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AMENDMENT 1
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**Petroleum and natural gas industries —
External coatings for buried or
submerged pipelines used in pipeline
transportation systems —**

**Part 3:
Field joint coatings**

AMENDMENT 1
(standards.iteh.ai)

*Industries du pétrole et du gaz naturel — Revêtements externes des
conduites enterrées ou immergées utilisées dans les systèmes de
transport par conduites*

<https://standards.iteh.ai/en/standards/iso-21809-3-2008-amd-1-2011>

Partie 3: Revêtements des joints soudés sur site

AMENDEMENT 1



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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

Amendment 1 to ISO 21809-3:2008 was prepared by Technical Committee ISO/TC 67, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*, Subcommittee SC 2, *Pipeline transportation systems*.

Amendment 1 to ISO 21809-3:2008 adds field joint coatings based on non-crystalline low-viscosity polyolefin tapes and makes corrections to the technical requirements of ISO 21809-3:2008.

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Petroleum and natural gas industries — External coatings for buried or submerged pipelines used in pipeline transportation systems —

Part 3: Field joint coatings

AMENDMENT 1

Page 1, Clause 2

In the list of normative references, replace

“ISO 31-0:1992, *Quantities and units — Part 0: General principles*”

with

“ISO 80000-1:2009, *Quantities and units — Part 1: General*”

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Page 7, 5.1

<https://standards.iteh.ai/catalog/standards/sist/ceb7f68f-7c21-4360-a60e-35e828b81b34/iso-21809-3-2008-amd-1-2011>

Replace both instances of “ISO 31-0:1992” with “ISO 80000-1:2009”.

Page 9, 7.2.1; page 13, 9.1.2.1 and 9.1.2.2; page 14, 9.1.3 and 9.4; page 64, D.1.1; page 65, D.1.3.1; page 66, D.1.4 and D.2.1; page 83, I.5

Replace the cross-reference to “Clauses 10 to 17” with one to “Clauses 10 to 18”.

Page 12, Clause 8

Add the following new rows in Table 1:

Code	Clause	Type of field joint coating
1E-a	18	Coatings based on non-crystalline low-viscosity polyolefin tapes with polymeric tape outer wrap
1E-b		Coatings based on non-crystalline low-viscosity polyolefin tapes with heat shrinkable sleeve outer wrap

Page 14, 9.1.2.2, seventh paragraph

Replace “1A, 1B, 1C, 1D, 2A and 7” with “1A, 1B, 1C, 1D, 1E-a, 1E-b, 2A, and 7”.

Page 15, 10.2.2

Replace the first sentence with the following:

“Petrolatum tape coatings consist of a single layer or multiple layers of petrolatum tapes, with or without a primer.”

Page 17, 10.4.4

Replace the third bullet with the following:

- Apply a thin coat of compatible primer (if any) by brush, by hand or using other applicable tools.

Page 21, Table 5

Replace Table 5 with the one given below.

Table 5 — Requirements for Type 1C — Wax tape and primer

Property	Test temperature °C	Units	Requirements	Test method
Primer				
Congeal point	—	°C	55 to 70	ASTM D 938
Flash point	—	°C	≥ 65	ASTM D 92
Specific gravity	25	g/cm ³	0,9 to 1,25	ASTM D 70
Cone penetration	25	0,1 mm	75 to 225	ASTM D 937
Dielectric strength	—	V/μm	≥ 4	ASTM D 149
Tape				
Congeal point of saturant	—	°C	65 to 70	ASTM D 938
Flash point of saturant	—	°C	≥ 60	ASTM D 92
Thickness	—	mm	> 1,75	ASTM D 1000
Dielectric strength	—	V/μm	> 6,7	ASTM D 149
Complete coating				
Impact resistance	20	J/mm	≥ 0,8	Annex G
Indentation resistance	Test pressure	N/mm ²	0,1	Annex H
	Holiday detection	—	No holiday	
	Residual thickness	mm	≥ 0,6	
Specific electrical insulation resistance	R _{S100}	Ω·m ²	≥ 10 ⁶	Annex K
	R _{S100} /R _{S70}	—	≥ 0,8 ^a	
Cathodic disbondment resistance at 28 days	23	mm	< 12	Annex F
Peel strength to pipe surface and plant coating	23	—	Leave a film of compound on the substrate	—
Peel strength to steel and plant coating before and after 28-day hot-water immersion test at 30 °C	23	—	Leave a film of compound on the substrate	Annex I
Drip resistance	45	—	No dripping of compound	Annex J
Holiday detection at 5 kV/mm + 5 kV	—	—	No holiday	Annex B

^a This requirement (R_{S100}/R_{S70} ≥ 0,8) need 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.

