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	CLIENT: PETROBRAS	SHEET: 1 of 8
	JOB: RIGID OFFSHORE PIPELINES	CC
	AREA:	PROJECT:
DP&T	TITLE: PIPELINE FIELD JOINT COATING AND FIELD REPAIR OF LINEPIPE COATING	 EISE/EDR

INDEX OF REVISIONS

REV.	DESCRIPTION AND/OR REVISED SHEETS
0	ORIGINAL
A	REVISED IN ACCORDANCE WITH DNVGL-RP-F102:2017.

	REV. 0	REV. A	REV. B	REV. C	REV. D	REV. E	REV. F	REV. G	REV. H
DATE	29/11/2017	19/02/2018							
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TITLE: PIPELINE FIELD JOINT COATING AND FIELD REPAIR OF LINEPIPE COATING

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1. SCOPE OF DOCUMENT

1.1 This Technical Specification defines the minimum requirements related to the application of field joint coating and coating field repair.

1.2 Contractor shall fulfill all the requirements presented within this Technical Specification.

1.3 This document shall be read in conjunction with the following standards:

- Recommended Practice DNVGL-RP-F102 - August 2017
Title: Pipeline Field Joint Coating and Field Repair of Linepipe Coating
- ISO 21809-3:2008 with amendment issued on 2011
Title: Petroleum and natural gas industries - External coatings for buried or submerged pipelines used in pipeline transportation systems - Part 3: Field joint coatings

In case that it is noted any sort of conflict between this Technical Specification and the aforementioned documents, the following precedence order shall be respected by Contractor:

- a) This Technical Specification
- b) DNVGL-RP-F102 - August 2017
- c) ISO 21809-3:2008 with amendment issued on 2011

1.4 This Technical Specification is not applicable to thermal insulation coatings.

2. FIELD JOINT COATING AND FIELD REPAIRS OF LINEPIPE COATING REQUIREMENTS

2.1 Contractor shall fulfill the requirements of the following document for the manufacturing of field joint coating:

- Recommended Practice DNVGL-RP-F102 - August 2017.
Title: Pipeline Field Joint Coating and Field Repair of Linepipe Coating.

There are some additional and modified requirements which shall be fulfilled by Contractor. Additional and modified requirements to the aforementioned document are highlighted in this Technical Specification considering the following expressions:

[ADDITION] - When Contractor shall consider new requirements.

[MODIFICATION] - When a partial or full modification in the referred item is required.

[DELETED] - When the referred item shall be entirely disregarded by Contractor.



3. ADDITIONAL AND MODIFIED REQUIREMENTS FOR FIELD JOINT COATING APPLICATION RELATED TO DNVGL-RP-F102 STANDARD

The items mentioned below are following the sequence already defined within the Recommended Practice DNVGL-RP-F102 - August 2017. The DNVGL-RP-F102 paragraph number is given in brackets.

1.2 Scope

(1.2.2) Modification: "The following 10 types of FJC/CFR systems, applicable to corrosion control of submarine pipelines, and including associated risers, are covered in this document. (The designations used in this RP are the same as in ISO 21809-3 but some amendments are made by introducing a number within parenthesis):

— Type 3A: Fusion bonded epoxy (FBE) coating (FJC only)

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- Type 2B(2): PE heat shrink sleeve applied on FBE coating (FJC only)
- Type 2C(3): PP heat shrink sleeve applied on FBE coating (FJC only)
- Types 5A, 5B and 5C(1): PP coatings applied on FBE (FJC only)
- Types 5D(1) and 5E: PE coatings applied on FBE (FJC only)”

(1.2.3) Deleted.

1.3 Objectives and use

(1.3.1) Modification: “DNVGL-RP-F102 has been prepared for compliance with general and coating system specific requirements in ISO 21809-3. This RP focuses on the execution and documentation of quality control, including detailed guidance to the specification of coating work. The requirements to testing and inspection are basically the same as in ISO 21809-3. This RP includes more stringent requirements and detailed recommendations to ensure a consistent quality of the coated pipes and to reduce the effect of ambiguous and incomplete specifications on costs and schedule for submarine pipeline construction (see 1.1.5). Whilst ISO 21809-3 covers FJC for both onshore and offshore pipelines, this RP focuses on FJC for submarine pipelines and includes CFR of linepipe coating.”

3. Terminology and Definitions

Addition:

“*Hold point* Activity to be performed with the presence of owner, purchaser, applicator representatives and QA/QC inspector.

Witness point Activity to be performed with the presence of the owner, purchaser, applicator representatives and QA/QC inspector. All representatives shall be notified in advance but if not available the activity continues.

Monitoring point Activity to be performed with the presence of the applicator QA/QC inspector.

