DET NORSKE VERITAS

Ref.: **ROT 12.028439.15**

WELDING PROCEDURE QUALIFICATION TEST

According to (code, standard)

EN ISO 15614-1:2004/A2:2008

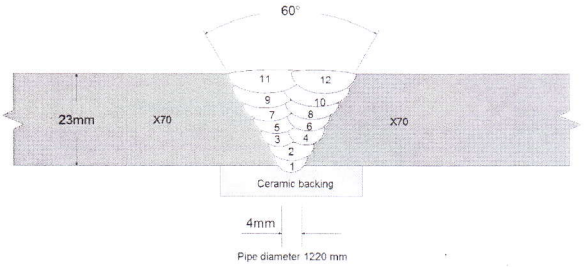
Manufacturer's welding procedure No.
HM260612-2

Manufacturer **Herstaco Tubewelding B.V.** Place and date **Middelburg (NLD), 2012-06-26**

Purchaser's spec. No. **ARL1570-1** Project **General**

Requirements beyond code/standard **N.A.**

Joint preparation and welding sequence (Sketch).



BASE MATERIAL SPECIFICATION AND GROUPING

X70 acc. API 5L (Grouping (1.3)-X70 acc. API 5L (Grouping (1.3)

Grade	C, %	C eq %
X70	0,08	0,38

Grade	C, %	C eq %
X70	0,08	0,38

If applicable, the following C eq based on ladle analysis is to be calculated:

$$Ceq = C + \frac{Mn}{6} + \frac{Cr+Mo+V}{5} + \frac{Cu+Ni}{15} \ \%$$

Welding process(es) **138 / 121** Welding position **PA** Single-/double sided welding **Single side**

WELDING CONSUMABLES:

Index	Consumable(s), trade name	Code designation
A	**Hyundia SuperCored 81MAG**	**EN ISO 17632-A: T46 6 1Ni P M 2 2**
B	**Hyundia Wire A-2- Flux S-900SP**	**EN 756: S50 3 CS S2Mo**
C		

WELDING PARAMETERS

Pass No.	Index	Diam. mm	Gas composition	Gas L/min	Current polarity	Amps	Volts	Travel speed mm/min	Wire feed mm/min	Heat input kJ/mm
1	A	1,2	M23*	15	DC-EP	196	25,3	239	N.A.	1,00
2	B	3,2	N.A.	N.A.	DC-EP	520	26,9	574	N.A.	1,46
3	B	3,2	N.A.	N.A.	DC-EP	550	27,9	574	N.A.	1,60
4	B	3,2	N.A.	N.A.	DC-EP	628	30,7	574	N.A.	2,01
5	B	3,2	N.A.	N.A.	DC-EP	628	30,7	574	N.A.	2,01
6	B	3,2	N.A.	N.A.	DC-EP	628	30,7	574	N.A.	2,01
7	B	3,2	N.A.	N.A.	DC-EP	628	30,7	574	N.A.	2,01
8	B	3,2	N.A.	N.A.	DC-EP	628	30,7	574	N.A.	2,01
9	B	3,2	N.A.	N.A.	DC-EP	628	30,7	574	N.A.	2,01
10	B	3,2	N.A.	N.A.	DC-EP	628	30,7	574	N.A.	2,01
11	B	3,2	N.A.	N.A.	DC-EP	628	30,7	574	N.A.	2,01
12	B	3,2	N.A.	N.A.	DC-EP	628	30,7	574	N.A.	2,01

ther information (weaving, backing, groove preparation, gouging, grinding, etc.):

*** Composition shielding gas 90% Ar - 5% CO_2 -5%0_2**

**** Heat-input in acc. with NEN-EN 1011-1, efficiently factor 0,8 for process 138 and efficiently factor 1,0 for 121**

SPECIAL REQUIREMENTS: Preheat min **≥ 10 °C** Interpass max **≤ 194 °C** PWHT **N.A.°C** Time **N.A. Hr(s)**

Heating/cooling rate **N.A.** Baking of electrodes **N.A.** Others **N.A.**

WELDING CARRIED OUT BY **D. Sulkers** TEST PIECE MARKED **ARL1570-2 , and DNV Stamp**

EXTENT OF APPROVAL: Base material(s) **1.3*** - 1.3 ***)** Positions: **PA**

Plate /wall thickness **11,5 - 46 mm mm** Diam. **≥ Ø 610 mm** Other limitations **N.A.**

*** **Approval for materials in the same group with an equal or lower yield strenght**

We certify that the statements in this record are correct and that the test weld was prepared, welded and heat treated in accordance with the specified Code/Standard and/or purchaser's requirements.

Manufacturer's signature and stamp

DNV's survey station and surveyor's signature

Rotterdam (NL)

If any person suffers loss or damage which is proved to have been caused by any negligent act or omission of Det Norske Veritas, then Det Norske Veritas shall pay compensation to such person for his proved direct loss or damage. However, the compensation shall not exceed an amount equal to ten times the fee charged for the service in question, provided that the maximum compensation shall never exceed USD 2 million.
In this provision "Det Norske Veritas" shall mean the Foundation Det Norske Veritas as well as all its subsidiaries, directors, officers, employees, agents and any other acting on behalf of Det Norske Veritas.

NON-DESTRUCTIVE TESTING

☐ **1. Radiographic testing**

Procedure ref.	Acceptance criteria	Result
Film type	Screens	IQI

KV	mAmin.	Sensitivity **N.A.%**	Density

☒ **2. Ultrasonic examination**

Procedure ref. **EN 17638**	Acceptance criteria **EN 11666 Level 2**	Result **Acceptable**

☒ **3. Other examination Type: M.P.I.**

Procedure ref. **EN ISO 17638**	Acceptance criteria **EN 23278 level 1**	Result **Acceptable**

Place and date **Breda (NL), 2012-07-05**

Reviewed by **M. van Holsteijn (DNV)**

Laboratory signature and stamp **Report SL 12.7030-1 Schielab, Breda (NL)**

MECHANICAL TESTING

(According to **EN ISO 15614-1:2004/A1:2008**)

☒ **1. Tensile tests** Specified R_{eH} **N.A.** Specified Rm: **≥ 570 N/mm2**

Test No.	Dim (mm)	Area (mm^2)	Yield load (kN)	ReH (N/mm^2)	U.T. load (kN)	Rm (N/mm^2)	A, % on	Remarks
Cross	**24,99x22,39**	**559,52**				**608**		
Cross	**24,97x22,49**	**561,57**				**606**		

☒ **2. Bend tests** Specified **180** degr. Former diameter **4t**

Type and dimensions	Results	Type and dimensions	Results
4x Sidebend	**Acceptable**		

☒ **3. Impact tests** Type: **Charpy KV** Size: **10x10 mm** Requirement: **Minimum ≥ 27J**

Notch Location/Direction	Temp. °C	Values, J 1	2	3	Average J	Remarks
Mid weld	**-20**	**91**	**84**	**73**	**83**	
Fusion line	**-20**	**236**	**245**	**222**	**234**	

☒ **4. Macro examination** **1x Acceptable**

☒ **5. Hardness test** Specified type if test:: **Vickers HV10** Required: **≤ 380 HV10**

Sketch showing indentations

This qualification is approved for applications under PED 97/23/EC by Det Norske Veritas B.V. PC NL (NoBo 0427)

Point	Hardness	Point	Hardness
	Cap area		**Root area**
Base material	199-206-206	**Base material**	205-198-206
H.A.Z.	218-212-221-194-196	**H.A.Z.**	197-191-193-188-
Weld metal	222-224-227-225-215	**Weld metal**	206-209-205-206-196
H.A.Z.	207-209-205-188-185	**H.A.Z.**	212-207-206-188-186
Base material	207-206-199	**Base material**	198-202-196

Other tests Type and results: **Visual inspection acceptable acc. ISO 5817 Level B&C**

Place **Breda (NL)** Date **2012-07-05** Witnessed by **M. van Holsteijn (DNV)**

Laboratory signature and stamp **Report SL 12.7030-1 Schielab, Breda (NL)**

We hereby certify that by virtue of the information given on page 1 of this form and the laboratory test results given above, this welding procedure meets the Code/Standard and/or purchaser's specification, and that within the limitations given in the Code/Standard and/or purchaser''s specification by our signature is approved for welding on said product.

Place **Rotterdam (NL)** Date **2012-07-05**

Surveyor **M. VAN HOLSTEIJN**

Herstaco B.V.
Nijverheidsweg 24, 4338 PC MIDDELBURG, The Netherlands
Phone: +31 118-635 511, Fax: +31 118-633 391

pWPS in accordance with EN ISO 15609-1

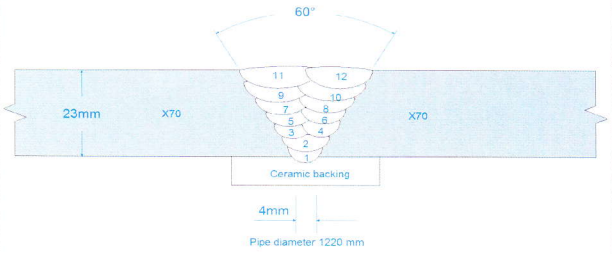
Process(es) EN ISO 4063 / ASME IX : *136/FCAW-121/SAW*

Welding position NEN ISO 6947 / ASME IX : *PA/1G*

pWPS number:	*HM260612-2*
Revision :	*0*
Date:	*26-6-2012*
Page:	*1-2*

Project:	*Welding circumferential weld for qualification*
Contractor:	*Herstaco B.V. Middelburg*
Applied codes:	*NEN-EN ISO 15614-1*
Application:	*Shop instruction*
Welding process(e:	*136/FCAW-121/SAW*
PQR number:	*ROT 12.028439.15*
Drawing number:	*N.A.*

Nr.	Basemateriaal	Thickness range mm.	Tube diameter range mm.
1	*X70 (API 5L)*	*23 mm*	*Ø 1220 mm*
2	*X70 (API 5L)*	*23 mm*	*Ø 1220 mm*



