

INSPECTION CERTIFICATE

273.1 mm x 6.4 mm

Date : Nov 21, 2017

CERTIFICATE No. : 171121-0677

Specification : CSA Z245.1 Gr.359 CAT II

 **HUSTEEL Co., Ltd.**

INSPECTION CERTIFICATE



CERTIFICATE No. : 171121-0677
 MANUFACTURED No. : 17-11-045-0
 SUPPLIER : HUSTEEL CO., LTD.
 CUSTOMER : MRC Global(CANADA) ULC

HEAD OFFICE SHINAN B/D 15F, 943-19, DAECHE-DONG,
 KANGNAM-GU, SEOUL, KOREA
 DANGJIN PLANT 131-BUGOKGONGDAN STREET, SONGKAK-EUP,
 DANGJIN-SI, CHUNGCHONGNAM-DO, KOREA

P/O No. : S71G 329250
 L/C No. :
 ISSUED DATE : 2017. 11. 21
 COMMODITY : ERW STEEL PIPE
 SPECIFICATION : CSA Z245.1-14 Gr.359 CAT II M45C,
 Sour service

CUSTOMER : MRC Global(CANADA) ULC																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
CHEMICAL COMPOSITION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
NO.	HEAT NO Pipe No	QUAN- TITY	TYPE	NOMINAL SIZE	ORDER SIZE			WEIGHT		TENSILE TEST *3					FLATTENING OR BEND TEST										VISUAL & DIMENSION					METALLOGRAPHIC TEST		RESIDUAL MAGNETISM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
					O.D mm	W.T mm	LENGTH mm	kg/m	TS MPa	YS MPa	EL %	YR MPa	TWA TS	DIV *4	C	Si	Mn	P	S	Cu	Ni	Cr	Mo	V	Nb	Ti	B	CE	GOOD	GOOD	GOOD	GOOD	GOOD	GOOD																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
01	SQ49944 37	68	BPEB	10	273.1	6.4	18,000	42.09	530	477	32	90	514	H	0.04	0.14	0.91	0.004	0.001	0.127	0.118	0.103	0.0030	0.0010	0.0400	0.0101	0.0001																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	

*1. Type of Pipe Ends
 N BPE Black Plain Ends GPE Galvanized Plain Ends
 O BPE Black Plain Ends GPE Galvanized Plain Ends
 T BPE Bevelled GPE Bevelled
 E BPE Bevelled GPE Bevelled
 BTE Black Threaded Ends GTE Galvanized Threaded Ends
 BTE Black Threaded Ends GTE Galvanized Threaded Ends
 BTE Black Threaded & Coupled GTE Galvanized Threaded & Coupled

*2. O.D. : Outside Diameter, W.T. : Wall Thickness
 *3. Tensile Test - TS : Tensile Strength, YS : Yield Strength, EL : Elongation, YR : Yield Ratio, Gauge Length : 2 inch, Y.P method : 0.5% Underload
 *4. H : Heat analysis, P : Product analysis
 *5. TPA : Transverse pipe axis, LPA : Longitudinal pipe axis, TWA : Transverse weld axis
 *6. Specimen Size - A : 10x10mm, B : 10x7.5mm, C : 10x6.7mm, D : 10x5.0mm, E : 10x3.3mm
 *7. T.P : Testing Pressure, B.T : Holding Time
 *8. NDT : UT, 1/16" Drilled Hole or NS Notch / 6.4mm(0.25") x 1/2"(Depth) = FBH / 9mm(0.375") x 1/2"(Depth) = FBR
 Latest edition per CSA Z245.1 (2014)

* Sour service means that pipes meet CSA clause 16 except for HIC test
 * 17.7.b Charpy Test specimen are non flattened.
 * CE = C+F(Mn/6+Si/24+Cu/15+Ni/20+(Cr+Mo+V+Nb)/5+5B)

