

CERTIFICATE - ZEUGNIS - CERTIFICAT

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Seite 1(2)

EN 10 204-3.1

Date - Datum Load - Ladung - Charge No

Cert.No - Zeugnis Nr

120717

2071691.R00

OUTOKUMPU

Your order - Ihre Bestellung - Votre commande

775291 OI.

Purchaser - Besteller - Achetur

Shaw Modular Solutions, LLC

3191 W. Lincoln Road

70605 LAKE CHARLES, LA

USA

Dest

To buyer by mail

Product - Erzeugnisform - Produit

Stainless steel plate, hot rolled

Solution annealed, pickled/No.1 Finish

Grade - Werkstoff - Nuance *

LDX 2101

UNS S32101

Outokumpu Order - Auftrag - Ordre

Pack - Kolli - Colis No

200731

Requirements - Anforderungen - Exigences

ASTM A240M-11a

APP-VL52-Z0-023 Rev.1

ASTM A 577-90

ASTM A578

A480/A480M

Charpy impact test acc. ASTM A923 Method B at -40°C Min

average=27J/27J single

Ultrasonic examination: ASTM A 577 and A 578 Level B

Brand-Mark *

Herstellerzeichen

Signe du Producteur



Inspectors stamp *

Abnahme - Stempel

Estamp de l'expert



Melting process

Erschmelzungsart

Procédé de fusion

E+AOD

Marking - Kennzeichnung - Marquage

Plate No, Dimension, Heat No, Lot No, Incl. *

Extent of delivery - Lieferumfang - Etendue de livraison

Item Pcs

Pos

Anzahl

Nombre

Kg

Dimension

Abmessung

mm

Heat No

Schmelze Nr

Coulée

Lot No

Los Nr

Lot No

3 3

25.4 * 2083 * 11887

421716

243906

Plate No

Blech Nr

Tôle No

9096 2401,-2701,-2801

Chemical composition - Chemische Zusammensetzung - Composition chimique%

Heat - Schmelze - Coulée No

	C	Si	Mn	P	S	Cr	Ni	Mo	Cu	N		
Min	0.000	0.00	4.00	0.000	0.000	21.0	1.35	0.10	0.10	0.20		
Max	0.040	1.00	6.00	0.040	0.030	22.0	1.70	0.80	0.80	0.25		
421716	0.021	0.67	4.73	0.020	0.001	21.3	1.60	0.19	0.36	0.22		

Test results - Prüfergebnisse - Résultats des essais (1N/mm² = 1 MPa)

Direc.

T = Transverse

L = Longitudinal

Top/Bot

F = Front

B = Back

Form

P = Flat

C = Round

Location

1 = Center

2 = Close to Surface

3 = Standard

4 = At 1/4 of thickness

Mechanical Properties

Tensile testing/Hardness Brinell

Plate-NoDirec. Top/BotLocation Form Temp. Rp 0,2 Rm A50 HB

C N/mm² N/mm² %

Min 450 650 30

Max 290

2701 T F 3 C 20 489 716 37 219

Charpy impact test A923 B (V-notch)

Plate-NoDirec. Top/BotLocation Form Temp. Value 1 Value 2 Value 3 Average

C Joule Joule Joule Joule

Min 27 27 27 27

Max

2701 T F 3 P -40 40 44 43 42

The results comply with the requirements of the order.

Outokumpu Stainless AB

Business Line Special Plate

Quarto Plate Europe

SE-693 81 Degerfors, Sweden

Tel. +46 586 470 00, Fax +46 586 470 16, www.outokumpu.com

Registered office: Stockholm, Sweden.

Reg. No. 556001-8748, Vat No. SE556001874801

Computer generated original
Quality Inspector

Björn Olsson

CERTIFICATE - ZEUGNIS - CERTIFICAT		Page Seite 2(2)
EN 10 204-3.1		
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**OUTO
KUMPU****Corrosion**

2701 EN ISO 3651-2 Method A : Approved

Test report 2012-046 see appendix:

Metallography

2701F Microstructure examination: Approved

Ferrite examination acc. to ASTM E562

Plate-No	Direc.	Top/Bot	Location	Form	Temp.	Ferrite
					C	%
Min						40
Max						60
2701	T	F	3	P		54.6

Test report 2012-046 see appendix:

Chemical Composition**Product analysis**

	C	Si	Mn	P	Ni	Cr	Mo	N	S	Al	Nb	Ti	Cu	Co
	%	%	%	%	%	%	%	%	%	%	%	%	%	%
2701	0.023	0.67	4.66	0.023	1.63	21.37	0.18	0.215	0.001	0.023	0.005	0.007	0.36	0.046
	V													
	%													
	0.044													

Other Information

Heat treated at 1050°C and Quenched in water.