Bead sequence,Welding sequence

PREHEAT / INTERPASS TEMPERATURE

Preheat, min(Gr.C):	*10*
Method of Preheating:	*Propan Burner*
Control:	*Digital*
Maintance temperature.,Min (Gr.C):	*10*
Control:	*Digital*
Interpasstemp. Max (Gr.C):	*194°C*
Control:	*Digital*

WELDING SEQUENCE

Apliess to layer	*Root*	*Filler*	*Filler*	*Cap*
Pass Nr.:	*1*	*2-3*	*4-10*	*11-12*
Welding Position EN / ASME:	*All*	*PA/1G*	*PA/1G*	*PA/1G*
Welding Process EN / ASME:	*136*	*121 / SAW*	*121 / SAW*	*121 / SAW*
Consumable Brand:	*Hyundai*	*Hyundai*	*Hyundai*	*Hyundai*
Consumable Type:	*SuperCored 81MAG*	*A-2*	*A-2*	*A-2*
Size Filler Material (mm):	*1,2*	*3,2*	*3,2*	*3,2*
Shielding Flux Brand:	*N.A*	*Hyundai*	*Hyundai*	*Hyundai*
Shielding Flux Type:	*N.A*	*S-900SP*	*S-900SP*	*S-900SP*
Shielding Gas:	*Ar - CO2 - O*	*N.A.*	*N.A.*	*N.A.*
Shielding Gas Composition:	*90%-5%-5%*	*N.A.*	*N.A.*	*N.A.*
Gasflowrate,min-max (l/min):	*15*	*N.A.*	*N.A.*	*N.A.*
Gas-nozzle Diameter (mm):	*15,0*	*N.A.*	*N.A.*	*N.A.*
Tungsten electrode type:	*N.A.*	*N.A.*	*N.A.*	*N.A.*
Tungsten electrode diameter:	*N.A.*	*N.A.*	*N.A.*	*N.A.*
Backing-Gas (Yes/No):	*No*	*No*	*No*	*No*
Backing-Gas Composition:	*N.A.*	*N.A.*	*N.A.*	*N.A.*
Backing Gas Flowrate,min-max(l/min):	*N.A*	*N.A*	*N.A*	*N.A*
AC - DC Polarity E(lectrode) P(ositive) or E(lectrode) N(egative)	*DC-EP*	*DC-EP*	*DC-EN*	*DC-EP*
Current range (A):	*190 · 210*	*520 · 550*	*610 · 645*	*600 · 645*
Voltage range, (V):	*24,0 · 26,0*	*26,0 · 28,0*	*30,0 · 32,0*	*30,0 32,0*
Metal-transfer mode:	*Spray arc*	*N.A.*	*N.A.*	*N.A.*
Peak Current, Voltage (V/A):	*N.A*	*N.A*	*N.A*	*N.A*
Backgroundcurrent (A):	*N.A*	*N.A*	*N.A*	*N.A*
PulsFrequenty (Hz):	*N.A*	*N.A*	*N.A*	*N.A*
Balance (%):	*N.A*	*N.A*	*N.A*	*N.A*
Travel-speed range,main-max (mm/min):	*220 · 260*	*550 · 600*	*550 · 600*	*550 · 600*
Weaving allowed (Yes/No):	*Yes*	*N.A.*	*N.A.*	*N.A.*
Minimum run out length (mm):	*N.A*	*N.A*	*N.A*	*N.A*
Thermal rendement welding process EN 1011-1 (K-factor)	*0,8*	*1,0*	*1,0*	*1,0*
Heat-Input,min-max (KJ/mm): (Calculated in accordance with EN 1011-2)	*0,84 · 1,19*	*1,35 · 1,68*	*1,83 · 2,25*	*1,80 · 2,25*

Contractor:
Herstaco B.V. Middelburg
Approved by:
J. Jobse
Date:
26-6-2012

Herstaco B.V.
Nijverheidsweg 24, 4338 PC MIDDELBURG, The Netherlands
Phone: +31 118-635 511, Fax: +31 118-633 391

Client:
Reviewed / Witnessed
Found to comply with:
DNV rules
Reviewed by:
M. van Halsteijn
Date:
11 JUL 2012
DET NORSKE VERITAS B.V. - ROTTERDAM

Herstaco B.V.
Nijverheidsweg 24, 4338 PC MIDDELBURG, The Netherlands
Phone: +31 118-635 511, Fax: +31 118-633 391

pWPS in accordance with EN ISO 15609-1

Process(es) EN ISO 4063 / ASME IX : 136/FCAW-121/SAW

Welding position NEN ISO 6947 / ASME IX : PA/1G

pWPS number:	HM260612-2
Revision :	0
Date:	26-6-2012
Page:	2-2

Customer:	Herstaco B.V. Middelburg	Application	Shop instruction
Project:	Welding circumferential weld for qualification	PQR.Nr.:	ROT 12.028439.15
Apllied codes :	NEN-EN ISO 15614-1	Drawing. Nr.:	N.A.
Welding proces(ses):	136/FCAW-121/SAW		

Nr.	Material-specification		ASME IX P.No Gr.No	AWS D1.1 Group	ISO 15608 Group	Thickness range mm	Tube diameter range mm
1	X70 (API 5L)		N.A	N.A.	1.3	23 mm	Ø 1220 mm
2	X70 (API 5L)		N.A	N.A.	1.3	23 mm	Ø 1220 mm

WELDING CONSUMABLES.	Root	Filler	Filler	Cap
Solid / FCAW	FCAW	SAW	SAW	SAW
Designation	EN ISO 17632-A: T46 6 1Ni P M 2 2	EN 756 S50 3 CS S2Mo	EN 756 S50 3 CS S2Mo	EN 756 S50 3 CS S2Mo
Brand welding wire	Hyundai	Hyundai	Hyundai	Hyundai
Type welding wire	SuperCored 81MAG	A-2	A-2	A-2
Welding Position (EN, ASME)	All	PA/1G	PA/1G	PA/1G
Manual / Semi-automatic / Automatic	Semi automatic	Automatic	Automatic	Automatic
Single electrode / multiple electrode Process 121/ SAW	Single electrode	Single electrode	Single electrode	Single electrode
Wire feed, min-max (m/min)	N.A.	N.A	N.A.	N.A.
Oscillation (Yes/No)	N.A.	N.A	N.A.	N.A.
Oscillation width, min-max (mm)	N.A.	N.A	N.A.	N.A.
Oscillation frequence (HZ)	N.A.	N.A	N.A.	N.A.

TECHNIQUE	
Single / Double side welding	Single side
Single / Multiple passes side	Multiple pass
Stickout Length, (+- 5 mm)	136/FCAW 20 mm for 121/SAW 25 mm
Electrode spacing (mm)	N.A.
Peening (Yes/No)	No
Weld-edge preparation (method)	Flame cutting and grinding
Initial & Inter pass Cleaning	Grinding and Brushing
Fit-Up method	Tack welding
Consumable insert	N.A.
Material backing (Yes/No)	Yes
Type of backing (Retrainer)	Ceramic backing
Back-gouging-method	N.A.

Cladding No

Deposited weld metal thickness

Process(EN/ASME)	Max.(mm)
136	8 mm
121	38 mm

Minimum distance from surface to fusion line, in case cladding (mm): N.A.

POSTWELD HEAT TREATMENT	
Apply (Yes/No)	No
Local or furnace	N.A.
PWHT temp, min-max (Gr.C)	N.A.
PWHT time, min-max (min.)	N.A.
Heating Rate, max (Gr.C/hr)	N.A.
Cooling Rate, max (Gr.C/hr)	N.A.
Withdraw.temp, max (Gr.c)	N.A.
PWHT-Procedure ref.nr.(for local PWHT)	N.A.

Further information LMK/PQR

PQR impact testing with test < 20 Gr.C

Yes

PQR impact test temperature (Gr.C):

-20

Thickness PQR testpiece mm:

23 mm

PQR.ref.nr:. ROT 12.028439.15

REMARKS:

Contractor:
Herstaco B.V. Middelburg
Approved by:
J. Jobse
Date:
26-6-2012

Herstaco B.V.
Nijverheidsweg 24, 4338 PC MIDDELBURG, The Netherlands
Phone: +31 118-635 511, Fax: +31 118-633 391

Client:
Reviewed / Witnessed
Found to comply with:
(DNV rel)
Reviewed by: M. van Holstein
Date: 11 JUL 2012 (date)
DET NORSKE VERITAS B.V. - ROTTERDAM

Herstaco TubeWelding B.V.
Nijverheidsweg 24, 4338 PC MIDDELBURG, The Netherlands
Phone: +31-118.635.511, Fax: +31-118-633.391

PQR / WPQ
TEST RECORD No.: ARL1570-2

Testdate:	2012-06-26
Customer:	Herstaco Tubewelding B.V.
Place:	Middelburg (NLD)
Order No.:	ARL1570-2
Project:	General
WPS No.:	HM260612-2
Witnessing Auth.:	M. van Holsteijn (DNV)

WPQ in acc. with	N.A.
WPS in acc. with:	EN ISO 15609-1:2004
PQR in acc. with:	EN ISO 15614-1:2004/A1:2008
Additional requirements:	N.A.

Pipe 1 dim. / Thickness:	Ø 1220x23 mm
Pipe 2 dim. / Thickness:	Ø 1220x23 mm
Material certificate pipe 1:	SL 12.6540-1
Material certificate pipe 2:	SL 12.6540-1
Pipe 1 material:	X70 acc. API 5L (Grouping (1.3)
Pipe 2 material:	X70 acc. API 5L (Grouping (1.3)

Edge preparation:	V-joint 60°
Welding position:	PA
Welding process:	136 / 121
Interpass temp.:	≤ 194 °C
Preheat temp. min.:	≥ 10 °C
P.W.H.T.:	N.A.

