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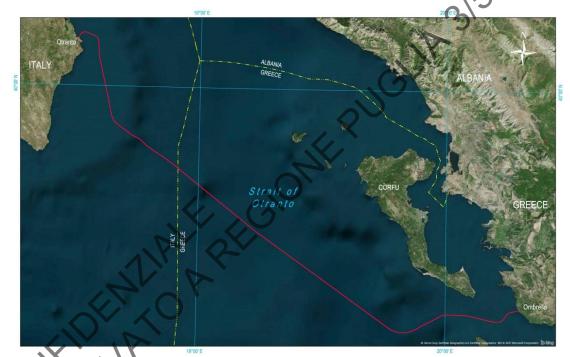
1 INTRODUCTION

1.1 Background

The Poseidon Pipeline Project, developed by IGI Poseidon S.A., will be designed for the supply of gas from Turkey and the Eastern Mediterranean region to the European market through the interconnection of the Greek and Italian gas networks.

The Poseidon Pipeline consists of two sections:

• An onshore section, stretching from Kipi (north-east of Greece, next to the Greek Turkish border) to the north western coast of Greece (Thesprotia area);



An offshore section, from the north-western coast of Greece to Italy (Figure 1-1)

Figure 1-1 Poseidon Pipeline Project – Offshore Section

e offshore section of the Poseidon pipeline comprises:

A compressor and fiscal metering station next to the Greek landfall (Thesprotia area);

- A deep water offshore pipeline from the Greek landfall to Italy (Otranto, Apulia region). The offshore section (about 200 km, ca. 1,370 m water depth) will cross the Greek shelf, descend the slope into the north Ionian Basin and then ascend the Italian slope, to make landfall east of Otranto;
- A receiving fiscal metering and pressure reduction station in Italy (Otranto, Apulia region);
- Two short buried onshore pipeline sections connecting compressor station in Greece and metering station in Italy to the respective landfalls, including associated scraper launching and receiving facilities.



The FEED phase of the offshore section of the Poseidon Pipeline Project was completed in 2013 and designed for a maximum flow rate of 12 BNCMA of gas (12.66 BSCMA).

ENGINEER's scope of work is named the Poseidon Pipeline Project - Offshore Section Update (the PROJECT). It concerns the Design Update to accommodate a maximum flow rate of 20 BSCMA of gas (which represents a potential development of the gas pipeline, not yet authorized, but evaluated for the maximum design capacity and related technical aspects) for the deep water offshore pipeline from the Greek landfall to Italy (Otranto) and the short onshore buried pipelines connecting compressor station in Greece and fiscal metering and pressure reduction station in Italy to the respective landfalls.

The document numbers for the FEED Revision have a new CTR number (1000 serie

1.2 **Document Scope**

This document presents the permanent materials and quantities, including spares required for the coated line pipe and auxiliary items for the Italian section of the offshore pipeline system of the Poseidon Pipeline Project.

OM3.2_OLF_130612 as shown in The offshore pipeline route employed in the material take-off is IGI the Offshore Pipeline Alignment Sheets (Ref. [10]).

The auxiliary items include for buckle arrestors, sacrificial anodes, bare line pipe joints for induction bends manufacturing and isolation joints.

The material take-off is organized as follows:

- Italian offshore section, from KP140.0 to landfall point OLF
- , from ore section, i ore section, i ore section, i Italian short onshore section, from landfall point OLF to the fence of Otranto receiving station



DEFINITIONS AND ABBREVIATIONS 2

Definitions 2.1

Definitions applicable to the Project are provided in Table 2-1.

Table 2-1 Project Definitions

WORK	Scope of Services per CONTRACT for "Poseidon Pipeline Project – Offshore Section Update"
CONTRACT	The CONTRACT between IGI Poseidon and ENGINEER for WORK as detailed in the CONTRACT documents
CLIENT	IGI Poseidon (50% EDISON S.p.A. and 50% DERA)
INTECSEA	INTECSEA B.V, the engineering company appointed by CLIENT to carry out the WORK
ENGINEER	INTECSEA
Project	The official title of the Project s "Poseidon Pipeline Project – Offshore Section Update"
INTECSEA Project No.	406010-00159