4. Abbreviations

Addition: “TDZ Touch Down Zone”

5.2 Information to Applicator

(5.2.1) Modification: “...Longitudinal seam weld and girth weld dimensions, including tolerances, are considered as relevant for the specified FJC system...”

5.3 Mandatory requirements to be specified by Purchaser

(5.3.1) Addition: “Repairs on FJC are not permitted. Damaged or defective FJC shall be striped and re-applied in accordance with a qualified procedure”.

(5.3.1) Modification: “...Requirements for pipe tracking and marking are applicable (see 6.12)...”

5.4 Optional requirements for specification by Purchaser

(5.4.1) Addition: “Regarding to the installation method of pipelines, the full scale tests shall be required for the following field joint coating systems:

Test	Types of Field Joint Coating
Impact full scale	All FJC
Ramp roller load (only when radial loads are applicable)	All FJC
Full scale bending	Only for FJC installed by Reel Lay Vessel
Full scale abrasion	Only for FJC for risers (at TDZ)
Model tensioner	All FJC

- For the model tensioner test, the relevant tests parameters such as radial and axial loads, material of clamp, etc. shall be defined within the ambit of PETROBRAS/Contractor.
- The additional testing protocol after full scale tests shall be agreed within the relevant test procedure;
- In case of existing successful full scale tests track records that were carried out in an equivalent condition



being requested for a new project, the test data shall be shared with PETROBRAS and Contractor for reviewing.

- The aforementioned full scales tests shall be carried out in compliance with a relevant test procedure agreed with PETROBRAS.”

6.1 Application Procedure Specification (APS)

(6.1.1) Modification: “...The APS shall be submitted for PETROBRAS’ review at least 45 days prior to the beginning of PQT, PPT and/or start of production...”

(6.1.3) Addition: “QA/QC inspector shall be present on execution of any test or control activity during PQT, PPT and production phases when activities are defined as hold point, witness point and monitoring.

6.2 Inspection and Testing Plan (ITP)

(6.2.2) Modification: “...The ITP shall be submitted for PETROBRAS’ review at least 45 days prior to the beginning of PQT, PPT and/or start of production, respectively...”

(6.2.3) Modification: “...recording of essential process parameters is mandatory...”

6.3 Daily Log

(6.3.4) Modification: “...A “Daily Log” format shall be accepted by Purchaser prior to start of production and a draft format shall be submitted for PETROBRAS’ review at least 45 days prior to the beginning of PQT/PPT. Daily Logs covering...”

6.4 Procedure Qualification Trial (PQT) and Pre-Production Trial (PPT)

(6.4.1) Addition: “In case that a coating system has been already qualified by PETROBRAS, the specific conditions demanding the execution of a new PQT are as follows:

Key Variable	Specific conditions requiring a new full PQT
Coating material	Change of any coating material composing the coating system
Chemical pre-treatment	Alteration of chemical pre-treatment after blasting operation
Equipment	Change of methodology/equipment of the coating application
Pipe OD	Any change on the pipe OD
Key process parameters	Out of the range previously qualified (e.g. temperatures limits, heat input, cycle time, application velocity, etc.)
Pipe wall thickness	Pipe wall thickness variation out of $\pm 15\%$
Steel grade	Carbon steel pipe and CRA pipes

(6.4.1) Addition: “Each person involved in the field joint coating process during the PQT, PPT and production phases shall be qualified and the records shall be presented to the client prior to the start of production.”



(6.4.1) Addition: “It is mandatory that each qualified applicator working during PQT, PPT and production exhibit his/her name on helmet and/or working clothes in order to make his/her identification possible.”

(6.4.2) Addition: “The PQT data book shall be approved prior to PPT and the beginning of activities related to the manufacturing of field joint coating. The PPT report shall be approved prior to the start of production.”

(6.4.3) Addition: “Notification of the PQT shall be issued at least 30 days before start of activities. Notification of the PPT shall be issued at least 15 days before start of activities”.

(6.4.4.) Addition: “The APS and ITP shall be submitted for client’s review at least 45 days prior to the beginning of PQT and PPT activities.”

(6.4.6) Addition: “An actual girth weld is mandatory for full scale bending test.”

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(6.4.7) Addition: “In case that full scale tests are required, additional pipes will be supplied by the Purchaser within the relevant Material Requisition.”

(6.4.11) Modification: “...For the linepipe coating, the verification shall include testing of resistance to peeling and cathodic disbonding. The acceptance criteria shall be the same as defined during the qualification of parent coating. Verification of no detrimental...”

(6.4.12) Addition: “Cooling time and FJC temperature recorded during the PQT shall be considered as key parameters during the installation phase.”