Welder / operator:	
Date / place of birth:	
Stamp No. / I.D.:	
Testpiece marked with:	

Solid / FCAW / SMAW:	FCAW
AWS. spec. / class.:	N.A.
EN spec. / class.:	EN ISO 17632-A: T46 6 1Ni P M 2 2
Batch number:	LOT 733 064
Brand:	Hyundia
Type:	SuperCored 81MAG

Solid / FCAW / SMAW:	Solid
AWS. spec. / class.:	A5.23 F9A2-EA2
EN spec. / class.:	EN 756: S50 3 CS S2Mo
Batch number:	1020303
Brand:	Hyundia
Type:	Wire A-2- Flux S-900SP

Shielding gas type EN ISO 14175 :	M23
Shielding gas composition:	90% Argon -5% CO_2 - 5%0_2
Gas flow:	15 L/min
Gas nozzle diameter:	15 mm
Backing gas type EN ISO 14175 :	N.A.
Backing gas composition:	N.A.
Backing gas flow:	N.A.

Remarks: Type of backing ceramic

Witnessed by:

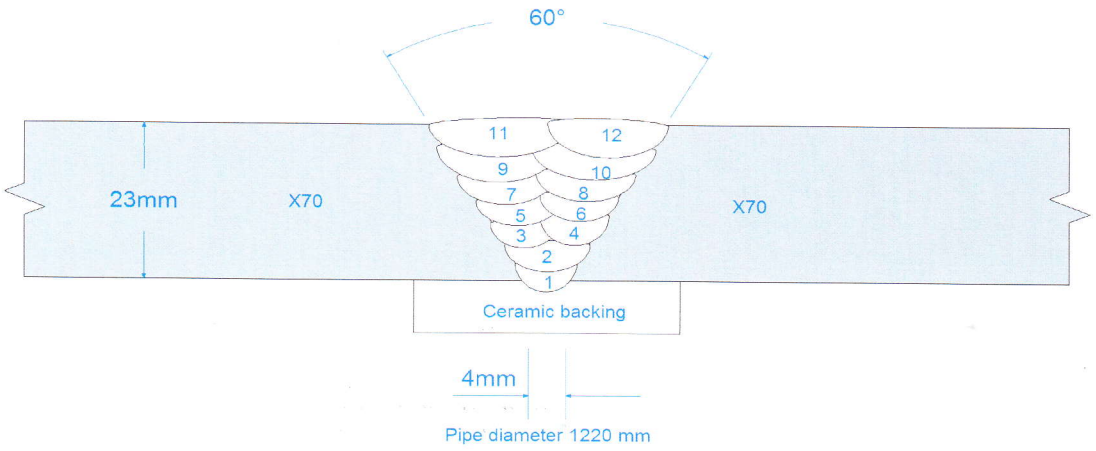
Herstaco TubeWelding B.V.
Nijverheidsweg 24, 4338 PC MIDDELBURG, The Netherlands
Phone: +31-118.635.511, Fax: +31-118-633.391

PQR / WPQ
TEST RECORD No.: ARL1570-2

Testdate: *2012-06-26*
Customer: *Herstaco Tubewelding B.V.*
Place: *Middelburg (NLD)*
Order No.: *ARL1570-2*
Project: *General*
WPS No.: *HM260612-2*

Witnessing Auth.: *M. van Holsteijn (DNV)*

Pass no.	Inter-pass temp	Process	Consumable		Diam. (mm)	Gas flow (L/min.)	Volts (V)	Ampere (A)	Welding time in sec.	Welding length in mm	Current DC +/-	Efficiently factor (EN 1011-1)	Travel-speed (mm/mi	Heat-input (KJ/mm)
1	10	136	SC 81MAG	Spray Arc	1,2	15	25,3	196	479	1905	DC-EP	0,8	239	1,00
2	31	121	A-2 / S-900SP	N.A.	3,2	N.A.	26,9	520	398	3810	DC-EP	1	574	1,46
3	48	121	A-2 / S-900SP	N.A.	3,2	N.A.	27,9	550	398	3810	DC-EP	1	574	1,60
4	83	121	A-2 / S-900SP	N.A.	3,2	N.A.	30,7	628	398	3810	DC-EP	1	574	2,01
5	118	121	A-2 / S-900SP	N.A.	3,2	N.A.	30,7	628	398	3810	DC-EP	1	574	2,01
6	151	121	A-2 / S-900SP	N.A.	3,2	N.A.	30,7	628	398	3810	DC-EP	1	574	2,01
7	158	121	A-2 / S-900SP	N.A.	3,2	N.A.	30,7	628	398	3810	DC-EP	1	574	2,01
8	181	121	A-2 / S-900SP	N.A.	3,2	N.A.	30,7	628	398	3810	DC-EP	1	574	2,01
9	163	121	A-2 / S-900SP	N.A.	3,2	N.A.	30,7	628	398	3810	DC-EP	1	574	2,01
10	170	121	A-2 / S-900SP	N.A.	3,2	N.A.	30,7	628	398	3810	DC-EP	1	574	2,01
11	176	121	A-2 / S-900SP	N.A.	3,2	N.A.	30,7	628	398	3810	DC-EP	1	574	2,01
12	194	121	A-2 / S-900SP	N.A.	3,2	N.A.	30,7	628	398	3810	DC-EP	1	574	2,01
Welding parameters measured with Triton AMV 3000 Parameter recorder														



Reviewed / Witnessed
Found to comply with:
(DNV ref.)
11 JUL 2012
M. van Holsteijn
(date)
DET NORSKE VERITAS B.V. - ROTTERDAM

Witnessed by:

WELDING PROCEDURE QUALIFICATION RECORD AND

Testing in accordance with	: EN ISO 15614-1:2004/A1:2008
Purchaser	: Arjan Roza Lastechniek BV
Purchase order no.	: ARL1570-2
Manufacturer	: Herstaco Tubewelding B.V.
WPS	: HM160612-2
Description of sample(s)	: V-joint 60° single side welded
Dimension(s)	: Ø 1220x23 mm
Material grade	: X70 acc. API 5L (Grouping (1.3)
Welding process(es)	: 136 / 121
Filler	: Root 136 - Hyundai, SuperCored 81MAG
	: Fill and cap 121 - Hyundai, Wire A-2 - Flux S-900SP
Shielding gas EN ISO 14175	: M23, 90% Argon - 5% CO_2 - 5%O_2, 15 L/min.
Backing type	: Ceramic backing
Welding position	: PA
Preheat / Interpass temp.	: ≥ 10 °C / ≤ 194 °C
Joint type	: V-joint 60°
PWHT	: N.A.
Welder	:
Date / place of birth	:
ID	:
Testpiece marked with	:

NON DESTRUCTIVE EXAMINATION

* Visual examination	: performed by examiner
* Ultrasonic examination	: acceptable, see RTD/Applus report 04539-2012-27-003 No 7030
* Magnetic particle examination	: acceptable, see RTD/Applus report 04539-2012-27-005 No.7030

CROSS WELD TENSILE TESTS

Dimensions(s) [mm]	Rm [N/mm²]	Fracture location
24.99x22.39	608	Base material
24.97x22.49	606	Base material
Requirements;	≥ 570	

TECHNOLOGICAL TESTS

Type	Former / Bending Angle	Results
Side bend	4t / 180°	4 x acceptable

MACROSCOPIC EXAMINATION

Amount	Result
1x	Acceptable (see Appendix A)

HARDNESS MEASUREMENTS

Method : Vickers HV10kg
Requirements : Max. 380 HV10kg

Location of indentations	Traverse 1-2mm below outer surface	Traverse Root area
base material	199-206-206	205-198-206
heat affected zone	218-212-221-194-196	197-191-193-188-183
weld metal	222-224-227-225-215	206-209-205-206-196
heat affected zone	207-209-205-188-185	212-207-206-188-186
base material	207-206-199	198-202-196

IMPACT TESTS - Type: Charpy KV

Notch location	Size [mm]	Test temp. [°C]	Results [J]	Average value [J]
Midweld	10 x 10	-20	91-84-73	83
Heat Affected Zone	10 x 10	-20	236-245-222	234
Requirements;			≥ 20	≥ 27

Conclusion: The results satisfy the requirements.

All characteristics of the above object(s) have, as far as accessible and relevant, been verified by Schielab b.v. Other information was provided by the purchaser. This information was verified as far as possible and has been copied into this report, unchanged. We hereby certify that the reported test data is correct and that the above object(s) was (were) tested/examined in accordance with purchasers requirements and/or the above procedure(s) and/or code(s)/specification(s). On occasion a destructive test is subcontracted by Schielab b.v. (marked 'U' on the report). Opinions, interpretations and advice expressed in this report are outside the scope of any possible RvA accreditation, but are presented in a true and fair manner based on the best knowledge of the Schielab personnel involved. If, upon reproduction, only part of this report is copied, Schielab will not bear any responsability for content, purport and conclusions of that reproduction. This report has legal value only when printed on Schielab paper and furnished with an authorised signature. Digital versions of this report have no legal value. . Unless explicitly agreed upon otherwise in writing our "General conditions for activities performed by Schielab b.v.", deposited at the Chamber of Commerce in Rotterdam, under number 24170257, apply