2.2

2.2	Abbreviatio	ns
Abbrevi	ations applicable to	the Project are provided below.

	3LPP	Three-Layer-Polypropylene
	BCNMA	Billion Normal Cubic Meters Per Annum
	BSCMA	Billion Standard Cubic Meters Per Annum
	cwc	Concrete Weight Coating
	FEED	Front-End Engineering Design
C		Inside Diameter
	OD	Outside Diameter
	OLF	Otranto Landfall
	OM3.2	Ombrella 3.2 Landfall
	SMTS	Specified Minimum Tensile Strength
	SMYS	Specified Minimum Yield Strength
	WD	Water Depth
	WT	Wall Thickness

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BASIS OF MATERIAL TAKE-OFF 3

3.1 **Materials**

This material take-off covers the following materials for the Italian pipeline section:

- Coated line pipe
 - Line pipe 0
 - Internal flow coating 0
 - External anti-corrosion coating 0
 - Concrete weight coating 0
- Auxiliary items
 - 0 Buckle arrestor assemblies
- 315120102 Bare line pipe joints for induction bend manufacturing 0
 - Anodes 0
 - Isolation joint 0

For the material take-off of the onshore cathodic protection system, reference is made to Cathodic Protection System Material Take-Off - Italy (Ref. [12])

Materials with a relatively short delivery time that will be procured by EPC contractor are not included in the material take-off. Examples of such materials are:

- Material for infrastructure crossings
- Seabed intervention materi
- Field joint material

3.2 Base Quantities

The base quantities are taken from the pipeline alignment sheets:

[10] for the offshore Italian pipeline from KP140.0 to Otranto (OLF)

Ref. [11] for the onshore Italian pipeline from Otranto to the Receiving Station

The pipeline alignment sheets show the pipeline routing, profile data and pipeline properties.

The material take-off quantities are based on an average pipe joint length of 12.2m in accordance with the Specification for Line Pipe (Ref. [1]).



3.3 Spares

In addition to the base quantities, spare quantities shall be procured.

For the (coated) line pipe, spare length is required to account for the following:

- Welding procedure, welder qualification and welding trials
- Field joint coating qualification
- Pipeline start-up and lay down heads
- 151201 Contingency for route deviation / pipelay inaccuracy and terrain undulations
- Contingency for damage due to pipe transportation and handing •
- Contingency for pipeline buckle •
- Operating stock for damage during operational phase

For the auxiliary items, the amount of spare quantities is driven by testing requirements and potential damage.

rech gualification re-off. These sp The spare quantities are taken from the List of Recommended Spares (Ref. [14]). Note that spares required for manufacturing (i.e. production qualification testing) are not included in Ref. [14] and therefore not included in this material take-off. These spares shall be identified by vendor in line with



COATED LINE PIPE 4

The quantities for coated line pipe for the Italian section are provided in below tables:

- Offshore; Table 4-1
- Onshore; Table 4-2

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		Line Pipe ^(1, 2) (Ref. [1])			Internal Flow Coating (Ref. [3])		Anti-Corrosion Coating (Ref. [4])		Concrete Weight Coating (Ref. [5])		Spare Quantity ⁽⁶⁾	TOTAL
	Material Grade	OD	wт	Туре	Thickness	Туре	Thickness	Density	Thickness	Length	Length	Length
		[mm]	[mm]		[mm]		⁽⁸⁾ [mm]	[kg/m ³]	[mm]	[m]	[m]	[m]
2.1	SAWL 485 FDU	812.8	30.7	Liquid Epoxy Paint	As per Ref. [3]	3LPP	3.0	3,040	120	646.6	24.4	671.0
2.2	SAWL 485 FDU	812.8	20.0	Liquid Epoxy Paint	As per Ref. [3]	3LPP	3.0	3,040	110	402.6	24.4	427.0
2.3	SAWL 485 FDU	812.8	20.0	Liquid Epoxy Paint	As per Ref. [3]	3LPP	3.0	3,040	90	18,104.8	170.8	18,275
2.4	SAWL 485 FDU	812.8	20.0	Liquid Epoxy Paint	As per Ref. [3]	3LPP	3.0	3,040	70	21,838.0 ⁽⁴⁾	170.8	22,008
2.5	SAWL 485 FDU	812.8	20.0	Liquid Epoxy Paint	As per Ref. [3]	3LPP	3.0	3,040	50	2,586.4 ⁽⁴⁾	1,342.0	3,928.
2.6	SAWL 485 FDU	812.8	30.7	Liquid Epoxy Paint	As per Ref. [3]	3LPP	3.0	-	-	20,203.2(5)	3,403.8	23,607
2.7	SAWL 485 FDU	812.8	30.7	Liquid Epoxy Paint	As per Ref. [3]	3LPP	6.0	-	-	573.4 ⁽⁷⁾	24.4	597.8
2.8	SAWL 485 FDU	812.8	30.7	-	- (3 LPP	3.0	-	-	-	12.2	12.2
2.9	SAWL 485 FDU	812.8	20.0	-		3LPP	3.0	-	-	-	12.2	12.2
2.10	SAWL 485 FDU	812.8	30.7			-	-	-	-	-	158.6	158.6
2.11	SAWL 485 FDU	812.8	20.0			-	-	-	-	-	158.6	158.6