Page 31, Table 16

In row 5, column 3, delete the cross-reference to “Table 1”.

Page 37, 13.5.4

Replace the text of the entire subclause with the following:

The adhesion to the steel surface shall be tested in accordance with ISO 4624 (pull-off test) and shall meet the requirements of Table 19 or 20. For production testing, the method defined in Annex C may be used for Types 4A and 4B, unless otherwise agreed. The results shall meet the requirements of Table 19.

The adhesion to plant-applied coating shall be tested in accordance with Annex C for Types 4A and 4B and ISO 4624 for Types 4C, 4D and 4E, and shall meet the requirements of Table 19 or 20. Alternatively, the adhesion test may be carried out using ISO 4624 for Types 4A and 4B for PQT and PPT, and shall meet the requirements of Table 19 or 20.

Page 37, 13.5.8

Replace the text of the entire subclause with the following:

A hot water immersion test shall be carried out in accordance with Annex I, the test temperature being the maximum design temperature of the joint coating, limited as specified in Annex I.

The adhesion to the steel surface shall be tested in accordance with ISO 4624 (pull-off test) during PQT and PPT and shall meet the requirements of Table 19 or 20.

The adhesion to plant-applied coating shall be tested in accordance with Annex C during PQT and PPT for Types 4A and 4B and in accordance with ISO 4624 for Types 4C, 4D and 4E, and shall meet the requirements of Table 19 or 20. Alternatively, the adhesion test may be carried out using ISO 4624 (pull-off test) and shall meet the requirements of Table 19 or 20 for Types 4A and 4B.

Page 39, Table 19

In row 10, column 2, replace “2 °C” by “20 °C”.

In row 15, column 8, replace “ISO 4624” by “Annex I plus ISO 4624”.

Page 40, Table 20

Delete row 6 (Cathodic disbondment at 48 h).

In row 11, column 2, replace “23 °C” by “20 °C”.

Page 59

Add the following Clause 18 before Annex A.

18 Coatings based on non-crystalline low-viscosity polyolefin tapes

18.1 Coating identification

Coatings based on non-crystalline low-viscosity polyolefin tapes shall be identified in the APS in accordance with Table 40 and shall meet the requirements of Table 41.

Data sheets for the non-crystalline low-viscosity polyolefin compound tapes used as the base of the coatings shall be in accordance with Table 42.

Application instructions shall be provided by the manufacturer in accordance with Table 43.

18.2 Description of the coatings

The coatings consist of the following:

- a coat comprising one or several layers of a non-crystalline low-viscosity (fully amorphous, non-crosslinked) polyolefin (e.g. polyisobutylene) compound tape applied without any primer or adhesive; this material may be reinforced by fabrics; a backing film may cover this compound tape;
- an outer wrap, which shall be a polymeric tape (FJC type 1E-a) or a heat-shrinkable sleeve (FJC type 1E-b) or any other agreed material, provided that the requirements of Table 41 are fulfilled for the complete coating.

NOTE The purposes of the outer wrap are to provide additional pressure in order to support cold flow of the compound tape and self-healing properties of the complete coating system and to give mechanical protection.

Maximum design temperature is 50 °C to 80 °C, depending on the composition of the non-crystalline low-viscosity polyolefin compound tape and on the choice of outer wrap.

Specific configurations allowing higher maximum design temperature may be used subject to qualification.

The maximum design temperature shall be precisely defined in the APS and for the coating identification (see Table 40). Requirements given in Table 41 are applicable whatever the maximum design temperature.