Breda, 05-07-2012

SCHIELAB S. Wevers

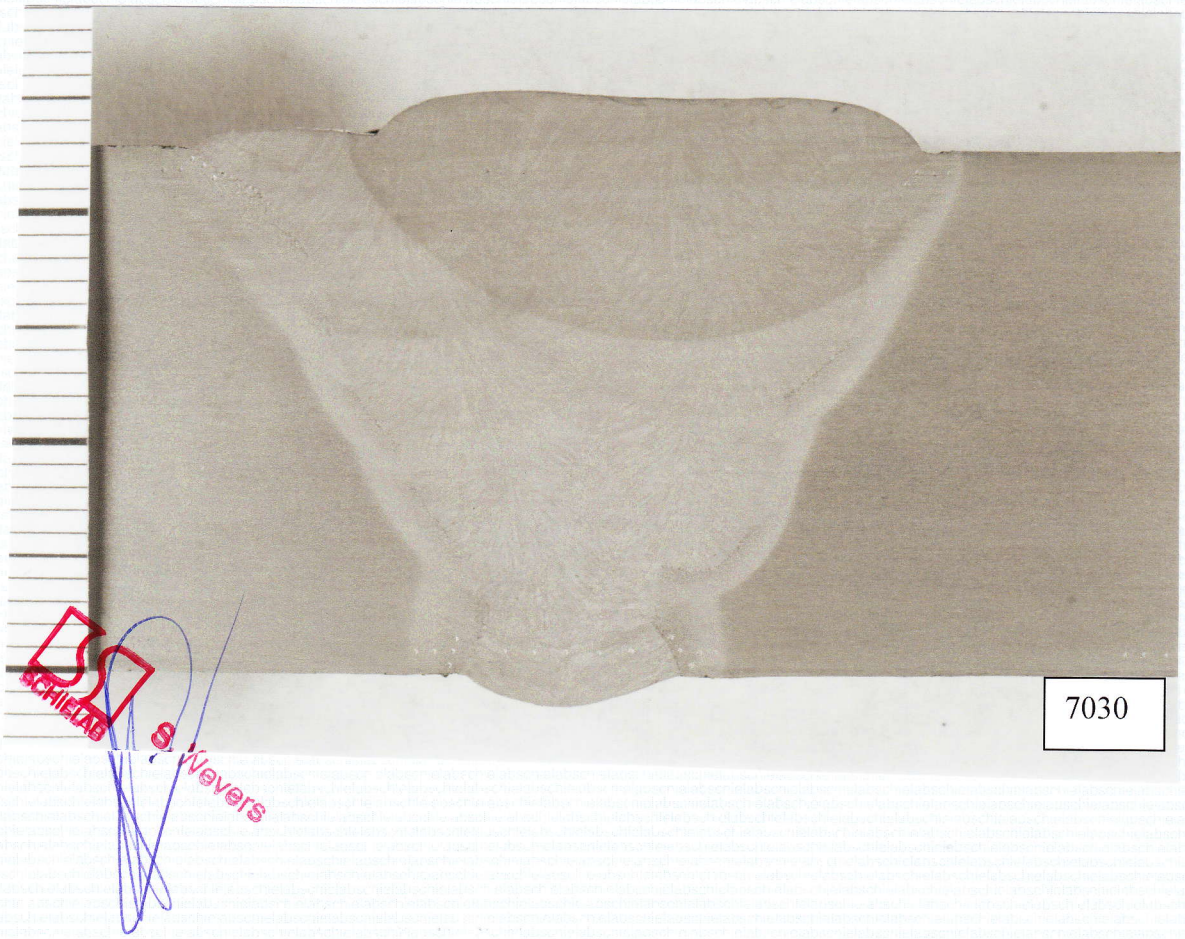
DET NORSKE VERITAS 1864 Reviewed / Witnessed
Found to comply with: (DNV ref.)
11 JUL 2012 (date)
M. van Holsteijn
DET NORSKE VERITAS B.V. - ROTTERDAM

TESTING
RvA L 063

Ingeschreven in het RvA register voor laboratoria onder nr. L 063 voor gebieden zoals nader omschreven in de erkenning.
Entered in the RvA register for laboratories under number L 063 for the areas outlined in the approval.

Appendix A
SL 12.7030-1

MACRO PHOTO
Cross section no. 7030



Ultrasonic examination Report

Röntgen Technische Dienst bv

Delftweg 144
Postbus 10065
3004 AB Rotterdam

Tel. (010) 208 82 08
Fax (010) 415 80 22
E-mail rtd@rtd.nl

F&A number	Report number
5002--78949/014	04539-2012-27-003

Client	Schielab BV
Address	Sevillaweg 64
Post code and city	3047AL Rotterdam
Country	the Netherlands
Contact	S. Wevers
Carried out at	Schielab BV. Breda
Address	Voorerf 18-20
Post code and city	4824GN Breda
Country	the Netherlands
Date	2-7-2012
Client order number	--
Purchaser	A. Roza Lastechniek
Project	ARL 1570
Drawing number	7030R
Object	Testweld
RTD branch office	Roosendaal
Telephone number	(0165) 56 01 26
Fax	(0165) 53 84 17
Contact	F.de Krom
Remarks	

Exam. standard	EN-ISO 17640:2010		
Accept. standard	EN-ISO 11666:2010 level 2		
Exam. procedure	UT 21112	**Rev.**	6
Accept. procedure	UT 21112	**Rev.**	6
Parent material	X70	**Thickness** [mm]	23
Temp. object [°C]	Ambient (>5 - <70)	**Heat treated**	☐ Yes ☐ No
Surface condition	Acceptable	**Couplant**	MR 750
Welding process	136 - 121	**Technique**	
Weld material	--	■ Pulse echo	
Weld preparation	BW	☐ Special	
Equipment	Sitescan150 **No.** 649	**Cal. exp.**	01-03-2013
Ref. block	ASME 19 mm	**Cal. block**	V2 block

		Probe 1	Probe 2	Probe 3	Probe 4
Probe type		SMA04-45	SA04-60	MB4S	SA04-70
Frequency	[MHz]	2	2	4	4
Angle	[°]	45	60	0	70
Sound path	[mm]	0-100	0-150	0-50	0-250
Sens. setting	[dB]	DAC	DAC	2e	DAC
Transfer	[dB]	4	4	--	4
Scan sens.	[dB]	14	14	--	14
Total	[dB]	--	--	--	--

Purpose of examination: Detection of weld defects

Items examined:

Schielab no	Remarks	Thickness	Material grade	joint design	proces
7030	ARL 1570-2	23	X70	BW	136-121

Result: Acceptable to specification.

DET NORSKE VERITAS 1864
Reviewed / Witnessed
(DNV ref.) Found to comply with:
M. van Holsteijn 11 JUL 2012 (date)
DET NORSKE VERITAS B.V. - ROTTERDAM

For client	Operator	No.	Level	Cert.no.	Report checked for RTD
	a K. Cocquyt	1132	II	473/1441	Name
	b				
Page 1	**Date, signature and stamp**				**Date, signature and stamp**
Total pages 1	Applus RTD NDT Testing Kevin Cocquyt				

Magnetic Particle Examination Report

Röntgen Technische Dienst bv

Delftweg 144
Postbus 10065
3004 AB Rotterdam

Tel. (010) 208 82 08
Fax (010) 415 80 22
E-mail rtd@rtd.nl

F&A number	Report number
5002--78949/014	04539-2012-27-005

Client	Schielab BV
Address	Sevillaweg 64
Post code and city	3047AL Rotterdam
Country	the Netherlands
Contact	S. Wevers
Carried out at	Schielab BV Breda
Address	Voorerf 18-20
Post code and city	4824 GN Breda
Country	the Netherlands
Date	2-7-2012
Client order number	--
Purchaser	A. Roza Lastechniek
Project	ARL 1570
Drawing number	7030R
Object	Testweld
RTD branch office	Roosendaal
Telephone number	(0165) 56 01 26
Fax	(0165) 53 84 17
Contact	F. de Krom
Remarks	

Exam. standard	EN-ISO 17638: 2009		
Accept. standard	EN-ISO 23278: 2009		
Exam. procedure	MT 21202	**Rev.**	0
Accept. procedure	MT 21202	**Rev.**	0
Parent material	X70	**Thickness** [mm]	23
Temp. object [°C]	Ambient (>5 - <50)	**Heat treated**	☐ Yes ☐ No
Surface condition	Acceptable		
Welding process	136-121		
Weld material	--		
Weld preparation	BW		
Prod equip. no.	--	**Yoke no.**	V763
Perm. mag. no.	--	**Cal. expiry**	16-1-2013
Blacklight	--	**Cal. expiry**	
Prod current [A]	NA	**Yoke magnet**	Magnaflux
Centr. cond. [A]	NA	**Coil** [A.turns]	NA
Test medium	Marker	**Type**	MR 76 S
■ Wet		■ Colour	
☐ Dry		☐ Fluorescent	
Contrast paint	■ Yes ☐ No	**Demagnetized**	☐ Yes ■ No

Purpose of examination: Detection of surface defects

Items examined:

Schielab no.	Remarks	Thickness	Material	Joint design	process.
7030R	ARL 1570-2	23	X70	BW	136-121

Result: Acceptable to specification.

DET NORSKE VERITAS 1864
Reviewed / Witnessed
Found to comply with: (DNV ref.)
M. van Holsteijn, 11 JUL 2012 (date)
DET NORSKE VERITAS B.V. - ROTTERDAM

For client	Operator	No.	Level	Cert.no.	Report checked for RTD
	a K. Cocquyt	1132	II	473/1441	Name
	b				

Page 1	**Date, signature and stamp**	**Date, signature and stamp**
Total pages 1	Applus RTD ND Testing Kevin Cocquyt 2-7-2012	

6914E rev. 3

6916 rev. 1

DET NORSKE VERITAS

Ref.: ROT 12.028439.14

WELDING PROCEDURE QUALIFICATION TEST

According to (code, standard)

EN ISO 15614-1:2004/A2:2008

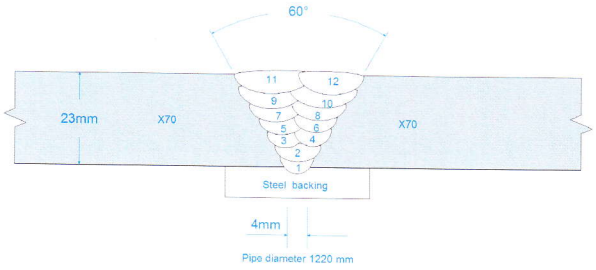
Manufacturer's welding procedure No.
HM260612-1

Manufacturer **Herstaco Tubewelding B.V.** Place and date **Middelburg (NLD), 2012-06-26**

Purchaser's spec. No. **ARL1570-1** Project **General**

Requirements beyond code/standard **N.A.**

Joint preparation and welding sequence (Sketch).