Ultrasonic testing see appendix:



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Quality Inspector

Björn Olsson
Björn Olsson

ULTRASONIC INSPECTION CERTIFICATE
ULTRASCHALLPRÜFZEUGNIS
CERTIFICAT DE CONTRÔLE PAR ULTRA-SONS

OUTOKUMPU

Ref. Gunnar Karlsson	Testing date - Prüfungsdatum - Date de contrôle 2012-07-03	Certificate No. - Zeugnis Nr - Certificat No. 2071691.R00
	Date of certificate - Zeugnisdatum - Date de certificat 2012-07-01	Appendix - Anlage - Annexe 1

MATERIAL IDENTIFICATION - MATERIALIDENTIFIKATION - IDENTIFICATION DU MATERIEL

Purchaser - Besteller - Acheteur Shaw Modular Solutions, LLC 3191 W. Lincoln Road 70605 LAKE CHARLES, LA USA	Your order - Ihre Bestellung - Votre commande 775291 OI.	Outokumpu order - Auftrag - Ordre 200731	Item - Pos 3
Grade - Werkstoff - Nuance LDX 2101; UNS S32101	Lot No - Los Nr - Lot No 243 906	Heat No - Schmelz Nr - Coulée 421716	Dimension - Abmessungen - Dimension (mm) 25.4 x 2083 x 11887
Plate No - Blech Nr - Tôle No 9096 2401, -2701, -2801			

TESTING PRESUMPTIONS - PRÜFVORAUSSETZUNG - CONDITIONS D'ESSAI

Testing method - Prüfmethode - Méthode d'essai Pulse echo/contact technique - Impuls-Echo kontakttechnik - Contrôle par contact/réflexion	Testing specification - Prüfspezifikation - Spécification d'essai Outokumpu specification: KF-10.4230 Other spec.-Andere spez.-Autre: KF-10.4231	Rev. 2 3
Inspection by - Überwachung von - Contrôle par Outokumpu Stainless, Degerfors	Acceptance standard - Zlässigkeitsgrenze - Critère d'acceptation A 578/A 577 Level B	
Testing scope - Prüfungsfang - Etendue d'essai Straight, One side 100%, 10% overlap/Angel, Grid, 225mm; Edges 50mm 100%		
Notes - Bemerkung - Remarques		

EQUIPMENT - GERÄT - EQUIPMENT

Instrument - Gerät - Appareil P-scan 4/USM 35 X		No - Nr - No 206/2397a	
Probe - Prüfkopf - Palpeur TRL 4/MWB 45-2	Dim. probe - Apm. prüfkopf - Dim. Palpeur 6x20mm/8x9mm	Frequency - Frequenz - Fréquence 3MHz/2MHz	Angle - Einschallwinkel - Angle 0/45
Couplant - Ankopplung - Couplage Water	Notes - Bemerkung - Remarques		

SETTINGS

Reference method - Bezugsmethode - Methode de référence Backwall-Reflection (BR)	Ref. level - Bezugshöhe - Eche de référence TVG/DAC	
Sensitivity - Empfindlichkeit - Sensibilité Reference level +6dB	Scanning rate - Prüfgeschwindigkeit - Vitesse d'essai ≤150 mm/s	Pulse energv - Impulsstärke - Puissance 1
Notes - Bemerkung - Remarques		

TESTING CONDITIONS

Surface condition - Oberfläche - Etat de surface Stainless Steel, Hot rolled, Pickled
Notes - Bemerkung - Remarques

TEST RESULTS - PRÜFERGEBNISSE - RESULTAT D'ESSAI

Reporting level - Registrierschwelle - Seuil d'enregistrement			
☒	No discontinuity indications above the reporting level - Keinefehler grösser als registrierschwelle - Aucune indications supérieure seuil 'enregistriement		☐ See annexure - Siehe anlage - Voir annexe
☒	Disposition - Beschluss - Evaluation Accepted - Akzeptiert - Approuvé	☐ Disposition - Beschluss - Evaluation Rejected - Kassiert - Rébute	☐ Further investigation - Weiter untersuchung - Examen supplémentaire
Notes - Bemerkung - Remarques			

OPERATOR, INSPECTOR - PRÜFER, PRÜFAUFSICHT - OPERATEUR, CONTRÔLEUR

Testing performed by - Abnahme durch - Opérateur Gunnar Karlsson	Level acc. - Niveau gem. - Niveau s. SNT-TC-1A II	Sign.
Testing performed by - Abnahme durch - Opérateur Petter Isirath	Level acc. - Niveau gem. - Niveau s. SNT-TC-1A II	Sign.
Approved by - Akzeptiert von - Approuvé par Outokumpu Stainless/Gunnar Karlsson	Inspector - Prüfaufsicht - Contrôleur	Inspector - Prüfaufsicht - Contrôleur
Position - Stellung - Poste Level II acc. to SNT-TC-1A	Agency - TUO - Agence d'inspection	Agency - TUO - Agence d'inspection
Sign. 	Sign.	Sign.
Notes - Bemerkung - Remarques	This certificate is based on internal report - Diesen zeugnis basiert auf dem internen prübericht - Ce certificat est basé sur le procès-verbal interne	No - Nr - No