(6.4.13) Modification: “For pipelines to be installed by reeling, Purchaser shall duly consider a full scale bending test to verify FJC adhesion to parent coating and general flexibility of a FJC/infill assembly for inclusion in the PQT.”

6.6 Coating and blasting materials

(6.6.5) Modification: “Testing and certification of coating material properties shall relate to properties of either raw materials (as-delivered) and processed (as-applied) materials...”

(6.6.8) Addition: “Long term tests being applicable for evaluation of raw material properties and considered as non-specific testing shall be carried out in a frequency of each five years or immediately in case of change of material properties.”

6.8 Preparation of steel surface and linepipe coating for application of FJC/CFR

(6.8.4) Modification: “Pipe surfaces shall be prepared for coating using blast cleaning to provide a surface cleanliness and surface roughness (“anchor pattern”) to meet the requirements for the applicable FJC/CFR (Sec. 7). Blasting is the unique methodology of cleaning accepted. Any relaxation of these requirements...”

6.9 Coating application

(6.9.3) Addition: “Material for CFR shall be selected to comply with the maximum curing time of 15 minutes and able to complete curing process in seawater”.

(6.9.4) Modification: “...The control of heating shall ensure that any accidental heating of the pipe wall to a temperature higher than 260°C is prevented...”

(6.9.6) Modification: “Control and register of coating application parameters...”

6.14 Documentation

(6.14.1) Modification: “The minimum time for supply of documentation is 45 days prior to the beginning of PQT/PPT and production activities.”

(7.4) Deleted.

(7.5) Deleted.

7.6 Type 3A: Fusion bonded epoxy (FBE) coating (FJC only)

(7.6.2) Addition: “The maximum applied FBE thickness shall be 650 µm.”

(7.6.3) Modification: “...recording of surface roughness in accordance with ISO 8503-4 or ISO 8503-5 (60-110 µm) for...”

(7.6.7) Modification: “The applied thickness is defined within the item 7.6.2. Hot water soak test are not requested during the PPT. Consequently all the subsequent tests to the hot water soak evaluation are not applicable during the PPT. Long term cathodic disbondment test are not requested during the PPT.”

7.7 Type 2B(2): PE heat shrink sleeve applied on FBE coating (FJC only)



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(7.7.1) Addition: "The maximum applied FBE thickness shall be 650 µm."

7.8 Type 2C(2): PP heat shrink sleeve applied on FBE coating (FJC only)

(7.8.1) Addition: "The maximum applied FBE thickness shall be 650 µm."

7.9 Types 5A, 5B and 5C(1): PP coatings applied on FBE (FJC only)

(7.9.1) Modification: "Coating types 5A, 5B and 5C in ISO 21809-3 refers to PP coating applied as tape or sheet (5A), ...linepipe with 3LPP coating. The PQT/PPT shall include one extra FJC applied without adhesive for close examination of the FBE layer."

(7.9.5) Addition:

7.10 Types 5D(1) and 5E: PE coatings applied on FBE (FJC only)

(7.10.1) Modification: Coating types 5D and 5E in ISO 21809-3 refers to PE coating applied by flame spraying (5D) or as hot tape on top of a FBE or LE coating,...of maximum 10mm as used for linepipe with 3LPP coating. The PQT/PPT shall include one extra FJC applied without adhesive for close examination of the FBE layer."

(7.11) Deleted.

(8.2) Deleted.

(8.3) Deleted.

(8.4) Addition: "The maximum applied FBE thickness shall be 650 µm."

(8.5) Deleted.

(8.6) Deleted.

(Appendix B) Addition: "In addition to Table O.1 (Annex O) of ISO 21809-3, the following requirements shall be considered:

Property	FJC types	Reference subclause	Method of testing	Frequency		
				PQT	PPT	Production
Oxidation induction time (intercept in the tangent method)	5A, 5B, 5C	14.5.11	ISO 11357-6	3 joints	3 joints	-
Inspection of thickness	All	-	Annex A	3 joints	3 joints	Every 10 joints
Hot-water immersion test	All except 6 and 7	-	Annex I	3 joints	-	-
Adhesion on steel surface at ambient temperature after hot-water immersion	3	12.5.9	Annex C	3 joints	-	-
Adhesion on steel surface and plant coating at ambient temperature after hot-water immersion	4E	13.5.8	ISO 4624	3 joints	-	-
Adhesion on steel surface and plant coating at ambient temperature after hot-water immersion	5	14.5.6	Annex C	3 joints	-	-



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Lap shear strength at ambient temperature	2B(2), 2C(2)	10.5.11	Annex L	3 joints	-	-
Lap shear strength at maximum design temperature	2B(2), 2C(2)	10.5.11	Annex L	3 joints	-	-
Cathodic disbondment at maximum design temperature	All	-	Annex F	3 joints	3 joints	-

”