BASE MATERIAL SPECIFICATION AND GROUPING

X70 acc. API 5L (Grouping (1.3)-X70 acc. API 5L (Grouping (1.3)

Grade	C, %	C eq %
X70	0,08	0,38

Grade	C, %	C eq %
X70	0,08	0,38

If applicable, the following C eq based on ladle analysis is to be calculated:

$$Ceq = C + \frac{Mn}{6} + \frac{Cr+Mo+V}{5} + \frac{Cu+Ni}{15} \ \%$$

Welding process(es) **138 / 121** Welding position **PA** Single-/double sided welding **Single side**

WELDING CONSUMABLES:

Index	Consumable(s), trade name	Code designation
A	**Hyundia SuperCored 70ML**	**EN ISO 17632-A: T46 4 M M 2 2**
B	**Hyundia Wire A-2- Flux S-900SP**	**EN 756: S50 3 CS S2Mo**
C		

WELDING PARAMETERS

Pass No.	Index	Diam. mm	Gas composition	Gas L/min	Current polarity	Amps	Volts	Travel speed mm/min	Wire feed mm/min	Heat input kJ/mm
1	A	1,2	M23*	15	DC-EP	253	27,6	468	N.A.	0,72
2	B	3,2	N.A.	N.A.	DC-EP	520	26,9	574	N.A.	1,46
3	B	3,2	N.A.	N.A.	DC-EP	550	27,9	574	N.A.	1,60
4	B	3,2	N.A.	N.A.	DC-EP	628	30,7	574	N.A.	2,01
5	B	3,2	N.A.	N.A.	DC-EP	628	30,7	574	N.A.	2,01
6	B	3,2	N.A.	N.A.	DC-EP	628	30,7	574	N.A.	2,01
7	B	3,2	N.A.	N.A.	DC-EP	628	30,7	574	N.A.	2,01
8	B	3,2	N.A.	N.A.	DC-EP	628	30,7	574	N.A.	2,01
9	B	3,2	N.A.	N.A.	DC-EP	628	30,7	574	N.A.	2,01
10	B	3,2	N.A.	N.A.	DC-EP	628	30,7	574	N.A.	2,01
11	B	3,2	N.A.	N.A.	DC-EP	628	30,7	574	N.A.	2,01
12	B	3,2	N.A.	N.A.	DC-EP	628	30,7	574	N.A.	2,01

ther information (weaving, backing, groove preparation, gouging, grinding, etc.):

*** Composition shielding gas 90% Ar - 5% CO_2 -5%0_2**

**** Heat-input in acc. with NEN-EN 1011-1, efficiently factor 0,8 for process 138 and efficiently factor 1,0 for 121**

SPECIAL REQUIREMENTS: Preheat min **≥ 10 °C** Interpass max **≤ 194 °C** PWHT **N.A.°C** Time **N.A. Hr(s)**

Heating/cooling rate **N.A.** Baking of electrodes **N.A.** Others **N.A.**

WELDING CARRIED OUT BY **D. Sulkers** TEST PIECE MARKED **ARL1570-1 , and DNV Stamp**

EXTENT OF APPROVAL: Base material(s) **1.3*** - 1.3 ***)** Positions: **PA**

Plate /wall thickness **11,5 - 46 mm mm** Diam. **≥ Ø 610 mm** Other limitations **N.A.**

*** **Approval for materials in the same group with an equal or lower yield strenght**

We certify that the statements in this record are correct and that the test weld was prepared, welded and heat treated in accordance with the specified Code/Standard and/or purchaser's requirements.

Manufacturer's signature and stamp

DNV's survey station and surveyor's signature

Rotterdam (NL)

If any person suffers loss or damage which is proved to have been caused by any negligent act or omission of Det Norske Veritas, then Det Norske Veritas shall pay compensation to such person for his proved direct loss or damage. However, the compensation shall not exceed an amount equal to ten times the fee charged for the service in question, provided that the maximum compensation shall never exceed USD 2 million.
In this provision "Det Norske Veritas" shall mean the Foundation Det Norske Veritas as well as all its subsidiaries, directors, officers, employees, agents and any other acting on behalf of Det Norske Veritas.

NON-DESTRUCTIVE TESTING

☒ 1. Radiographic testing

Procedure ref.	EN 1435 class B			Acceptance criteria	EN 12517-1 Level 1	Result	Acceptable
Film type	D4			Screens	Pb 0,027 mm	IQI	10 FE EN
KV	280	mAmin.	6	Sensitivity	N.A.%	Density	N.A.

☒ 2. Ultrasonic examination

Procedure ref.	EN 17638	Acceptance criteria	EN 11666 Level 22	Result	Acceptable

☒ 3. Other examination Type: M.P.I.

Procedure ref.	EN 17638	Acceptance criteria	EN 23278 level 1	Result	Acceptable

Place and date: Breda (NL), 2012-07-03

Reviewed by M. van Holsteijn (DNV)

Laboratory signature and stamp: Report SL 12.7029-1 Schielab, Breda (NL)

MECHANICAL TESTING

(According to EN ISO 15614-1:2004/A1:2008)

☒ 1. Tensile tests — Specified R_{eH}: N.A. — Specified Rm: ≥ 570 N/mm2

Test No.	Dim (mm)	Area (mm^2)	Yield load (kN)	ReH (N/mm^2)	U.T. load (kN)	Rm (N/mm^2)	A, % on	Remarks
Cross	24,98x22,34	558,05				601		
Cross	25,02x22,21	555,69				602		

☒ 2. Bend tests — Specified: 180 degr. — Former diameter: 4t

Type and dimensions	Results	Type and dimensions	Results
4x Sidebend	Acceptable		

☒ 3. Impact tests — Type: Charpy KV — Size: 10x10 mm — Requirement: Minimum ≥ 27J

Notch Location/Direction	Temp. °C	Values, J 1	2	3	Average J	Remarks
Mid weld	-20	69	65	67	67	
Fusion line	-20	147	132	201	160	

☒ 4. Macro examination — 1x Acceptable

☒ 5. Hardness test — Specified type if test:: Vickers HV10 — Required: ≤ 380 HV10

Sketch showing indentations

This qualification is approved for applications under PED 97/23/EC by Det Norske Veritas B.V. PC NL (NoBo 0427)

Point	Hardness	Point	Hardness
	Cap area		Root area
Base material	207-209-210	Base material	217-214-212
H.A.Z.	186-190-198-208-189	H.A.Z.	198-203-217-230-227
Weld metal	228-229-218-235-229	Weld metal	231-232-229-210-222
H.A.Z.	200-193-197-183-190	H.A.Z.	212-190-220-203-196
Base material	207-210-209	Base material	200-202-198

Other tests — Type and results: Visual inspection acceptable acc. ISO 5817 Level B&C

Place: Breda (NL) — Date: 2012-07-03 — Witnessed by M. van Holsteijn (DNV)

Laboratory signature and stamp: Report SL 12.7029-1 Schielab, Breda (NL)

We hereby certify that by virtue of the information given on page 1 of this form and the laboratory test results given above, this welding procedure meets the Code/Standard and/or purchaser's specification, and that within the limitations given in the Code/Standard and/or purchaser's specification by our signature is approved for welding on said product.

Place: Rotterdam (NL) — Date: 2012-07-03

Surveyor: M. VAN HOLSTEIJN

Herstaco B.V.
Nijverheidsweg 24, 4338 PC MIDDELBURG, The Netherlands
Phone: +31 118-635 511, Fax: +31 118-633 391

pWPS in accordance with EN ISO 15609-1

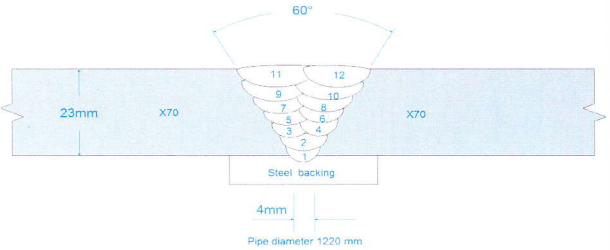
Process(es) EN ISO 4063 / ASME IX : *138/FCAW-121/SAW*

Welding position NEN ISO 6947 / ASME IX : *PA/1G*

pWPS number:	*HM260612-1*
Revision :	*0*
Date:	*26-6-2012*
Page:	*1-2*

Project:	*Welding circumferential weld for qualification*
Contractor:	*Herstaco B.V. Middelburg*
Applied codes:	*NEN-EN ISO 15614-1*
Application:	*Shop instruction*
Welding process(e:	*138/FCAW-121/SAW*
PQR number:	*ROT 12.028439.14*
Drawing number:	*N.A.*

Nr.	Basematériaal	Thickness range mm.	Tube diameter range mm.
1	*X70 (API 5L)*	*23 mm*	*Ø 1220 mm*
2	*X70 (API 5L)*	*23 mm*	*Ø 1220 mm*



Bead sequence,Welding sequence

PREHEAT / INTERPASS TEMPERATURE

Preheat, min(Gr.C):	*10*
Method of Preheating:	*Propan Burner*
Control:	*Digital*
Maintance temperature.,Min (Gr.C):	*10*
Control:	*Digital*
Interpasstemp. Max (Gr.C):	*194°C*
Control:	*Digital*