18.3 Surface preparation

Surface preparation shall be carried out in accordance with the APS. The edges of the plant coating shall be bevelled and the plant coating shall be roughened over the minimum length specified for the overlap on the plant coating (see 18.4.2).

Surface preparation shall be carried out either by means of wire-brush cleaning in accordance with 9.1.2.1 and 9.1.2.3 to a minimum degree of cleanliness of ISO 8501-1:2007, grade St 2, or by means of abrasive blast cleaning in accordance with 9.1.2.1 and 9.1.2.2 to a minimum degree of cleanliness of ISO 8501-1:2007, grade Sa 2 ½.

Alternative surface preparation methods may be used by agreement.

Dust contamination shall be a maximum of grade 3 measured in accordance with ISO 8502-3:1992.

18.4 Application of the coatings

18.4.1 General

Application of the coatings shall be carried out in accordance with the APS.

The non-crystalline low-viscosity polyolefin compound tape shall be applied without tension by means of lay-up techniques, using prefabricated shapes and sizes which are wrapped in a wrap-around method. Alternatively, spiral wrapping may be used for small-diameter pipes.

The outer wrap shall be applied directly on the compound tape in accordance with 10.4.5 for polymeric tape or 11.4.3 for heat-shrinkable sleeves, or in accordance with the manufacturer's recommendations for other agreed materials.

The minimum application temperature shall be 20 °C above the glass transition temperature of the low-viscosity polymer.

18.4.2 Overlap

The overlap of the compound tape on the plant-applied coating shall be in accordance with the manufacturer's application instructions (see Table 43) and shall be a minimum of 50 mm.

The outer wrap shall cover the compound tape.

When a polymeric tape is used for the outer wrap (Type 1E-a), it may overlap the plant coating.

When a heat-shrinkable sleeve (Type 1E-b) is used, it shall overlap the plant coating by at least 50 mm on both sides, excluding bevels.

The overlap of any other agreed outer wrap material shall be in accordance with the manufacturer's recommendations.

A double thickness of the compound tape shall be applied in an area extending 25 mm either side of the weld cap.

The overlap of the spirally wrapped outer wrap tape shall be 50 %.

18.5 Testing of the applied coating

18.5.1 General

The tests in 18.5.2 to 18.5.14, summarized in Table 41, shall be carried out for production quality control and for PQT and PPT if required.

18.5.2 Thickness

The minimum thicknesses of the compound tape and of the complete coating shall be agreed between the end user and/or purchaser and the applicator, based on the data sheets and recommendations of the manufacturers. The minimum thickness shall be specified in the APS.

Unless otherwise agreed with the purchaser, the minimum thickness of the complete coating on the weld cap shall be not less than 0,6 mm.

NOTE The coating thickness on the weld cap is normally less than on the body because some of the coating material flows from the weld cap to the body, both during and after application. This is necessary to prevent voids in the coating and is not detrimental to the corrosion protection.

The coating thickness shall be measured using the method given in Annex A.

18.5.3 Holiday detection

The entire surface of the coated joint shall be checked for holidays or other discontinuities at a voltage of 5 kV/mm + 5 kV at a maximum of 25 kV, in accordance with the method defined in Annex B. This test shall be carried out after application of the compound tape and may be repeated after completion of the coating where so required by the purchaser.

Holidays shall be repaired in accordance with the APS.

18.5.4 Impact resistance

The impact resistance shall be measured on the complete coating, using the method given in Annex G, and shall meet the requirements of Table 41.

18.5.5 Indentation resistance

The indentation resistance shall be measured on the complete coating at 23 °C and at maximum design temperature, using the method given in Annex H, and shall meet the requirements of Table 41.

18.5.6 Specific electrical insulation resistance

The specific electrical insulation resistance shall be measured on the compound tape, using the method given in Annex K, and shall meet the requirements of Table 41.

18.5.7 Cathodic disbondment resistance

The cathodic disbondment resistance shall be measured on the complete coating, using the method given in Annex F carried out on a pipe section. The resistance to cathodic disbondment shall meet the requirements of Table 41. The cathodic disbondment test shall be carried out over a period of 28 days at 23 °C. A test duration of 48 h instead of 28 days may be used for PPT or production testing if the test temperature is increased to 65 °C and provided that comparison of results is performed during PQT.