WE HEREBY CERTIFY THAT THE MATERIAL HEREIN HAS BEEN MADE IN ACCORDANCE WITH THE ORDER AND ABOVE SPECIFICATION
 THIS CERTIFICATE IS ISSUED ACCORDING TO EN 10204 3.1(ISO 10474 3.1)

MANAGER OF QA TEAM
 Haee Gyu . Kim
 PAGE 1 / 3

P/O No. : S 71G 329250		INSPECTION CERTIFICATE										CERTIFICATE No. : 171121-0677									
L/C No. :		 HUSTEEL Co., Ltd.										MANUFACTURED No. : 17-11-045-0									
ISSUED DATE : 2017. 11. 21		HEAD OFFICE SHINAN B/D 15F, 943-19, DAECHI-DONG, KANGNAM-GU, SEOUL, KOREA DANGJIN PLANT 131, BUGOKGONGDAN STREET, SONGAK-EUP, DANGJIN-SI, CHUNGCHONGNAM-DO, KOREA										SUPPLIER : HUSTEEL CO., LTD.									
COMMODITY : E.R.W STEEL PIPE												CUSTOMER : MRC Global(CANADA) ULC									
SPECIFICATION : Sour service																					

NO.	HEAT_NO Pipe_No	QUAN- TITY	TYPE	NOMINAL SIZE	ORDER SIZE			WEIGHT	TENSILE TEST					CHEMICAL COMPOSITION															
					O.D	W.T	LENGTH		TPA (*5)				TWA	DIV	C	Si	Mn	P	S	Cu	Ni	Cr	Mo	V	Nb	Ti	B	CE	
									TS	YS	EL	YR																	
									mm	mm	mm	MPa																	MPa
		*2												weight (%)															
	SQ49951 404	220	BPEB	10	273.1	6.4	18,000	42.09	510	472	36	93	518	H	0.03	0.14	0.89	0.005	0.001	0.115	0.112	0.102	0.0030	0.0010	0.0390	0.0085	0.0000		
	SQ49951 600		BPEB	10	273.1	6.4	18,000	42.09	521	452	34	87	511	P	0.04	0.16	0.90	0.006	0.001	0.125	0.116	0.103	0.0029	0.0028	0.0416	0.0072	0.0002	0.147	
	SQ49940 615	242	BPEB	10	273.1	6.4	18,000	42.09	522	454	34	87	508	H	0.04	0.15	0.89	0.004	0.001	0.118	0.119	0.099	0.0030	0.0020	0.0400	0.0101	0.0010		
													P	0.04	0.16	0.90	0.005	0.001	0.130	0.117	0.100	0.0026	0.0026	0.0418	0.0093	0.0002	0.149		

NO.	HYDROSTATIC TEST			HEAT TREATMENT	DROP WEIGHT TEST (Shear Area)	HARDNESS TEST		IMPACT TEST (-45) °C				*B N-D-T (U T)		FLATTENING OR BEND TEST		VISUAL & DIMENSION		METALLOGRAPHIC TEST		RESIDUAL MAGNETISM	
	T.P	H.T	RESULT			DIV	Energy (Ind. J)	Shear area	SIZE	FLANGE TEST	REVERSE FLATTENING TEST	CRUSH TEST	DRIFT TEST	ROOT GUIDED- BEND TEST							
	MPa	sec													HRC	HV 500gf	*5	*6			
	*7	°C	%																		
14.3	5	GOOD	950				TWA	77/48/55	-	D	* Sour service means that pipes meet CSA clause 16 except for HIC test * 17.7.b Charpy Test specimen are non flattened. * CE = C+F(Mn/6+Si/24+Cu/15+Ni/20+(Cr+Mo+V+Nb)/5+5B) Latest edition per CSA Z245.1 (2014)										
14.3	5	GOOD	950			TWA	103/107/92	-	D												
14.3	5	GOOD	950	11.8	185	TWA	51/39/28	-	D												
							TPA	145/150/130	100.0												
							TPA	143/150/136	100.0												
							TPA	126/158/130	100.0												