OUTOKUMPU**RAPPORT**utfärdat av ackrediterat laboratorium
REPORT issued by Accredited Laboratory1098
ISO/IEC 17025**TEST REPORT**
No. 2012-046Report Date 2012-07-04
Page 1/1

Customer Order No :

P.O. No. 775291 OI

Customer:

Shaw Modular Solutions
3191 W. Lincoln Road
70605 LAKE CHARLES, LA
USA

Test Specification:

Outokumpu Order No:

200731

Report Issued by

Jonas Balderud
Mgr Testing
+46(0)58647628

Test material:

ID	Heat No	Lot No	Grade
9096-2701	421716	243906	UNS S32101

Corrosion Test According to ISO 3651-2:1998, Method ATest Date: 12-05-25
Sample ID: 9096-2701**Method of preparation**

Mechanical grinding in the longitudinal plane on all surfaces and sharp edges with grade 120

Chemical. Pickling is done at 50-60 ° C in a 136ml consisting of nitric acid, HNO₃ (65 w / o), 65ml of hydrofluoric acid, HF (38 w / o) and 1900ml deionised water.**Nature of the test piece**

60(±3) x 20(±3) x 5(±0.5) mm

Test result

Approved (No cracks after bending)

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Säte/Registered office Stockholm Sweden

OUTOKUMPU**RAPPORT**utfärdat av ackrediterat laboratorium
REPORT issued by Accredited Laboratory1098
ISO/IEC 17025**TEST REPORT**
No. 2012-046

Report Date 2012-07-04

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Ferrite Fraction According to ASTM E562:2008Test Date: 12-05-24
Sample ID: 9096-2701**Grid Selection**

Rectangular grid with 100 points

Number of fields

20

Magnification

X 400

Preparation, including etchant, if used

The sample is ground in two steps and then polished with 3µm diamond suspension / paste. Cleaning is done between each step with water and ethyl alcohol (96%).

Etchant: The samples are etched in room temperature.

Etched solution: V2A consisting of 100 ml de-ionized water, 100 ml of hydrochloric acid,

HCl (37 w / o), and 10 ml of nitric acid, HNO₃ (65 w / o)**Raw data****Volume fraction**

Fields	%									
1 - 10	56	54	53	57	52	55	54	52	54	53
11 - 20	55	55	52	57	56	54	58	56	55	54
21 - 30	0	0	0	0	0	0	0	0	0	0
31 - 40	0	0	0	0	0	0	0	0	0	0
41 - 50	0	0	0	0	0	0	0	0	0	0
51 - 60	0	0	0	0	0	0	0	0	0	0
61 - 70	0	0	0	0	0	0	0	0	0	0
71 - 80	0	0	0	0	0	0	0	0	0	0

Num. Fields	Avg. vol. fraction	Standard deviation	95% CI	% RA
20	54,60	1,73	0,76	1,39

Requirements

Minimum average volume fraction (%) > 40%. Maximum average volume fraction (%) < 60%

Test Result

Approved

Customer information

ASTM E562:2008 is not included in the Swedac accreditation.

This report shall only be reproduced in its entirety.

The corrosion test results and Ferrite tests results satisfies the specified requirements.

Approved by

Jonas Balderud

Mgr Testing/Provningschef

Outokumpu Stainless AB (publ)

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10/26/12

Org nr/Reg. No.: 556001-8748 Moms nr/V.A.T. No.: SE556001874801

Säte/Registered office Stockholm Sweden



INDUSTRIAL TESTING LABORATORY SERVICES, LLC
635 Alpha Drive – RIDC Park
Pittsburgh, PA 15238 Phone: 412.963.1900 Fax: 412.963.1926
e-mail: info@itls.com website: itls.com

TEST REPORT
L20665 Rev. 1
October 10, 2012
Revised October 19, 2012

Purchase Order No: 694689-000 OP

To: Shaw Modular Solutions LLC
3191 West Lincoln Road
Lake Charles, LA 70605

Attn: Nick Koseski

Sample Received:

ITLS received seventeen (17) samples for Chemical, Mechanical, Hardness, Impact, Ferrite and Intergranular Corrosion evaluation, identified as follows:

Sample #	Coupon # Sent to ITLS	Heat #	Lot #	Description	Supplier
1	9096-32-02	421716	244903	1 pc. – 0.5" Thick Duplex Plate	Outokumpu
2	9096-27-02	421716	243906	1 pc. – 1" Thick Duplex Plate	Outokumpu
3	9099-32-02	421717	243988	1 pc. – 0.5" Thick Duplex Plate	Outokumpu
4	9096-23-03	421716	243891	1 pc. – 0.75" Thick Duplex Plate	Outokumpu
5	9099-27-03	421717	243892	1 pc. – 0.75" Thick Duplex Plate	Outokumpu
6	9099-22-02	421717	243907	1 pc. – 1" Thick Duplex Plate	Outokumpu
7	9096-35-03	421716	243990	1 pc. – 0.75" Thick Duplex Plate	Outokumpu
8	9096-22-05	421716	244095	1 pc. – 0.25" Thick Duplex Plate	Outokumpu
9	9080-25-02	421625	243526	1 pc. – 0.5" Thick Duplex Plate	Outokumpu
10	9099-28-02	421717	243890	1 pc. – 0.5" Thick Duplex Plate	Outokumpu
11	9081-12-04	421626	245018	1 pc. – 0.25" Thick Duplex Plate	Outokumpu
12	9080-35-02	421625	243531	1 pc. – 0.75" Thick Duplex Plate	Outokumpu
13	9080-33-03	421625	245672	1 pc. – 0.5" Thick Duplex Plate	Outokumpu
14	9096-31-02	421716	244281	1 pc. – 1" Thick Duplex Plate	Outokumpu
15	9081-24-02	421626	243533	1 pc. – 0.75" Thick Duplex Plate	Outokumpu
16	9081-36-02	421626	243904	1 pc. – 0.75" Thick Duplex Plate	Outokumpu
17	9099-29-02	421717	243991	1 pc. – 1" Thick Duplex Plate	Outokumpu



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ITLS Report L20665 Rev. 1
October 10, 2012

Acceptance:

Sample #	Test	Acceptance
All	Chemical Analysis	APP-VL52-Z0-023, Rev. 1, ASTM A240-12 (UNS S32101)
All	Mechanical	APP-VL52-Z0-023, Rev. 1, ASTM A240-12 (UNS S32101), A480-12
All	Rockwell B	ASTM A240-12 (UNS S32101), A480-12
All	Ferrite	APP-VL52-Z0-023, Rev. 1, ASTM E562-11, Method A
All	Impact	APP-VL52-Z0-023, Rev. 1, ASTM A923-08, Method B
All	Intergranular Corrosion	ISO 3651-2 Method A

Test References:

Specification	Title
ASTM A751-11	Standard Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products
ASTM A370-12	Standard Test Methods and Definitions for Mechanical Testing of Steel Products
ASTM E8-11	Standard Test Methods for Tension Testing of Metallic Materials
ASTM E140-07	Standard Hardness Conversion Tables for Metals
ASTM E23-07a ⁶¹	Standard Test Methods for Notched Bar Impact Testing of Metallic Materials
ASTM E3-11	Standard Guide for Preparation of Metallographic Specimens
ASTM E18-11	Standard Test Methods for Rockwell Hardness of Metallic Materials
ASTM E1245-03 (2008)	Standard Practice for Determining the Inclusion of Second-Phase Constituent Content of Metals by Automatic Image Analysis
ASTM E562-11	Standard Test Method for Determining Volume Fraction by Systematic Manual Point Count

Quality References:

Reference
10CFR21, 10CFR50.55(e) and 10CFR50 App. B
ASME NQA-1 – 1994 Basic and Supplementary Requirements
USNRC Regulatory Guide 1.28 Rev. 3
ITLS QA Manual Rev. 4 dated 12/3/11
No ITLS subcontractors used for completion of this order



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Results:

Impact Test – ASTM A923-08 Method B

Sample #	Temperature (°F)	Absorbed Energy (ft-lbs)
1	-40	96
2	-40	68
3	-40	93
4	-40	83
5	-40	82
6	-40	74
7	-40	84
*8	-40	96
9	-40	87
10	-40	97
*11	-40	88
12	-40	90
13	-40	91
14	-40	67
15	-40	90
16	-40	84
17	-40	66
Required	-40 or below	20 Min

*Note: Specimen size 10mm x 5mm, 1/2 size per ASTM A923. Absorbed energy values converted per ASTM A923 Table 2.

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October 10, 2012

Results (cont.):

Ferrite Testing – ASTM E562-11 Method A

Sample #	Ferrite (%)
1	42
2	44
3	43
4	43
5	41
6	41
7	44
8	41
9	41
10	42
11	44
12	41
13	43
14	41
15	44
16	44
17	42
Required	40 - 60%

Ferrite volume fraction tested with Image Analysis per ASTM E1245-03(2008). ASTM E562 offers the use of ASTM E1245 to determine the same measurements.

