارجی سرجوش ها ی خطوط لوله فلزی

Fiber Reinforced Epoxy &Vinyl Ester Coating System for External Corrosion Protection of Field Joints of Steel Pipe Lines

دفتر مدیرعامل

شرکت ملی گازایران

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ابلاغ مصوبه هیأت مدیره

مدیر محترم پژوهش و فناوری

باسلام،

به استحضار می‌رساند در جلسه ۱۹۵۱ مورخ ۱۴۰۰/۰۹/۲۱ هیات مدیره، نامه شماره گ۹/۰۰۰/۱۱۸۶۲۶ مورخ ۱۴۰۰/۰۹/۱۶ آن مدیریت در خصوص تصویب نهایی مقررات فنی شرکت ملی گاز ایران به شرح زیر مطرح و مورد تصویب قرار گرفت.

دستورالعمل سیستم پوششی تقویت شده اپوکسی و وینیل استری برای محافظت از خوردگی خارجی سرجوش های خطوط لوله فلزی

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Foreword

This standard specification is intended to be mainly used by N.I.G.C. and contractors, and has been prepared base on interpretation of recognized standards and technical documents, as well as knowledge, backgrounds and experiences in gas industries at national and international levels.

Iranian Gas Specification (IGS) are prepared, reviewed and amended by technical standard committees within NIGC standardization division of research and technology management and submitted to "the standards council of NIGC" for approval.

IGSs are subjected to revision, amendment or withdrawal, if required, and thus the latest edition of IGS shall be checked / inquired by NIGC'S users.

This standard must not be modified or altered by NIGC employees or its contractors. Any deviation or conflicts between this specification and other applicable standards, codes, procedure or well-known manufacturer's specifications must be resolved in writing by the user or its representative through Manager, Engineering Department or standardization division of NIGC.

The technical standard committee welcomes comments and feedbacks from concerned or interested corporate and individuals about this standard, and may revise this document accordingly based on the received feedbacks.

General Definitions

Throughout this standard the following definitions, where applicable, should be followed:

1- "STANDARDIZATION DIV." is organized to deal with all aspects of industry standards in NIGC. Therefore, all enquiries for clarification or amendments are requested to be directed to mentioned division.

2- "COMPANY": refers to National Iranian Gas Company (NIGC).

3- "SUPPLIER": refers to a firm who will supply the service, equipment or material to IGS specification whether as the prime producer or manufacturer or a trading firm.

4- "SHALL ": is used where a provision is mandatory.

5- "SHOULD": is used where a provision is advised only.

6- "MAY": is used where a provision is completely discretionary.

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Contents

Guidance for use of this specification:

The amendments/ supplements ISO 21809-3 2016 18 C&D given in this specifications are directly equivalent sections or clauses in ISO 21809-3 18C&D all other Paragraphs which are not amended by this supplementary shall remain valid as Written. The following annotations, as specified hereunder, have been used at the Beginning of each paragraph to indicate the type of change made to that paragraph of ISO 21809-3

Sub. (Substitution) "The paragraph in ISO 21809-3 18C&D shall be deleted and replaced by the new paragraph in this supplementary"

Del. (Deletion) "The paragraph in ISO 21809-3 18C&D shall be deleted without any Replacement"

Add. (Addition) "The new paragraph with the new number shall be added to The relevant section of ISO 21809-3 18C&D "

Mod. (Modification) "Part of the clause or paragraph in ISO 21809-3 18C&D shall be modified and/or the new description and/or statement shall be added to that clause or paragraph as given in this supplementary.

1. SCOPE (Sub.)

This standard specification covers the minimum requirements of Fiber reinforced epoxy & Fiber reinforced vinyl ester used for external corrosion protection on the field girth weld areas of steel pipe lines.

18 Liquid-applied coatings

18.1 Coating identification(Mod.)

Liquid-applied coatings (FJC Types 18C, 18D) shall be identified in the APS in accordance with Table 29 and shall meet the requirements of Table 30.

