

ISO 24139-2:2023-02 (E)

Petroleum and natural gas industries - Corrosion resistant alloy clad bends and fittings for pipeline transportation system - Part 2: Clad fittings

Contents		Page
Foreword		v
1	Scope	1
2	Normative references	1
3	Terms, definitions, symbols and abbreviated terms	4
3.1	Terms and definitions	4
3.2	Symbols	5
3.3	Abbreviated terms	5
4	General requirements	6
4.1	Units of measurement	6
4.2	Rounding	6
5	Information supplied by the purchaser	6
5.1	General information	6
5.2	Additional information	7
5.3	Information on the mother clad pipe	8
5.4	Information on the mother steel fitting	8
6	Designation	9
7	Design	9
8	Manufacturing	10
8.1	Starting materials	10
8.1.1	General requirement	10
8.1.2	Mother clad pipe	10
8.1.3	Clad plate	11
8.1.4	Mother steel fitting	11
8.1.5	Welding consumables	11
8.1.6	Re-inspection of starting materials	11
8.2	Manufacturing procedure specification (MPS)	12
8.2.1	General requirements	12
8.2.2	MPS development procedure	12
8.2.3	Required information in MPS	12
8.3	Clad fitting manufacture	13
8.4	Welding	13
8.4.1	General requirements	13
8.4.2	Weld overlay	13
8.4.3	Weld metal	14
8.4.4	Welds and position	14
8.5	Heat treatment	15
8.6	Cold forming and sizing	15
8.7	Jointers and girth welds	15
8.8	End preparation	15
8.9	Surface treatment	16
9	Testing and inspection	16
9.1	General requirements	16

9.2	Extent of testing and inspection	17
9.3	Chemical composition	19
9.3.1	Requirements	19
9.3.2	Test specimens	19
9.3.3	Test method	20
9.4	Physical testing	20
9.4.1	Tensile testing	20
9.4.2	Charpy V-notch impact test	20
9.4.3	Guided bending testing	20
9.4.4	Through-thickness hardness testing	21
9.4.5	Surface hardness testing	23
9.4.6	CRA cladding bond strength test	24
9.4.7	Flattening Tests	24
9.4.8	Macrographic examination	24
9.4.9	Metallographic examination	25
9.5	Corrosion testing	26
9.5.1	Intergranular corrosion testing	26
9.5.2	HIC testing of backing steel	27
9.5.3	SSC testing of backing steel	27
9.5.4	Corrosion evaluation of clad layer material for service condition	28
9.6	Dimensions and tolerances	28
9.6.1	General	28
9.6.2	Wall thickness	28
9.6.3	Diameter	29
9.6.4	Radius, end out-of-squareness, out-of-planeness and tangent length	30
9.6.5	Tolerances	30
9.6.6	Special dimensions	30
9.7	Non-destructive testing	30
9.7.1	General	30
9.7.2	NDT personnel	31
9.7.3	Visual inspection	31
9.7.4	Inspection of surfaces of clad fitting	31
9.7.5	Inspection of weld seam	31
9.7.6	Inspection of clad fitting ends	31
9.7.7	Inspection of clad fitting body	32
9.7.8	Level of residual magnetism	32
9.7.9	Imperfection and defect treatment	32
9.8	Hydrostatic testing	33
10	Marking	33
10.1	General requirements	33
10.2	Marking information	33
11	Packaging, handling and storage	34
12	Documents	34
	Annex A (normative) Corrosion qualification of CRA clad layer for intended service condition	36
	Annex B (normative) Location and quantity of specimens for testing and inspection	39
	Annex C (informative) Chemical requirements for clad layer of some CRAs	46
	Bibliography	48