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October 10, 2012

Results (cont.):

Mechanical Properties – ASTM E8-11 (flat) & ASTM E18-11 (HRB)

Sample #	Test Temp (°F)	Initial Dimensions (in)	Initial Area (in ²)	*Yield Strength (ksi)	Tensile Strength (ksi)	Elongation in 2" (%)	Hardness HRB** (Avg. of 3)
1	Room	0.503 x 0.526	0.2646	74	106	45	98
2	Room	0.500 x 1.040	0.5200	74	104	48	97
3	Room	0.503 x 0.543	0.2731	72	104	45	95
4	Room	0.502 x 0.785	0.3941	78	104	47	96
5	Room	0.502 x 0.780	0.3916	75	104	46	97
6	Room	0.501 x 1.020	0.5110	68	102	50	96
7	Room	0.502 x 0.788	0.3956	74	104	46	97
8	Room	0.489 x 0.258	0.1262	85	115	45	95
9	Room	0.502 x 0.552	0.2771	74	105	47	96
10	Room	0.503 x 0.533	0.2681	74	105	46	97
11	Room	0.489 x 0.249	0.1218	87	115	41	98
12	Room	0.502 x 0.786	0.3946	74	104	46	95
13	Room	0.503 x 0.525	0.2641	77	104	43	98
14	Room	0.501 x 1.040	0.5210	75	105	48	96
15	Room	0.501 x 0.795	0.3983	75	105	45	95
16	Room	0.501 x 0.784	0.3928	75	105	46	96
17	Room	0.501 x 1.040	0.5210	75	103	49	96
Required				65 Min	94 Min	30 Min	290 HBW Max

*Yield calculated at 0.20% offset

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**Customer requested hardness in Rockwell B. All measured values were between 95 and 98 HRB which is approximately equal to Brinell 210 to 240 based on ASTM E140 Tables 2 and 5. These values are well below the specified max of 290 HBW and are therefore acceptable.



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October 10, 2012

Results (cont.):

Chemical Analysis – ASTM A751-11 (OES/Leco)

Sample #	Composition (wt%)													
	C	Mn	P	S	Si	Ni	Cr	Mo	N	Cu	Co*	Al*	V*	Total Others*
1	0.027	5.00	0.018	<0.002	0.54	1.44	21.7	0.20	0.23	0.38	0.01	0.02	0.07	0.09
2	0.026	4.95	0.018	<0.002	0.52	1.40	21.8	0.18	0.23	0.38	0.01	0.02	0.07	0.09
3	0.029	5.11	0.016	<0.002	0.52	1.42	21.7	0.21	0.23	0.39	<0.01	0.02	0.06	0.08
4	0.025	4.94	0.017	<0.002	0.53	1.40	21.7	0.19	0.21	0.37	0.01	0.02	0.06	0.08
5	0.027	5.03	0.014	<0.002	0.51	1.36	21.7	0.21	0.22	0.38	<0.01	0.02	0.06	0.08
6	0.026	5.39	0.015	<0.002	0.52	1.45	21.8	0.21	0.23	0.39	0.01	0.02	0.07	0.08
7	0.024	4.93	0.016	<0.002	0.54	1.39	21.7	0.20	0.22	0.38	0.01	0.02	0.07	0.09
8	0.029	5.03	0.019	<0.002	0.55	1.44	21.8	0.19	0.23	0.39	0.02	0.01	0.07	0.09
9	0.033	4.99	0.019	<0.002	0.57	1.41	21.7	0.27	0.22	0.39	0.02	0.02	0.08	0.10
10	0.030	5.13	0.018	<0.002	0.53	1.40	21.7	0.21	0.23	0.39	0.02	0.02	0.06	0.08
11	0.029	5.34	0.018	<0.002	0.56	1.44	21.8	0.32	0.23	0.38	0.02	0.02	0.08	0.09
12	0.031	5.11	0.019	<0.002	0.56	1.42	21.6	0.26	0.22	0.38	0.02	0.02	0.08	0.09
13	0.034	5.13	0.021	<0.002	0.57	1.45	21.6	0.26	0.22	0.38	0.02	0.02	0.07	0.09
14	0.029	4.94	0.019	<0.002	0.57	1.45	21.7	0.19	0.23	0.39	0.02	0.02	0.07	0.08
15	0.029	5.11	0.019	<0.002	0.54	1.43	21.8	0.31	0.22	0.38	0.02	0.02	0.08	0.09
16	0.027	5.04	0.020	<0.002	0.56	1.39	21.8	0.32	0.23	0.39	0.01	0.02	0.08	0.10
17	0.028	5.13	0.019	<0.002	0.55	1.40	21.8	0.22	0.23	0.40	<0.01	0.02	0.07	0.09
Required	0.040 Max	4.00 6.00	0.040 Max	0.030 Max	1.00 Max	1.35 1.70	21.0 22.0	0.10 0.80	0.20 0.25	0.10 0.80	0.05 Max	0.10 Max	0.10 Max	0.50 Max

*Note: Customer-supplied requirement

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ITLS Report L20665 Rev. 1
October 10, 2012

Results (cont.):