Maximum service temperature shall be established by agreement between end user and manufacturer. Data sheets for the coating materials shall be in accordance with Table 32.

Application instructions shall be provided by the manufacturer in accordance with Table 33.

18.2 Description of the coatings

18.2.1 Liquid epoxy — 18A(Del.)

18.2.2 Liquid polyurethane — 18B(Del.)

18.2.5 Cast polyurethane — 18E(Del.)

18.3 Surface preparation(Mod.)

Surface preparation shall be carried out by abrasive blasting according to the provisions of 9.1.2.1 and 9.1.2.2 to a minimum cleanliness of Sa 21/2. The surface profile attained shall be between 50 µm and 100 µm as measured in accordance with the requirements of ISO 8503-5.

The plant-applied coating shall be bevelled and roughened for the minimum length according to the overlap on the plant coating (18.4.3). The plant-applied coating shall not be removed or contaminated by abrasive dust.

Dust contamination shall be grade 2 or better measured in accordance with ISO 8502-3.

18.5 Testing of the applied coatings

18.5.4 Adhesion(Mod.)

The adhesion to the steel surface and to the plant-applied coating shall be tested in accordance with ISO 4624 (pull-off test). Adhesion shall meet the requirements of Table 30. These figures are applicable when using a hand driven mechanical device. A proper correlation with the corresponding figures obtained with an automatic device should be established and documented, preferentially during the PQT.

18.5.5 Impact resistance(Mod.)

The impact resistance shall be measured for types 18C and 18D using the method given in Annex D and shall meet the requirements of Table 30.

18.5.6 Hardness(Mod.)

Hardness Shore D shall be checked using a suitable hardness gauge in accordance with ISO 868. The applicator shall include in the ITP the manufacturer's data that specify the acceptable value obtained.

18.5.7 Cathodic disbondment(Mod.)

The cathodic disbondment shall be measured using the method given in Annex G. The cathodic disbondment after 28 days at 23 °C shall meet the requirements of Table 30. A test duration of 48 h instead of 28 days can be used for batch test, provided that the test temperature is increased to 65 °C and a comparison of results is performed during PQT.
The cathodic disbondment after 28 days at maximum service temperature (subject to an upper temperature limit of 95 °C) shall meet the requirements of Table 30.

18.5.8 Hot-water immersion test(Mod.)

A hot water immersion test shall be carried out in accordance with Annex I with a duration of 28 days, the test temperature being the maximum service temperature of the joint coating, limited as specified in Annex I.
The adhesion to the steel surface and to plant-applied coating shall be tested in accordance with ISO 4624 (pull-off test) and shall meet the requirements of Table 30.

18.5.10 Indentation resistance(Mod.)

The indentation resistance shall be measured for types 18C and 18D using the method given in Annex E and shall meet the requirements of Table 30.

18.5.11 Specific electrical insulation resistance(Mod.)

The specific electrical insulation resistance shall be measured for types 18C and 18D using the method given in Annex F and shall meet the requirements of Table 30.

18.5.12 Compressive strength(Del.)

18.5.13 Electrical volume resistivity(Del.)

18.5.14 Water absorption(Del.)

Table 31 — Requirements for solid cast polyurethane — 18E(Del.)

Table 29 — Coating identification
Property
Coating trade name
Basic type of coating material
Minimum thickness of the applied coating system
Compatible plant coatings [a]
Maximum service temperature
[a] State all types of plant coating that have been tested