Note 1: For key design data, reference is made to Section 6

Note 2: Line pipe constant OD equals 812.8 mm

Note 3: Length extracted from Offshore Pipeline Alignment Sheets (Ref. [10])

Note 4: Pipe length replacement by buckle arrestors (Type BA-04 Ref. [15]) is accounted for, as the buckle arrestor replaces a complete joint and is therefore seen as a separate buckle arrestor assembly (see Table 5-1).

Note 5: Pipe length replacement by buckle arrestors (Type BA-05, Ref. [15]) is not accounted for, as the line pipe specified in this table is used as pup pieces to fabricate the buckle arrestor assemblies (see Table 5-1).

Note 6: For a breakdown of spare quantity, reference is made to the List of Recommended Spares (Ref. [14])

Note 7: Including also for HDD section between Otranto landfall (OLF) and HDD entry pit (EP-2)

Note 8: Minimum total thickness of anti-corrosion coating shall be 3 mm on line pipe body and 2.5 mm on weld seam



Table	e 4-2 Line Pipe –	32-inch It	alian Ons	hore Pipeline					~0)		
	Line Pipe ⁽¹⁾ (Ref. [1])					Anti-Corrosion Concre		Veight Coating ef. [5])	Base Quantity ⁽²⁾	Spare Quantity ⁽³⁾	TOTAL	
	Material Grade	OD [mm]	WT [mm]	Туре	Thickness [mm]	Туре	Thickness ⁽⁵⁾ [mm]		Thickness [mm]	Length [m]	Length [m]	Length [m]
4.1	SAWL 485 FDU	812.8	30.7	Liquid Epoxy Paint	As per Ref. [3]	3LPP	3.0	<u> </u>	-	2,281.4 (4)	231.8	2,513.2
4.2	SAWL 485 FDU	812.8	30.7	-	-	-		-	-	-	48.8	48.8

Note 1: For design data, reference is made to Section 6

Note 2: Length extracted from Pipeline Alignment Sheets - Italy Ref. [11]) with a correction for the induction bends; line pipe for induction bends is separately included as part of Auxiliary Items (see Section 5.2)

st of ke. e Pipeline MTO, . a 3 mm on line pipe body au. Note 3: For a breakdown of spare quantity, reference is made to the List of Recommended Spares (Ref. [14])

Note 4: Excluding HDD section, as this section is included in Offshore Pipeline MTO; see Table 4

Note 5: Minimum total thickness of anti-corrosion coating shall be 3 mm on line pipe body and 2.5 mm on weld seam

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5 **AUXILIARY ITEMS**

5.1 Offshore

Auxiliary items for the offshore pipeline section cover the following materials:

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Table 5	-1 Buckle Arrestor	Assemblies (Ref. [1]], Ref. [6])		^N O				
_	Туре ^(1, 2, 3)	Material Grade	OD [mm]	WТ [mm]	Length [mm]	Base Quantity (7) [ea]	Spare Quantity ⁽⁸⁾ [ea]	TOTAL [ea]	
5.4	BA-04	SAWL 485 FDU	848.6	48.6 / 30.7(5) (9)	4,000 / 12,200 (6)		6	17	
5.5	BA-05	SAWL 485 FDU	812.8	30.7	12,200	49	5	54	

Note 1: For buckle arrestor assembly layout, reference is made to the Buckle Arrestor Typical Drawing (Ref. [15])

Note 2: BA-05 and the pup pieces of BA-04 shall be supplied in accordance with the Specification for Line Pipe (Ref. [1]), whereas the buckle arrestor body and the buckle arrestor assembly of BA-04 shall be supplied in accordance with Specification for Rolled Buckle Arrestors (Ref. [6])