Intergranular Corrosion Test – ISO 3651-2 Method A

Sample #	Bend Radius	Bend	Result
1	1T	90°	Accept – No Cracking Observed
2	1T	90°	Accept – No Cracking Observed
3	1T	90°	Accept – No Cracking Observed
4	1T	90°	Accept – No Cracking Observed
5	1T	90°	Accept – No Cracking Observed
6	1T	90°	Accept – No Cracking Observed
7	1T	90°	Accept – No Cracking Observed
8	1T	90°	Accept – No Cracking Observed
9	1T	90°	Accept – No Cracking Observed
10	1T	90°	Accept – No Cracking Observed
11	1T	90°	Accept – No Cracking Observed
12	1T	90°	Accept – No Cracking Observed
13	1T	90°	Accept – No Cracking Observed
14	1T	90°	Accept – No Cracking Observed
15	1T	90°	Accept – No Cracking Observed
16	1T	90°	Accept – No Cracking Observed
17	1T	90°	Accept – No Cracking Observed
Required	1T	90°	No Cracking @ 10X

ACCEPTABLE

This certification affirms that the contents are correct and accurate, and that the test operations performed by Industrial Testing Laboratory Services are in compliance with the material specification, ITLS Quality Assurance Manual Rev. 4 dated 12/3/11, ASME NQA-1 1994, Regulatory Guide 1.28, 10 CFR 50 App. B, 10 CFR Part 21 and any additional requirements of SMS Purchase Order # 694689. Test Results comply with the PO required material specification(s) as noted below.

All Samples **ACCEPTABLE**

Signature 

Date 10/19/12

Electronic Copy – Original and Signed Report Located at ITLS



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Rev. 1 – Made to update year of acceptance specifications. All samples remain acceptable (10/19/12 – RDR)

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DURING OUR MANUFACTURING PROCESSES, TESTS, AND INSPECTIONS, THE PRODUCT DID NOT COME IN DIRECT CONTACT WITH MERCURY OR ANY OF ITS COMPOUNDS NOR WITH ANY MERCURY CONTAINING DEVICES EMPLOYING A SINGLE BOUNDARY OF CONTAINMENT.
"NOTE: THE RECORDING OF FALSE, FICTITIOUS, OR FRAUDULENT STATEMENTS OR ENTRIES ON THIS DOCUMENT MAY BE PUNISHABLE AS A FELONY UNDER FEDERAL STATUTES".



INDUSTRIAL TESTING LABORATORY SERVICES, LLC
635 Alpha Drive – RIDC Park
Pittsburgh, PA 15238 Phone: 412.963.1900 Fax: 412.963.1926
e-mail: info@itls.com website: itls.com

TEST REPORT
L20665 Rev. 1
October 10, 2012
Revised October 19, 2012

Purchase Order No: 694689-000 OP

To: Shaw Modular Solutions LLC
3191 West Lincoln Road
Lake Charles, LA 70605

Attn: Nick Koseski

Sample Received:

ITLS received seventeen (17) samples for Chemical, Mechanical, Hardness, Impact, Ferrite and Intergranular Corrosion evaluation, identified as follows:

Sample #	Coupon # Sent to ITLS	Heat #	Lot #	Description	Supplier
1	9096-32-02	421716	244903	1 pc. – 0.5" Thick Duplex Plate	Outokumpu
2	9096-27-02	421716	243906	1 pc. – 1" Thick Duplex Plate	Outokumpu
3	9099-32-02	421717	243988	1 pc. – 0.5" Thick Duplex Plate	Outokumpu
4	9096-23-03	421716	243891	1 pc. – 0.75" Thick Duplex Plate	Outokumpu
5	9099-27-03	421717	243892	1 pc. – 0.75" Thick Duplex Plate	Outokumpu
6	9099-22-02	421717	243907	1 pc. – 1" Thick Duplex Plate	Outokumpu
7	9096-35-03	421716	243990	1 pc. – 0.75" Thick Duplex Plate	Outokumpu
8	9096-22-05	421716	244095	1 pc. – 0.25" Thick Duplex Plate	Outokumpu
9	9080-25-02	421625	243526	1 pc. – 0.5" Thick Duplex Plate	Outokumpu
10	9099-28-02	421717	243890	1 pc. – 0.5" Thick Duplex Plate	Outokumpu
11	9081-12-04	421626	245018	1 pc. – 0.25" Thick Duplex Plate	Outokumpu
12	9080-35-02	421625	243531	1 pc. – 0.75" Thick Duplex Plate	Outokumpu
13	9080-33-03	421625	245672	1 pc. – 0.5" Thick Duplex Plate	Outokumpu
14	9096-31-02	421716	244281	1 pc. – 1" Thick Duplex Plate	Outokumpu
15	9081-24-02	421626	243533	1 pc. – 0.75" Thick Duplex Plate	Outokumpu
16	9081-36-02	421626	243904	1 pc. – 0.75" Thick Duplex Plate	Outokumpu
17	9099-29-02	421717	243991	1 pc. – 1" Thick Duplex Plate	Outokumpu



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Acceptance:

Sample #	Test	Acceptance
All	Chemical Analysis	APP-VL52-Z0-023, Rev. 1, ASTM A240-12 (UNS S32101)
All	Mechanical	APP-VL52-Z0-023, Rev. 1, ASTM A240-12 (UNS S32101), A480-12
All	Rockwell B	ASTM A240-12 (UNS S32101), A480-12
All	Ferrite	APP-VL52-Z0-023, Rev. 1, ASTM E562-11, Method A
All	Impact	APP-VL52-Z0-023, Rev. 1, ASTM A923-08, Method B
All	Intergranular Corrosion	ISO 3651-2 Method A

Test References:

Specification	Title
ASTM A751-11	Standard Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products
ASTM A370-12	Standard Test Methods and Definitions for Mechanical Testing of Steel Products
ASTM E8-11	Standard Test Methods for Tension Testing of Metallic Materials
ASTM E140-07	Standard Hardness Conversion Tables for Metals
ASTM E23-07a ⁶¹	Standard Test Methods for Notched Bar Impact Testing of Metallic Materials
ASTM E3-11	Standard Guide for Preparation of Metallographic Specimens
ASTM E18-11	Standard Test Methods for Rockwell Hardness of Metallic Materials
ASTM E1245-03 (2008)	Standard Practice for Determining the Inclusion of Second-Phase Constituent Content of Metals by Automatic Image Analysis
ASTM E562-11	Standard Test Method for Determining Volume Fraction by Systematic Manual Point Count

Quality References:

Reference
10CFR21, 10CFR50.55(e) and 10CFR50 App. B
ASME NQA-1 – 1994 Basic and Supplementary Requirements
USNRC Regulatory Guide 1.28 Rev. 3
ITLS QA Manual Rev. 4 dated 12/3/11
No ITLS subcontractors used for completion of this order



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Shaw Modular Solutions, LLC
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Results:

Impact Test – ASTM A923-08 Method B

Sample #	Temperature (°F)	Absorbed Energy (ft-lbs)
1	-40	96
2	-40	68
3	-40	93
4	-40	83
5	-40	82
6	-40	74
7	-40	84
*8	-40	96
9	-40	87
10	-40	97
*11	-40	88
12	-40	90
13	-40	91
14	-40	67
15	-40	90
16	-40	84
17	-40	66
Required	-40 or below	20 Min

*Note: Specimen size 10mm x 5mm, 1/2 size per ASTM A923. Absorbed energy values converted per ASTM A923 Table 2.

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Results (cont.):

Ferrite Testing – ASTM E562-11 Method A

Sample #	Ferrite (%)
1	42
2	44
3	43
4	43
5	41
6	41
7	44
8	41
9	41
10	42
11	44
12	41
13	43
14	41
15	44
16	44
17	42
Required	40 - 60%

Ferrite volume fraction tested with Image Analysis per ASTM E1245-03(2008). ASTM E562 offers the use of ASTM E1245 to determine the same measurements.

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Shaw Modular Solutions, LLC
ITLS Report L20665 Rev. 1
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Results (cont.):

Mechanical Properties – ASTM E8-11 (flat) & ASTM E18-11 (HRB)

Sample #	Test Temp (°F)	Initial Dimensions (in)	Initial Area (in ²)	*Yield Strength (ksi)	Tensile Strength (ksi)	Elongation in 2" (%)	Hardness HRB** (Avg. of 3)
1	Room	0.503 x 0.526	0.2646	74	106	45	98
2	Room	0.500 x 1.040	0.5200	74	104	48	97
3	Room	0.503 x 0.543	0.2731	72	104	45	95
4	Room	0.502 x 0.785	0.3941	78	104	47	96
5	Room	0.502 x 0.780	0.3916	75	104	46	97
6	Room	0.501 x 1.020	0.5110	68	102	50	96
7	Room	0.502 x 0.788	0.3956	74	104	46	97
8	Room	0.489 x 0.258	0.1262	85	115	45	95
9	Room	0.502 x 0.552	0.2771	74	105	47	96
10	Room	0.503 x 0.533	0.2681	74	105	46	97
11	Room	0.489 x 0.249	0.1218	87	115	41	98
12	Room	0.502 x 0.786	0.3946	74	104	46	95
13	Room	0.503 x 0.525	0.2641	77	104	43	98
14	Room	0.501 x 1.040	0.5210	75	105	48	96
15	Room	0.501 x 0.795	0.3983	75	105	45	95
16	Room	0.501 x 0.784	0.3928	75	105	46	96
17	Room	0.501 x 1.040	0.5210	75	103	49	96
Required				65 Min	94 Min	30 Min	290 HBW Max

*Yield calculated at 0.20% offset

ACCEPTABLE

**Customer requested hardness in Rockwell B. All measured values were between 95 and 98 HRB which is approximately equal to Brinell 210 to 240 based on ASTM E140 Tables 2 and 5. These values are well below the specified max of 290 HBW and are therefore acceptable.