WELDING SEQUENCE

Apliess to layer	*Root*	*Filler*	*Filler*	*Cap*
Pass Nr.:	*1*	*2-3*	*4-10*	*11-12*
Welding Position EN / ASME:	*All*	*PA/1G*	*PA/1G*	*PA/1G*
Welding Process EN / ASME:	*138*	*121 / SAW*	*121 / SAW*	*121 / SAW*
Consumable Brand:	*Hyundai*	*Hyundai*	*Hyundai*	*Hyundai*
Consumable Type:	*SuperCored 70ML*	*A-2*	*A-2*	*A-2*
Size Filler Material (mm):	*1,2*	*3,2*	*3,2*	*3,2*
Shielding Flux Brand:	*N.A*	*Hyundai*	*Hyundai*	*Hyundai*
Shielding Flux Type:	*N.A*	*S-900SP*	*S-900SP*	*S-900SP*
Shielding Gas:	*Ar - CO2 - O*	*N.A.*	*N.A.*	*N.A.*
Shielding Gas Composition:	*90%-5%-5%*	*N.A.*	*N.A.*	*N.A.*
Gasflowrate,min-max (l/min):	*15*	*N.A.*	*N.A.*	*N.A.*
Gas-nozzle Diameter (mm):	*15,0*	*N.A.*	*N.A.*	*N.A.*
Tungsten electrode type:	*N.A.*	*N.A.*	*N.A.*	*N.A.*
Tungsten electrode diameter:	*N.A.*	*N.A.*	*N.A.*	*N.A.*
Backing-Gas (Yes/No):	*No*	*No*	*No*	*No*
Backing-Gas Composition:	*N.A.*	*N.A.*	*N.A.*	*N.A.*
Backing Gas Flowrate,min-max(l/min):	*N.A*	*N.A*	*N.A*	*N.A*
AC - DC Polarity E(lectrode) P(ositive) or E(lectrode) N(egative)	*DC-EP*	*DC-EP*	*DC-EN*	*DC-EP*
Current range (A):	*245 · 265*	*520 · 550*	*610 · 645*	*600 · 645*
Voltage range, (V):	*27,0 · 29,0*	*26,0 · 28,0*	*30,0 · 32,0*	*30,0 32,0*
Metal-transfer mode:	*Spray arc*	*N.A.*	*N.A.*	*N.A.*
Peak Current, Voltage (V/A):	*N.A*	*N.A*	*N.A*	*N.A*
Backgroundcurrent (A):	*N.A*	*N.A*	*N.A*	*N.A*
PulsFrequenty (Hz):	*N.A*	*N.A*	*N.A*	*N.A*
Balance (%):	*N.A*	*N.A*	*N.A*	*N.A*
Travel-speed range,main-max (mm/min):	*440 · 480*	*550 · 600*	*550 · 600*	*550 · 600*
Weaving allowed (Yes/No):	*Yes*	*N.A.*	*N.A.*	*N.A.*
Minimum run out length (mm):	*N.A*	*N.A*	*N.A*	*N.A*
Thermal rendement welding process EN 1011-1 (K-factor)	*0,8*	*1,0*	*1,0*	*1,0*
Heat-Input,min-max (KJ/mm): (Calculated in accordance with EN 1011-2)	*0,66 · 0,84*	*1,35 · 1,68*	*1,83 · 2,25*	*1,80 · 2,25*

Contractor:
Herstaco B.V. Middelburg
Approved by:
J. Jobse
Date:
26-6-2012

Herstaco B.V.
Nijverheidsweg 24, 4338 PC MIDDELBURG, The Netherlands
Phone: +31 118-635 511, Fax: +31 118-633 391

Client:

Reviewed by:

Date:

Herstaco B.V.
Nijverheidsweg 24, 4338 PC MIDDELBURG, The Netherlands
Phone: +31 118-635 511, Fax: +31 118-633 391

pWPS in accordance with EN ISO 15609-1

Process(es) EN ISO 4063 / ASME IX : 138/FCAW-121/SAW

Welding position NEN ISO 6947 / ASME IX : PA/1G

pWPS number:	HM260612-1
Revision :	0
Date:	26-6-2012
Page:	2-2

Customer:	Herstaco B.V. Middelburg	Application	Shop instruction
Project:	Welding circumferential weld for qualification	PQR.Nr.:	ROT 12.028439.14
Apllied codes :	NEN-EN ISO 15614-1	Drawing. Nr.:	N.A.
Welding proces(ses):	138/FCAW-121/SAW		

Nr.	Material-specification		ASME IX P.No Gr.No	AWS D1.1 Group	ISO 15608 Group	Thickness range mm	Tube diameter range mm
1	X70 (API 5L)		N.A	N.A.	1.3	23 mm	Ø 1220 mm
2	X70 (API 5L)		N.A	N.A.	1.3	23 mm	Ø 1220 mm

WELDING CONSUMABLES.	Root	Filler	Filler	Cap
Solid / FCAW	FCAW	SAW	SAW	SAW
Designation	EN ISO 17632-A: T46 4 M M 2 2	EN 756 S50 3 CS S2Mo	EN 756 S50 3 CS S2Mo	EN 756 S50 3 CS S2Mo
Brand welding wire	Hyundai	Hyundai	Hyundai	Hyundai
Type welding wire	SuperCored 70ML	A-2	A-2	A-2
Welding Position (EN, ASME)	All	PA/1G	PA/1G	PA/1G
Manual / Semi-automatic / Automatic	Semi automatic	Automatic	Automatic	Automatic
Single electrode / multiple electrode Process 121/ SAW	Single electrode	Single electrode	Single electrode	Single electrode
Wire feed, min-max (m/min)	N.A.	N.A	N.A.	N.A.
Oscillation (Yes/No)	N.A.	N.A	N.A.	N.A.
Oscillation width, min-max (mm)	N.A.	N.A	N.A.	N.A.
Oscillation frequence (HZ)	N.A.	N.A	N.A.	N.A.

TECHNIQUE	
Single / Double side welding	Single side
Single / Multiple passes side	Multiple pass
Stickout Length, (+- 5 mm)	138/FCAW 20 mm for 121/SAW 25 mm
Electrode spacing (mm)	N.A.
Peening (Yes/No)	No
Weld-edge preparation (method)	Flame cutting and grinding
Initial & Inter pass Cleaning	Grinding and Brushing
Fit-Up method	Tack welding
Consumable insert	N.A.
Material backing (Yes/No)	Yes
Type of backing (Retrainer)	Ceramic backing
Back-gouging-method	N.A.

Cladding No

Deposited weld metal thickness

Process(EN/ASME)	Max.(mm)
136	8 mm
121	38 mm

Minimum distance from surface to fusion line, in case cladding (mm): N.A.

POSTWELD HEAT TREATMENT	
Apply (Yes/No)	No
Local or furnace	N.A.
PWHT temp, min-max (Gr.C)	N.A.
PWHT time, min-max (min.)	N.A.
Heating Rate, max (Gr.C/hr)	N.A.
Cooling Rate, max (Gr.C/hr)	N.A.
Withdraw.temp, max (Gr.c)	N.A.
PWHT-Procedure ref.nr.(for local PWHT)	N.A.

Further information LMK/PQR

PQR impact testing with test < 20 Gr.C

Yes

PQR impact test temperature (Gr.C):

-20

Thickness PQR testpiece mm:

23 mm

PQR.ref.nr:. ROT 12.028439.14

REMARKS:

Contractor:
Herstaco B.V. Middelburg
Approved by:
J. Jobse
Date:
26-6-2012

Herstaco B.V.
Nijverheidsweg 24, 4338 PC MIDDELBURG, The Netherlands
Phone: +31 118-635 511, Fax: +31 118-633 391

Client: Reviewed / Witnessed
Found to comply with: (DNV ref.)
Reviewed by:
Vlissingen-Oost
Date: 11 JUL 2012 (date)
R.V. - ROTTERDAM

Herstaco TubeWelding B.V.
Nijverheidsweg 24, 4338 PC MIDDELBURG, The Netherlands
Phone: +31-118.635.511, Fax: +31-118-633.391

PQR / WPQ
TEST RECORD No.: ARL1570-1

Testdate:	2012-06-26
Customer:	Herstaco Tubewelding B.V.
Place:	Middelburg (NLD)
Order No.:	ARL1570-1
Project:	General
WPS No.:	HM260612-1
Witnessing Auth.:	M. van Holsteijn (DNV)

WPQ in acc. with	N.A.
WPS in acc. with:	EN ISO 15609-1:2004
PQR in acc. with:	EN ISO 15614-1:2004/A1:2008
Additional requirements:	N.A.

Pipe 1 dim. / Thickness:	Ø 1220x23 mm
Pipe 2 dim. / Thickness:	Ø 1220x23 mm
Material certificate pipe 1:	SL 12.6540-1
Material certificate pipe 2:	SL 12.6540-1
Pipe 1 material:	X70 acc. API 5L (Grouping (1.3)
Pipe 2 material:	X70 acc. API 5L (Grouping (1.3)

Edge preparation:	V-joint 60 °
Welding position:	PA
Welding process:	138 / 121
Interpass temp.:	≤ 194 °C
Preheat temp. min.:	≥ 10 °C
P.W.H.T.:	N.A.

Welder / operator:	
Date / place of birth:	
Stamp No. / I.D.:	
Testpiece marked with:	

Solid / FCAW / SMAW:	FCAW
AWS. spec. / class.:	N.A.
EN spec. / class.:	EN ISO 17632-A: T46 4 M M 2 2
Batch number:	LOT MF1120G8
Brand:	Hyundia
Type:	SuperCored 70ML

Solid / FCAW / SMAW:	Solid
AWS. spec. / class.:	A5.23 F9A2-EA2
EN spec. / class.:	EN 756: S50 3 CS S2Mo
Batch number:	1020303
Brand:	Hyundia
Type:	Wire A-2- Flux S-900SP

Shielding gas type EN ISO 14175 :	M23
Shielding gas composition:	90% Argon -5% CO_2 - 5%0_2
Gas flow:	15 L/min
Gas nozzle diameter:	15 mm
Backing gas type EN ISO 14175 :	N.A.
Backing gas composition:	N.A.
Backing gas flow:	N.A.