Note 3: Buckle arrestor assembly shall be coated in accordance with the requirements stipulated in Appendix E of the Specification for Rolled Buckle Arrestors (Ref. [6]). Minimum total thickness of anti-corrosion coating shall be 3 mm on buckle arrestor body and 2.5 mm on weld seam

Note 5: Wall thickness of buckle arrestor body / wall thickness of pup piece at each side

Note 6: Length of buckle arrestor body / length of buckle arrestor assembly

Note 7: Base quantity based on buckle arrestor spacing as per Offshore Pipeline Alignment Sheets (Ref. [10])

Pipeline A., List of Recommended Note 8: For a breakdown of spare quantity, reference is made to the List of Recommended Spares (Ref. [14]

Note 9: Line pipe for pup pieces is included in Table 4-1



	Type ^(1, 2)	Thickness	Width	Pipe OD ⁽³⁾	Mass ⁽⁴⁾	Base Quantity (5)	Spare Quantity ⁽⁶⁾	TOTAL
	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	[mm]	[mm]	[mm]	[kg]	[ea]	[ea]	[ea]
7.6	Type S-6-32	45	500	818.8	136	9	5	14
7.7	Type S-7-32	65	500	818.8	207	77	2	79
7.8	Type S-8-32	85	500	818.8	270	62	2	64
7.9	Type S-9-32	105	500	818.8	351	2	2	4
7.10	Type S10-32	115	600	818.8	466	6	2	8
7.13	Type T-3-32	40	500	818.8	130	69	13	82

Note 1: "S" refers to square end anode type and "T" refers to tapered anode type

Note 2: Dimensions of anode types are extracted from the Anode General Arrangement Drawing (Ref. [13])

Note 3: Including 3LPP coating

Note 4: Based on anode density of 2750kg/m³ and spacing between half shells of 100mm as per Ref. [13]

half she. ipeline Alignment S. to the List of Recommended D. interval of the second Note 5: Base quantity based on anode spacing as per Offshore Pipeline Alignment Sheets (Ref. 14)

Note 6: For a breakdown of spare quantity, reference is made to the List of Recommended Spares (Ref. [14])



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5.2 **Onshore Italy**

Auxiliary items for the onshore pipeline section cover the following materials:

- Isolation joints; Table 5-3 ٠
- Bare line pipe joints for induction bend manufacturing; Table 5-4 ٠

The quantities are provided in below tables.

Table 5-3 32-inch Isolation Joints

					N-J
	Туре	Reference	Base Quantity ⁽¹⁾ [ea]	Spare Quantity [ea]	TOTAL [ea]
10.1	Monolithic joint	Ref. [8], Ref. [9]	2		2

Note 1: 1-off at landfall (Ref. [11]) and 1-off at station

Table 5-4 32-inch Bare Line Pipe Joints for Bend Manufacturing (Ref. [2])

	Material Grade	OD [mm]	WT [mm]	Base Quantity ^(3, 4) [ea]	Spare Quantity [ea]	TOTAL [ea]
11.1	SAWL 485 FDU	812.8	30.7	16	3	19

Note 1: Induction bends shall be manufactured in accordance with the Specification for Induction Bends (Ref. [2]). The minimum tangent length is 1,000 mm.

Note 2: After manufacturing, bends shall be coated in accordance with the Specification for Anti-Corrosion Coating (Ref. [4]) and the Specification for Internal Flow Coating (Ref. [3])

Note 3: Quantity refers to number of bare line pipe joints

Note 4: For quantity and individual angles of bends, reference is made to Pipeline Alignment Sheets - Italy (Ref. [11]) and Appendix A of this document; applied basis for quantity of bare line pipe joints:

- Bend angle $\leq 20^{\circ}$ (8-off): 1 joint for production of 3 bends
- CONFIDENCE 45° between 20° and 45° (9-off): 1 joint for production of 2 bends Bend angle
 - 15° (8-off): 1 joint for production of 1 bend



6 DATA SHEET

This section contains a datasheet that provides relevant design data for both the line pipe components and the auxiliary items.