Table 30 — Requirements for types 18C and 18D liquid coatings (Sub.)							
Property	**Test temp.**	**Unit**	**Type 18C** Reinforced epoxy	**Type 18D** Reinforced vinyl ester	**Qualification Certificate**	**Batch certificate**	**Test method**
Minimum thickness	-	µm	by agreement		*	*	Annex B
Visual inspection	-	-	free of cracks, foreign matter, blisters and pits, wrinkles, pin holes, dry spots, uniform resin colour				
Holiday detection at 5 kV/mm at a maximum of 25 kV	-	-	no holiday		*	*	Annex C
Impact resistance (holiday detection at 5 kV/mm)	23 °C −5 °C	J/mm	≥5 ≥1,5	≥5 ≥1,5	*	*	Annex D
Indentation resistance at 10 N/mm2	*T*max	% DFT	≤10	≤10	*	*	Annex E
Cathodic disbondment at 28 days	23 °C *T*max limited to 95 °C	mm	≤8 ≤15	≤8 ≤15	*	-	Annex G
Cathodic disbondment at 48 h	65 °C	mm	≤8	≤8	-	*	Annex G
Hardness (Shore D)	23 °C	-	as per manufacturer specification		*	*	ISO 868
Adhesion to pipe surface	23 °C	MPa	≥7	≥7	*	*	ISO 4624
Adhesion to FBE, liquid applied epoxy or PU plant coatings	23 °C	MPa	≥10,0a	≥10,0a	*	-	ISO 4624
Adhesion to polyolefin plant coatings	23 °C	MPa	≥2,0	≥2,0	*	-	ISO 4624
Adhesion to pipe surface after 28-day hot-water immersion test at Tmax limited as per Annex I	23 °C	MPa	≥7,0	≥7,0	*	-	Annex I plus ISO 4624

Cont.)Table 30 — Requirements for types 18C and 18D liquid coatings (Sub.)

Property	Test temp.	Unit	Type 18C Reinforced epoxy	Type 18D Reinforced vinyl ester	Qualification certificate	Batch certificate	Test method
Adhesion to polyolefin plant coating after 28-day hot-water immersion test at Tmax limited as per Annex I	23 °C	MPa	≥2,0	≥2,0	*	-	-Annex I plus ISO 4624
Adhesion to FBE, liquid applied epoxy or PU plant coatings after 28-day hot-water immersion test at Tmax limited as per Annex I	23 °C	MPa	≥7,0	≥7,0	*	-	Annex I plus ISO 4624
Specific electrical insulation resistance (R_{S100})	23 °C	Ω·m2	≥10[6]	≥10[6]	*	-	Annex F
R_{S100}/R_{S70}	-	-	≥0,80[b]	≥0,80[b]	*	-	-

a Figures applicable for PQT and PPT. For production testing, results of 70 % of these figures may be accepted by agreement due to a possible lack of curing of the glue during the allowable duration of testing, provided that the failure occurs within the glue.

b It is necessary that this requirement (RS100/RS70 ≥ 0,8) be fulfilled only if the specific electrical insulation resistance after 70 days is less than 10 times the requirement of the specific electrical insulation resistance after 100 days.

Table 32 — Data sheet(Sub.)		
Property	Unit	Test method
Trade name	—	—
Description of coating material	—	—
Solid content	%	—
Density	g/cm3	ISO 2811-1
Mix ratio	—	—
Colour	—	—
Minimum thickness	mm	ISO 4591 and ISO 4593
Maximum application temperature	°C	—
Minimum application temperature	°C	—
Maximum service temperature	°C	—
Minimum design temperature	°C	—
Maximum storage temperature	°C	—
Minimum storage temperature	°C	—
Shelf life at storage temperature	month	—
glass transition temperature (Tg)	°C	—
Lap shear	psi	EN 1465 (or ASTM D3165)

Table 33 — Application instructions(Sub.)	
Property	Unit
Ambient conditions (dew point)	—
Surface preparation of steel surface	—
Cleanliness (ISO 8501-1)	—
Profile (ISO 8503-2)	—
Surface preparation of plant coating	—
Pre-heat temperature range	—
Application of liquid coatings	—
Mixing ratio	—
Pot life	—
Cure temperature profile (temp. vs. time)	—
Overlap on plant coating (minimum)	—
Repair procedures	—
Dry to touch	—
Back fill time	—
Full cure time	—