Remarks: Type of backing steel (S235JR acc. EN 10025-2)

Witnessed by:

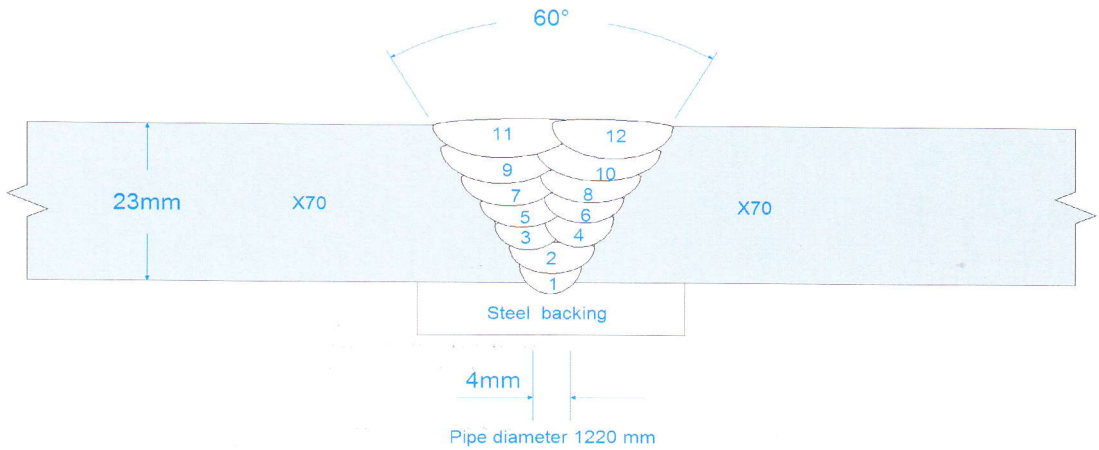
Herstaco TubeWelding B.V.
Nijverheidsweg 24, 4338 PC MIDDELBURG, The Netherlands
Phone: +31-118.635.511, Fax: +31-118-633.391

PQR / WPQ
TEST RECORD No.: ARL1570-1

Testdate: *2012-06-26*
Customer: *Herstaco Tubewelding B.V.*
Place: *Middelburg (NLD)*
Order No.: *ARL1570-1*
Project: *General*
WPS No.: *HM260612-1*

Witnessing Auth.: *M. van Holsteijn (DNV)*

Pass no.	Inter-pass temp	Process	Consumable		Diam. (mm)	Gas flow (L/min.)	Volts (V)	Ampere (A)	Welding time in sec.	Welding length in mm	Current DC +/-	Efficiently factor (EN 1011-1)	Travel-speed (mm/mi	Heat-input (KJ/mm)
1	10	136	SC 70ML	Spray Arc	1,2	15	27,6	253	244	1905	DC-EP	0,8	468	0,72
2	31	121	A-2 / S-900SP	N.A.	3,2	N.A.	26,9	520	398	3810	DC-EP	1	574	1,46
3	48	121	A-2 / S-900SP	N.A.	3,2	N.A.	27,9	550	398	3810	DC-EP	1	574	1,60
4	83	121	A-2 / S-900SP	N.A.	3,2	N.A.	30,7	628	398	3810	DC-EP	1	574	2,01
5	118	121	A-2 / S-900SP	N.A.	3,2	N.A.	30,7	628	398	3810	DC-EP	1	574	2,01
6	151	121	A-2 / S-900SP	N.A.	3,2	N.A.	30,7	628	398	3810	DC-EP	1	574	2,01
7	158	121	A-2 / S-900SP	N.A.	3,2	N.A.	30,7	628	398	3810	DC-EP	1	574	2,01
8	181	121	A-2 / S-900SP	N.A.	3,2	N.A.	30,7	628	398	3810	DC-EP	1	574	2,01
9	163	121	A-2 / S-900SP	N.A.	3,2	N.A.	30,7	628	398	3810	DC-EP	1	574	2,01
10	170	121	A-2 / S-900SP	N.A.	3,2	N.A.	30,7	628	398	3810	DC-EP	1	574	2,01
11	176	121	A-2 / S-900SP	N.A.	3,2	N.A.	30,7	628	398	3810	DC-EP	1	574	2,01
12	194	121	A-2 / S-900SP	N.A.	3,2	N.A.	30,7	628	398	3810	DC-EP	1	574	2,01
Welding parameters measured with Triton AMV 3000 Parameter recorder														



Reviewed / Witnessed
Found to comply with:
(DNV ref.)
M. van Holsteijn, 11 JUL 2012 (date)
DET NORSKE VERITAS B.V. - ROTTERDAM

Witnessed by:

WELDING PROCEDURE QUALIFICATION RECORD AND

Testing in accordance with	: EN ISO 15614-1:2004/A1:2008
Purchaser	: Arjan Roza Lastechniek BV
Purchase order no.	: ARL1570-1
Manufacturer	: Herstaco Tubewelding B.V.
WPS	: HM160612-1
Description of sample(s)	: V-joint 60° single side welded
Dimension(s)	: Ø 1220x23 mm
Material grade	: X70 acc. API 5L (Grouping (1.3)
Welding process(es)	: 138 / 121
Filler	: Root 138 - Hyundai, SuperCored 70ML
	: Fill and cap 121 - - Hyundai, Wire A-2 - Flux S-900SP
Shielding gas EN ISO 14175	: M23, 90% Argon - 5% CO_2 - 5%O_2, 15 L/min.
Backing type	: Steel backing
Welding position	: PA
Preheat / Interpass temp.	: ≥ 10 °C / ≤ 194 °C
Joint type	: V-joint 60°
PWHT	: N.A.
Welder	:
Date / place of birth	: n
ID	:
Testpiece marked with	:

NON DESTRUCTIVE EXAMINATION

* Visual examination	: performed by examiner
* Radiographic examination	: acceptable, see RTD/Applus report 1213-2012-26-037 No. 7029
* Ultrasonic examination	: acceptable, see RTD/Applus report 00858-2012-18-005 No. 7029
* Magnetic particle examination	: acceptable, see RTD/Applus report 1217-2012-26-046 No. 7029

CROSS WELD TENSILE TESTS

Dimensions(s) [mm]	Rm [N/mm^2]	Fracture location
24.98 x 22.34	601	Base material
25.02 x 22.21	602	Base material
Requirements;	≥ 570	

TECHNOLOGICAL TESTS

Type	Former / Bending Angle	Results
Side bend	4t / 180°	4 x acceptable

MACROSCOPIC EXAMINATION

Amount	Result
1x	Acceptable (see Appendix A)

HARDNESS MEASUREMENTS

Method : Vickers HV10kg
Requirements : Max. 380 HV10kg

Location of indentations	Traverse 1-2mm below outer surface	Traverse Root area
base material	207-209-210	217-214-212
heat affected zone	186-190-198-208-189	198-203-217-230-227
weld metal	228-229-218-235-229	231-232-229-210-222
heat affected zone	200-193-197-183-190	212-190-220-203-196
base material	207-210-209	200-202-198

IMPACT TESTS - Type: Charpy KV

Notch location	Size [mm]	Test temp. [°C]	Results [J]	Average value [J]
Midweld	10 x 10	-20	69-65-67	67
Fusion line +2mm	10 x 10	-20	147-132-201	160
Requirements;			≥ 20	≥ 27

Conclusion: The results satisfy the requirements.

All characteristics of the above object(s) have, as far as accessible and relevant, been verified by Schielab b.v. Other information was provided by the purchaser. This information was verified as far as possible and has been copied into this report, unchanged. We hereby certify that the reported test data is correct and that the above object(s) was (were) tested/examined in accordance with purchasers requirements and/or the above procedure(s) and/or code(s)/specification(s). On occasion a destructive test is subcontracted by Schielab b.v. (marked 'U' on the report). Opinions, interpretations and advice expressed in this report are outside the scope of any possible RvA accreditation, but are presented in a true and fair manner based on the best knowledge of the Schielab personnel involved. If, upon reproduction, only part of this report is copied, Schielab will not bear any responsability for content, purport and conclusions of that reproduction. This report has legal value only when printed on Schielab paper and furnished with an authorised signature. Digital versions of this report have no legal value. . Unless explicitly agreed upon otherwise in writing our "General conditions for activities performed by Schielab b.v.", deposited at the Chamber of Commerce in Rotterdam, under number 24170257, apply

Breda, 03-07-2012

SCHIELAB S. Wevers

Reviewed / Witnessed
Found to comply with:
(RAV ref.)
M. van Holstein, 11 JUL 2012
(date)
DET NORSKE VERITAS B.V. - ROTTERDAM

Appendix A
SL 12.7029-1

MACRO PHOTO
Cross section no. 7029

S. Wevers

TESTING
RvA L 063

Ingeschreven in het RvA register voor laboratoria onder nr. L 063 voor gebieden zoals nader omschreven in de erkenning.
Entered in the RvA register for laboratories under number L 063 for the areas outlined in the approval.

Magnetic Particle Examination Report

F&A number	Report number
5002--45438/001	1217-2012-26-046

Röntgen Technische Dienst bv

Delftweg 144
Postbus 10065
3004 AB Rotterdam

Tel. (010) 208 82 08
Fax (010) 415 80 22
E-mail rtd@rtd.nl

Client	Schielab B.V.
Address	Pb 10065
Post code and city	3004 AB Rotterdam
Country	The Netherlands
Contact	Mrs. S. Wevers
Carried out at	Applus-RTD
Address	Belder 8
Post code and city	4704 RK Roosendaal
Country	The Netherlands
Date	28-06-2012
Client order number	
Client	A. Roza Lastechniek
Project	ARL 1570
Drawing number	
Object	Testwelds
RTD branch office	Roosendaal
Telephone number	(0165) 56 01 26
Fax	(0165) 53 84 17
Contact	F. de Krom
Remarks	

Exam. standard	EN 17638		
Accept. standard	EN ISO 23278: 2009 Level 1		
Exam. procedure	MT 21202	**Rev.**	0
Accept. procedure	MT 21202	**Rev.**	0
Parent material	X70	**Thickness** [mm]	23
Temp. object [°C]	28	**Heat treated**	☐ Yes ☐ No
Surface condition	Acceptable		
Welding process	138-121		
Weld material			
Weld preparation	BW		
Prod equip. no.		**Yoke no.**	97-590
Perm. mag. no.		**Cal. expiry**	01-01-2013
Blacklight		**Cal. expiry**	
Prod current [A]		**Yoke magnet**	Magnaflux
Centr. cond. [A]		**Coil** [A.turns]	
Test medium	Diffu-Therm	**Type**	MPS-S
■ Wet		■ Colour	
☐ Dry		☐ Fluorescent	
Contrast paint	■ Yes ☐ No	**Demagnetized**	☐ Yes ■ No

Purpose of examination: Detection of surface defects.

Items examined: Testweld 7029, ARL 1570-1.

Testweld 7030, ARL 1570-2.