Table 6-1 Data Sheet

Parameter	Value
Corrosion allowance	0 mm
Design pressure	170 barg at 400m above MSL
Maximum design temperature	70°C
Maximum operating temperature	C260a
Minimum design temperature	-10°C
Isolation joint – max. bending moment	2 ,000 kNm ⁽¹⁾
Isolation joint – max. axial force	7,000 kN ⁽¹⁾
Note 1: Values to be confirmed in detail design.	
Isolation joint – max. axial force Note 1: Values to be confirmed in detail design.	



7 REFERENCES

- Ref. [1] INTECSEA Poseidon Pipeline Project Offshore Section Update, Specification for Line Pipe, Doc. No. IGI-1207-10-PL-SPC-001
- Ref. [2] INTECSEA Poseidon Pipeline Project Offshore Section Update, Specification for Induction Bends, Doc. No. IGI-207-10-PL-SPC-002
- Ref. [3] INTECSEA Poseidon Pipeline Project Offshore Section Update, Specification for Internal Flow Coating, Doc. No. IGI-207-10-PL-SPC-003
- Ref. [4] INTECSEA Poseidon Pipeline Project Offshore Section Update, Specification Anti-Corrosion Coating, Doc. No. IGI-207-10-PL-SPC-004
- Ref. [5] INTECSEA Poseidon Pipeline Project Offshore Section Update, Specification for Concrete Weight Coating and Anode Installation, Doc. No IGI-207-10-PL-SPO-005
- Ref. [6] INTECSEA Poseidon Pipeline Project Offshore Section Update, Specification for Rolled Buckle Arrestors, Doc. No. IGI-1207-10-PL-SPC-013
- Ref. [7] INTECSEA Poseidon Pipeline Project Offshore Section Update, Specification for Anode Fabrication, Doc. No IGI-207-10-PL-SPC-010
- Ref. [8] INTECSEA Poseidon Pipeline Project Offshore Section Update, Specification of Isolation Joints, IGI-207-10-PL-SPC-012
- Ref. [9] INTECSEA Poseidon Pipeline Project Offshore Section Update, Isolation Joint Datasheet, Doc. No IGI-1309-30-PL-DAS-001
- Ref. [10] INTECSEA, Poseidon Pipeline Project Offshore Section Update, Offshore Alignment Sheets, Doc. No. IGI-1316-30-PL-DWG-001
- Ref. [11] INTECSEA, Poseidon Pipeline Project Offshore Section Update, Alignment Sheets Italy, Doc. No. IGI-1410-46 PL-DWG-002
- Ref. [12] INTECSEA, Poseidon Pipeline Project Offshore Section Update, Cathodic Protection System Material Take-Off - Italy, Doc. No. IGI-401-46-PL-MTO-002
- Ref. [13] INTECSEA, Poseidon Pipeline Project Offshore Section Update, Anode General Arrangement Drawing, Doc. No. IGI-1309-30-PL-DWG-001
- Ref. [14] INTECSEA, Poseidon Pipeline Project Offshore Section Update, List of Recommended Spares, Doc. No. IGI-1209-10-GE-LST-001
 - Ref. [15] INTECSEA, Poseidon Pipeline Project Offshore Section Update, Buckle Arrestor Typical Drawing, Doc. No. IGI-1308-30-PL-DWG-001



GLA SISTANS Bend Dat? Appendix A Preliminary Induction Bend Data (Ref. [11])



Please note that EPCI contractor will finalize the vertical alignment (grade plan) of the onshore route in <u>detail design</u>. This means that the final MTO for induction bends (i.e. quantity and angles) will be provided after completion of detail design.

5D Bend nr	Angle	КР	
1	64.9	0.102	
2	15.0	0.111	REGIONE PUGLIA 3151201
3	26.8	0.212	
4	24.6	0.249	
5	84.0	0.296	
6	25.0	0.547	
7	90.1	0.554	
8	88.5	0.579	
9	30.0	0.589	· ')'
10	19.7	0.643	
11	5.0	0.692	
12	30.0	0.738	. ()
13	83.4	0.745	
14	14.2	0.856	
15	4.6	0.955	
16	47.6	1.041	
17	42.0	1.339	
18	57.5	1.456	
19	25.0	1.839	
20	34.3	1.907	
21	20.1	2.168	
22	18.2	2.293	
23	8.0	2.435	1
24	90.0	2.539	1
25	9.5	2.557	
25 0 25 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	271		-

Onshore Italy - IGI-1410-46-PL-DWG-0