N O T E	*1. Type of Pipe Ends				*2. O.D : Outside Diameter, W.T : Wall Thickness				*3. Tensile Test - TS : Tensile Strength, YS : Yield Strength, EL : Elongation, YR : Yield Ratio, Gauge Length : 2 inch, Y.P method : 0.5% Underload			
	BPE	Black Plain Ends	GPE	Galvanized Plain Ends					*4. H : Heat analysis, P : Product analysis			
	BPEB	BPE Bevelled	GPEB	GPE Bevelled					*5. TPA : Transverse pipe axis, LPA : Longitudinal pipe axis, TWA : Transverse weld axis			
	BTE	Black Threaded Ends	GTE	Galvanized Threaded Ends					*6. Specimen Size - A : 10x10mm, B : 10x7.5mm, C : 10x6.7mm, D : 10x5.0mm, E : 10x3.3mm			
	BTC	Black Threaded & Coupled	GTC	Galvanized Threaded & Coupled					*7. T.P : Testing Pressure, H.T : Holding Time			
								*8. NDT : UT, 1/16" Drilled Hole or NS Notch / 6.4mm(Ø) x 1/2t(Length) = FBH / 8mm(w) x 15mm(L) x 1/2t(Length) = FBR				

WE HEREBY CERTIFY THAT THE MATERIAL HEREIN HAS BEEN MADE IN ACCORDANCE WITH THE ORDER AND ABOVE SPECIFICATION THIS CERTIFICATE IS ISSUED ACCORDING TO EN 10204 3.1(ISO 10474 3.1)		 Hae Gyu . Kim MANAGER OF Q.A TEAM
SURVEYOR		PAGE 2 / 3

Diameter : 273.1 mm		Gage : 6.4 mm		Grade : Gr-359 CAT II M45C, SS										
Specification : CSA Z245.1 GR-359 CAT II														
Heat No	Pipe No	Product ID	Test Type			Orientation								
			Wgt[%]	C	SI	Mn	P	S	Cr					
SQ49044	37	HRX063680	MILL CONTROL			PIPE TPA								
			MILL CONTROL			PIPE TWA								
			Heat ..	0.04	0.14	0.004	0.001	0.127	0.118	0.103	0.0030	0.0010	0.0400	0.0001
SQ49047	113	HRX064740	Product ..	0.04	0.16	0.005	0.001	0.145	0.121	0.106	0.0032	0.0032	0.0412	0.0002
			MILL CONTROL			PIPE TPA			38.0		484	520	32	0.93
			MILL CONTROL			PIPE TWA			38.0			513		
SQ49051	404	HRX063740	MILL CONTROL			PIPE TPA			38.0		480	523	35	0.92
			MILL CONTROL			PIPE TWA			38.0			515		
			Heat ..	0.03	0.14	0.004	0.001	0.124	0.116	0.101	0.0030	0.0020	0.0399	0.0001
SQ49060	600	HRX063670	MILL CONTROL			PIPE TPA			38.0		472	510	36	0.93
			MILL CONTROL			PIPE TWA			38.0			518		
			Heat ..	0.03	0.14	0.005	0.001	0.115	0.112	0.102	0.0030	0.0010	0.0390	0.0000
SQ49940	615	HRX063570	Product ..	0.04	0.16	0.006	0.001	0.125	0.116	0.103	0.0029	0.0028	0.0416	0.0002
			MILL CONTROL			PIPE TPA			38.0		454	522	34	0.87
			MILL CONTROL			PIPE TWA			38.0			508		
SQ49940	820	HRX063760	MILL CONTROL			PIPE TPA			38.0		491	529	33	0.93
			MILL CONTROL			PIPE TWA			38.0			519		
			Heat ..	0.04	0.15	0.009	0.004	0.001	0.118	0.119	0.099	0.0030	0.0020	0.0400
SQ49940	820	HRX063760	Product ..	0.04	0.16	0.005	0.001	0.130	0.117	0.100	0.0026	0.0026	0.0418	0.0002
			MILL CONTROL			PIPE TPA			38.0			508		
			MILL CONTROL			PIPE TWA			38.0			519		