The cathodic disbondment after 28 days at maximum design temperature (subject to an upper limit of 95 °C) shall meet the requirements of Table 41.

At the end of the test, the thickness of the compound tape at the location of the artificial defect shall be as a minimum the thickness specified in the APS and no holiday shall be detected.

18.5.8 Peel strength between outer wrap and compound tape and between layers of outer wrap

The peel strength between outer wrap and compound tape (with or without backing) shall be measured at 23 °C and at maximum design temperature, using the method given in Annex M, and shall meet the requirements of Table 41.

If the outer wrap consists of multiple layers, the peel strength between outer wrap layers shall also be measured at 23 °C and at maximum design temperature, using the method given in Annex M, and shall meet the requirements of Table 41.

18.5.9 Adhesion to pipe surface and plant coating

18.5.9.1 General

The adhesion test shall be carried out after application of the outer wrap and after cooling where heat has been applied.

18.5.9.2 Testing

The peel strength with respect to steel and plant coating of compound tape containing reinforcement shall be tested at 23 °C and at maximum design temperature, using the methods given in Annex D, and the results concerning failure mode and substrate coverage shall meet the requirements given in Table 41, unless otherwise agreed by all parties including the manufacturer. The method given in D.1 shall be used for PQT. The method given in D.2 may be used for PPT and production testing.

The adhesion to steel and plant coating of compound tape containing no reinforcement shall be measured as follows. Adhesion testing shall be carried out at the 6 o'clock and 12 o'clock positions of the FJC by using a utility knife to attempt to lift the coating material from the steel surface. The coating material shall leave a film of corrosion protective coating material on the substrate. There shall be no evidence of adhesive failure.

Adhesion to the plant coating of the outer wrap polymeric tape (Type 1E-a) when applicable or of the outer wrap shrinkable sleeve (Type 1E-b) shall be measured using the peel strength method given in Annex D and shall meet the requirements given in Table 41.

18.5.10 Thermal ageing resistance

18.5.10.1 Compound tape

The thermal ageing resistance for the compound tape shall be measured using the method given in N.3 for 100 days at $T_{\max} + 20$ °C. The adhesion of the compound tape to the pipe surface and the plant coating shall be measured as specified in 18.5.9.2 and shall meet the requirements of Table 41.

18.5.10.2 Outer wrap

For Type 1E-a, the thermal ageing resistance for the outer wrap polymeric tape shall be measured using the method given in N.1 and N.2 for 100 days at $T_{\max} + 20$ °C and shall meet the requirements of Table 41.

For Type 1E-b, the thermal ageing resistance for the outer wrap shrinkable material shall be measured using the method given in N.1 and N.3 for 100 days at $T_{\max} + 20$ °C and shall meet the requirements of Table 41.

18.5.11 Lap shear strength

The lap shear strength of the compound tape shall be measured at 23 °C and at maximum design temperature, using the method given in L.2, and shall meet the requirements of Table 41. The coating thickness shall be 2 mm, instead of 1 mm as specified in L.2.

18.5.12 Hot-water immersion test

The hot-water immersion test of the compound tape shall be carried out in accordance with Annex I for 100 days at $T_{\max} + 20$ °C, limited as specified in Annex I. The adhesion of the compound tape to the pipe surface and the plant coating shall be measured as specified in 18.5.9.2 and shall meet the requirements of Table 41.

The hot-water immersion test of the outer wrap shall be carried out in accordance with Annex I for 100 days at $T_{\max} + 20$ °C, limited as specified in Annex I. The adhesion of the outer wrap to the plant coating shall be measured as specified in 18.5.9.2 and shall meet the requirements of Table 41.

18.5.13 Glass transition temperature

The glass transition temperature of the compound tape shall be determined by differential thermal analysis (Annex E) of a sample of the material and shall meet the requirements of Table 41.

18.5.14 Drip resistance

No dripping of the compound tape shall be allowed, as specified in Table 41, when performing the test in accordance with Annex J with a modified test temperature of maximum design temperature +15 °C and in any case a minimum of 80 °C.