Result: No defects were detected during the examination.

DET NORSKE VERITAS * 1864 *
Reviewed / Witnessed
Found to comply with: (DNV ref.)
M. van Hasteijn, 11 JUL 2012 (date)
DET NORSKE VERITAS B.V. - ROTTERDAM

For client	Operator	No.	Level	Cert.no.	Report checked for RTD
	a F. van der Meeren	0551	2	473/132	Name
	b				
Page 1	Date, signature and stamp				Date, signature and stamp
Total pages 1	Applus RTD ND Testing 28-06-12				

6916 rev.1

Radiographic Examination report

RTD branch office	Roosendaal	**RTD report no**	1213-2012-26-037
Telephone number	0031 (0) 165 560126	**RTD order no**	
Fax	0031 (0) 165 538417	**F&A-number**	1102-78949/001
Contact	Hr. de Krom	**Examination date**	28-06-2012

Röntgen Technische Dienst bv

Delftweg 144 **Tel. (010) 208 82 08**
Postbus 10065 **Fax (010) 415 80 22**
3004 AB Rotterdam **E-mail rtd@rtd.nl**

Client	Schielab BV	**Carried out at**	Applus/RTD Benelux	**Exam. standard**	EN 1435 , klasse B			**Film type**	D4	**Manufacturer**	Agfa
Address	Sevillaweg 64	**Address**	Belder 8	**Exam. procedure**	RT 21013	**R**	11	**Screens (f/b)**	Pb 0.027 mm	**Per cassette**	1
Post code and city	3047AL Rotterdam	**Post code and city**	4704 RK Roosendaal	**Accept. standard**	EN12517-1 L1			**IQI**	10 FE EN	**Pct. exam.**	100 %
Country	Nederland	**Country**	Nederland	**Accept. procedure**	RT 21031	**R**	1	**Processing**	RTD Roosendaal		
Contact	S. Wevers	**Contractor**	A. Roza Lastechniek	**Material**	X70			**Set no**	1749	**Focal spot eff.**	3 mm
Order no		**Project**	ARL 1570-1	**Weld metal**	...			**Source type**	Röntgen	280 **kV**	6 mA
Request no		**Drawing no**		**Weld method**	138 / 121					**Ci**	**GBq**
Report no client		**Object**	Testplate 500 x 500 x 23	**Heat treated**	☐ Yes ☒ No						

Remarks Plate 23 mm + backingstrip 5 mm

Film no		Film Dim. [cmxcm]	Discontinuity type / location Na [cm]	A/Na			Welder	Weld prep.	Weld [mm x mm]	[kV]	[mA. min]	Pen. th. [mm]	D [mm]	d [mm]	Setup
7029	1	10 x 48		A			D.Suikers	BW	23	280	42	28	1000	28	SWSI

Reviewed / Witnessed
Found to comply with:
(DNV ref.)
M. van Holsteijn, 11 JUL 2012 (date)
DET NORSKE VERITAS B.V. - ROTTERDAM

Films and reporting	Operators		Filminterpretation	Report checked by
Film quantity 1	**Name** 0948 H,van Wezel	**Name**	**Name** 0948 H.van Wezel	**Name**
	Level 2 **Cert. no** 473/187	**Level** **Cert. no**	**Level** 2 **Cert. no** 473/187	**Date**
Page 1	Applus RTD ND Testing H. van Wezel		Applus RTD ND Testing H. van Wezel	
Total pages 1				

6949 rev. 5

Ultrasonic examination Report

F&A number	Report number
5002-411-78949/008	00858-2012-18-005

Röntgen Technische Dienst bv

Delftweg 144
Postbus 10065
3004 AB Rotterdam

Tel. (010) 208 82 08
Fax (010) 415 80 22
E-mail rtd@rtd.nl

Client	Schielab B.V.
Address	Pb 10065
Post code and city	3004 AB Rotterdam
Country	The Netherlands
Contact	Mrs. S. Wevers
Carried out at	Applus-RTD
Address	Belder 8
Post code and city	4704 RK Roosendaal
Country	The Netherlands
Date	28-06-2012
Client order number	
Client	A. Roza Lastechniek
Project	ARL 1570
Drawing number	
Object	Testwelds
RTD branch office	Roosendaal
Telephone number	(0165) 56 01 26
Fax	(0165) 53 84 17
Contact	Mr. de Krom
Remarks	

Exam. standard	EN 17640		
Accept. standard	EN 23278 Lvl 2		
Exam. procedure	UT 21112	**Rev.**	5
Accept. procedure	UT 21112	**Rev.**	5
Parent material	X70	**Thickness** [mm]	23
Temp. object [°C]	28	**Heat treated**	☐ Yes ☐ No
Surface condition	Acceptable	**Couplant**	Algum
Welding process	138-121	**Technique**	
Weld material		■ Pulse echo	
Weld preparation	BW	☐ Special	
Equipment	Sonatest15 **No.** 677	**Cal. exp.**	01-01-2013
Ref. block		**Cal. block**	V2 block

		Probe 1	Probe 2	Probe 3	Probe 4
Probe type		MB4SN	MWB4-45	MWB4-60	MWB4-70
Frequency	[MHz]	4	4	4	4
Angle	[°]	0	45	60	70
Sound path	[mm]	0-100	0-100	0-100	0-150
Sens. setting	[dB]	BWE 80%	Acc. to spec	Acc. to spec	Acc. to spec
Transfer	[dB]	--	4	4	4
Scan sens.	[dB]	--	8	8	8
Total	[dB]	--	--	--	--

Purpose of examination: Detection of weld defects.

Items examined Testweld 7029, ARL 1570-1.

Testweld 7030, ARL 1570-2.

Result: During the examination is in testplate 7030 an unacceptable linear indication detected.
Length 25 mm, -4dB, depthe 14-18 mm.

In testplate 7029 are no unacceptable indications detected.

Reviewed / Witnessed
Found to comply with:
(DNV ref.)
M. van Halsteijn. 11 JUL 2012
(date)
DET NORSKE VERITAS B.V. - ROTTERDAM

For client	Operator	No.	Level	Cert.no.	Report checked for RTD
	a F. van der Meeren	0551	2	473/132	Name
	b				
Page 1	**Date, signature and stamp**				**Date, signature and stamp**
Total pages 1	Applus® RTD ND Testing 28-06-12				

6914E rev. 3

6916 rev. 1

MATERIAL VERIFICATION TEST

Testing in accordance with : API 5L
Purchaser : Arjan Roza Lastechniek BV
Purchase order no. : ARL1555-1
Manufacturer : Herstaco Tubewelding B.V.

Description of sample(s) : Segment from pipe Ø 1220
Dimension(s) : 250x250x23 mm
Material grade : API 5L X70 PSL 1

NON DESTRUCTIVE EXAMINATION

* Visual examination : performed by examiner

TENSILE TESTS Base material – at roomtemperature

Schielab sample no.	Orientation of specimen	Size [mm]	Gauge length [mm]	Rt0.5% [N/mm^2]	Rm [N/mm^2]	Elong-ation [%]	Ratio Rt/Rm
6540	transverse	Ø 12.67	50	507	620	28	0.82
Requirements;				≥ 485	≥ 570	≥ 17	---

CHARPY IMPACT TESTS Base material - Charpy KV

Schielab sample no.	Orientation of sample	Size [mm]	Test temp. [°C]	Result Individual values [J]	Result Average value [J]
6540	transverse	10 x 10	-20	247-215-230	231
Requirements;				≥ 20	≥ 27

MATERIAL ANALYSIS

Method : Optical Emission Spectrometry
Requirements : API 5L PSL1

%C [1)]	%Si	%Mn [1)]	%P	%S	%Cr	%Ni	%Mo	%Al	%Cu	%Nb[2)]	%Ti[2)]	%V[2)]	CEV [IIW]
≤0.26	--	≤1.40	≤.030	≤.030	≤ 0.50	≤ 0.50	≤ 0.15	--	≤ 0.50	--	--	--	--
0.08	0.32	1.68	0.010	0.002	0.03	0.04	0.01	0.03	0.03	0.04	0.02	<0.01	0.38

Note 1): For each reduction of 0.01% below the specified max. carbon content, an increase of 0.05% above the max. manganese content is permissible, up to a max. of 1.65% for grades ≥ Gr.B but ≤ X52; up to a maximum of 1.75% for > X52, but < X70;and up to a maximum of 2.00% for grade X70.
Note 2): The sum of Nb, V and Ti shall be ≤ 0.15%.

By microscopic examination, the material showed a normalised structure.

Conclusion: The results satisfy the requirements.

All characteristics of the above object(s) have, as far as accessible and relevant, been verified by Schielab b.v. Other information was provided by the purchaser. This information was verified as far as possible and has been copied into this report, unchanged. We hereby certify that the reported test data is correct and that the above object(s) was (were) tested/examined in accordance with purchasers requirements and/or the above procedure(s) and/or code(s)/specification(s). On occasion a destructive test is subcontracted by Schielab b.v. (marked 'U' on the report). Opinions, interpretations and advice expressed in this report are outside the scope of any possible RvA accreditation, but are presented in a true and fair manner based on the best knowledge of the Schielab personnel involved. If, upon reproduction, only part of this report is copied, Schielab will not bear any responsability for content, purport and conclusions of that reproduction. This report has legal value only when printed on Schielab paper and furnished with an authorised signature. Digital versions of this report have no legal value. Unless explicitly agreed upon otherwise in writing our "General conditions for activities performed by Schielab b.v.", deposited at the Chamber of Commerce in Rotterdam, under number 24170257, apply.

Breda, 28-06-2012

S. Wevers

Reviewed / Witnessed
Found to comply with:
(DNV ref.)
M. van Holstein, 11 JUL 2012 (date)
DET NORSKE VERITAS B.V. - ROTTERDAM

TESTING
RvA L 063

Ingeschreven in het RvA register voor laboratoria onder nr. L 063 voor gebieden zoals nader omschreven in de erkenning.
Entered in the RvA register for laboratories under number L 063 for the areas outlined in the approval.