• TPA : Transverse pipe axis
 • LPA : Longitudinal pipe axis
 • TWA : Transverse weld axis
 • LAZ : Heat Affected Zone
 • FST : Full Section Testing
 • OD : Outside Diameter
 • ID : Inside Diameter

• Elastic Resistance Welded (Type E)
 • Flattening Test Acceptable
 • 273.1 X 6.4t : 14,300kPa
 • Minimum Weld Seam Heat Treatment Temperature : 620(°C)
 • UT Cal To 1/16" Drilled Hole or NS Nozzle / 6.4mm(Ø) ± 1/2x(Depth) = FBH / 8mm(w) ± 1/2x(Depth) = PBR
 • Sour service means that pipes meet CSA clause 16 except for HIC test

We certify that the product described above has been manufactured, sampled, inspected, and tested in accordance to the referenced specification. The product has been found to be in compliance with all requirements.

Diameter : 273.1 mm			Gage : 6.4 mm		Grade : Gr.359 CAT II M45C, SS	
Specification : CSA Z245.1 GR.359 CAT II						
Heat No	Pipe No	Product ID	Test Type	Orientation		
SQ49944	37	HRX063680	Transverse weld axis	PIPE TWA		
			Transverse pipe axis	PIPE TPA		
			Transverse weld axis	PIPE TWA		
SQ49947	113	HRX064740	Transverse weld axis	PIPE TWA		
			Transverse pipe axis	PIPE TPA		
			Transverse weld axis	PIPE TWA		
SQ49851	404	HRX063740	Transverse pipe axis	PIPE TPA		
			Transverse weld axis	PIPE TWA		
			Transverse pipe axis	PIPE TPA		
SQ49940	600	HRX063670	Transverse weld axis	PIPE TWA		
			Transverse pipe axis	PIPE TPA		
			Transverse weld axis	PIPE TWA		
SQ49940	615	HRX063570	Transverse weld axis	PIPE TWA		
			Transverse pipe axis	PIPE TPA		
			Transverse weld axis	PIPE TWA		
SQ49940	820	HRX063760	Transverse weld axis	PIPE TWA		
			Transverse pipe axis	PIPE TPA		
			Transverse pipe axis	PIPE TPA		

- TPA : Transverse pipe axis
- LPA : Longitudinal pipe axis
- TWA : Transverse weld axis
- HAZ : Heat Affected Zone
- PST : Full Section Testing
- OD : Outside Diameter
- ID : Mid Diameter
- ID : Inside Diameter

- Electric Resistance Welded (Type E)
- Flattening Test Acceptable
- 273.1 X 6.4K: 14,300MPa
- Minimum Weld Seam Heat Treatment Temperature: 620(°C)
- UT Cal. To 1/16" Drilled Hole or N5 Notch / 6.4mm(9) x 1/2t(Depth) = FBR / 8mm(9) x 1/2t(Depth) = FBR
- Sour service means that pipes meet CSA clause 16 except for HIC test

We certify that the product described above has been manufactured, sampled, inspected, and tested in accordance to the referenced specification. The product has been found to be in compliance with all requirements.

- 17.2.8 Charpy Test specimens are run flattened.
- CE = C-FeSi/(6+Si/24+Cu/15+Ni/20+(C+Mn+V+Nb)/5+SB)
- Latest edition per CSA Z245.1 (2014)

Diameter: 273.1 mm		Cage: 6.4 mm	Grade: Gr.399 CAT II M45C SS
Specification: CSA Z245.1 GR.359 CAT II			

Heat No	Pipe No	Product ID	Scale	Location	PM		HAZ		WPAZ		HAZ		PM		AVERAGES				Total Avg				
					OD	ID	OD	ID	OD	ID	OD	ID	PM	HAZ	WPAZ	HAZ							
SQ4944	37	HR0063680	RockwellC	OD	11.1	10.8	11.0	11.7	11.8	12.1	12.6	12.9	13.3	10.7	10.9	11.2	11.0	11.3	11.5	11.1	11.4	12.9	11.6
			RockwellC	ID	10.8	10.5	10.7	10.4	11.2	11.9	12.0	11.8	12.7	11.1	11.5	10.9	11.2	10.9	11.6	11.0	11.2	12.2	
SQ4949	615	HR0063570	RockwellC	OD	11.3	10.6	10.9	12.1	12.2	12.0	13.1	12.3	12.8	10.6	12.3	12.5	10.9	10.8	11.4	11.9	11.9	12.7	11.8
			RockwellC	ID	11.5	10.5	11.0	11.9	11.1	12.1	11.6	12.6	11.1	11.8	12.5	11.0	11.2	11.7	11.2	11.7	12.1	12.1	

- * TPA : Transverse pipe axis
- * LPA : Longitudinal pipe axis
- * TWA : Transverse weld axis
- * HAZ : Heat Affected Zone
- * PST : Full Section Testing
- * OD : Outside Diameter
- * MT : Mid Diameter
- * ID : Inside Diameter

- * Electric Resistance Welded (Type E)
- * Flattening Test Acceptable
- 273.1 X 6.4: 143000Pa
- Minimum Weld Seam Heat Treatment Temperature: 620C (°F)
- * UT Cal. To 1/16" Drilled Hole or NS Hatch / 6.4mm (0.25") x 1/2" (Depth) = 78H / 8mm (w) x 1/2" (Depth) = FUR
- * Saw service means that pipes meet CSA class 14 except for HIC test

We certify that the product described above has been manufactured, sampled, inspected, and tested in accordance to the referenced specification. The product has been found to be in compliance with all requirements.

Diameter: 273.1 mm Gauge: 6.4 mm Grade: GR.359 CAT II M45C, 35

Specification: CSA Z245.1 GR.359 CAT II

Heat No	Pipe No	Product ID	Scale	Location	P44		HAZ		WPAZ		HAZ		P44		AVERAGES				Total Avg	
					OD	ID	OD	ID	OD	ID	OD	ID	OD	ID	OD	ID	OD	ID		OD
SQ4944	37	H830A3690	Vickers HV 500gf	OD	216	0	0	183	0	0	197	0	0	196	0	206	181	197	101	
			Vickers HV 500gf	ID	212	0	0	173	0	0	185	0	0	196	0	204	174	185		
			Vickers HV 500gf	ID	210	0	0	174	0	0	193	0	0	178	0	0	202	176		193
			Vickers HV 500gf	ID	208	0	0	167	0	0	186	0	0	186	0	0	197	174		186
SQ4940	615	H830A3570	Vickers HV 500gf	ID	214	0	0	175	0	0	176	0	0	200	0	207	177	176	185	
			Vickers HV 500gf	ID	202	0	0	166	0	0	178	0	0	182	0	0	195	174		178

- * TPA: Transverse pipe axis
- * LPA: Longitudinal pipe axis
- * TWA: Transverse weld axis
- * HAZ: Heat Affected Zone
- * FST: Full Section Testing
- * OD: Outside Diameter
- * ID: Inside Diameter

- * Electric Resistance Welded (Type B)
- * Peeling Test Acceptable
- * 273.1 X 6.4t: 14,300MPa
- * Minimum Weld Seam Flow Treatment Temperature: 620(°C)
- * UT C.A. To 1/16" Drilled Hole or HS Notch / 6.4mm(Ø) = FBT / Seam(t) = 1/2t(Depth) = FBR
- * Sour service unless that pipes meet CSA clause 16 except for HIC test

We certify that the product described above has been manufactured, sampled, inspected, and tested in accordance to the referenced specification. The product has been found to be in compliance with all requirements.