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Shaw Modular Solutions, LLC
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Results (cont.):

Chemical Analysis – ASTM A751-11 (OES/Leco)

Sample #	Composition (wt%)													
	C	Mn	P	S	Si	Ni	Cr	Mo	N	Cu	Co*	Al*	V*	Total Others*
1	0.027	5.00	0.018	<0.002	0.54	1.44	21.7	0.20	0.23	0.38	0.01	0.02	0.07	0.09
2	0.026	4.95	0.018	<0.002	0.52	1.40	21.8	0.18	0.23	0.38	0.01	0.02	0.07	0.09
3	0.029	5.11	0.016	<0.002	0.52	1.42	21.7	0.21	0.23	0.39	<0.01	0.02	0.06	0.08
4	0.025	4.94	0.017	<0.002	0.53	1.40	21.7	0.19	0.21	0.37	0.01	0.02	0.06	0.08
5	0.027	5.03	0.014	<0.002	0.51	1.36	21.7	0.21	0.22	0.38	<0.01	0.02	0.06	0.08
6	0.026	5.39	0.015	<0.002	0.52	1.45	21.8	0.21	0.23	0.39	0.01	0.02	0.07	0.08
7	0.024	4.93	0.016	<0.002	0.54	1.39	21.7	0.20	0.22	0.38	0.01	0.02	0.07	0.09
8	0.029	5.03	0.019	<0.002	0.55	1.44	21.8	0.19	0.23	0.39	0.02	0.01	0.07	0.09
9	0.033	4.99	0.019	<0.002	0.57	1.41	21.7	0.27	0.22	0.39	0.02	0.02	0.08	0.10
10	0.030	5.13	0.018	<0.002	0.53	1.40	21.7	0.21	0.23	0.39	0.02	0.02	0.06	0.08
11	0.029	5.34	0.018	<0.002	0.56	1.44	21.8	0.32	0.23	0.38	0.02	0.02	0.08	0.09
12	0.031	5.11	0.019	<0.002	0.56	1.42	21.6	0.26	0.22	0.38	0.02	0.02	0.08	0.09
13	0.034	5.13	0.021	<0.002	0.57	1.45	21.6	0.26	0.22	0.38	0.02	0.02	0.07	0.09
14	0.029	4.94	0.019	<0.002	0.57	1.45	21.7	0.19	0.23	0.39	0.02	0.02	0.07	0.08
15	0.029	5.11	0.019	<0.002	0.54	1.43	21.8	0.31	0.22	0.38	0.02	0.02	0.08	0.09
16	0.027	5.04	0.020	<0.002	0.56	1.39	21.8	0.32	0.23	0.39	0.01	0.02	0.08	0.10
17	0.028	5.13	0.019	<0.002	0.55	1.40	21.8	0.22	0.23	0.40	<0.01	0.02	0.07	0.09
Required	0.040 Max	4.00 6.00	0.040 Max	0.030 Max	1.00 Max	1.35 1.70	21.0 22.0	0.10 0.80	0.20 0.25	0.10 0.80	0.05 Max	0.10 Max	0.10 Max	0.50 Max

*Note: Customer-supplied requirement

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Shaw Modular Solutions, LLC
ITLS Report L20665 Rev. 1
October 10, 2012

Results (cont.):

Intergranular Corrosion Test – ISO 3651-2 Method A

Sample #	Bend Radius	Bend	Result
1	1T	90°	Accept – No Cracking Observed
2	1T	90°	Accept – No Cracking Observed
3	1T	90°	Accept – No Cracking Observed
4	1T	90°	Accept – No Cracking Observed
5	1T	90°	Accept – No Cracking Observed
6	1T	90°	Accept – No Cracking Observed
7	1T	90°	Accept – No Cracking Observed
8	1T	90°	Accept – No Cracking Observed
9	1T	90°	Accept – No Cracking Observed
10	1T	90°	Accept – No Cracking Observed
11	1T	90°	Accept – No Cracking Observed
12	1T	90°	Accept – No Cracking Observed
13	1T	90°	Accept – No Cracking Observed
14	1T	90°	Accept – No Cracking Observed
15	1T	90°	Accept – No Cracking Observed
16	1T	90°	Accept – No Cracking Observed
17	1T	90°	Accept – No Cracking Observed
Required	1T	90°	No Cracking @ 10X

ACCEPTABLE

This certification affirms that the contents are correct and accurate, and that the test operations performed by Industrial Testing Laboratory Services are in compliance with the material specification, ITLS Quality Assurance Manual Rev. 4 dated 12/3/11, ASME NQA-1 1994, Regulatory Guide 1.28, 10 CFR 50 App. B, 10 CFR Part 21 and any additional requirements of SMS Purchase Order # 694689. Test Results comply with the PO required material specification(s) as noted below.

All Samples **ACCEPTABLE**

Signature _____

Date 10/19/12

Electronic Copy – Original and Signed Report Located at ITLS



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Rev. 1 – Made to update year of acceptance specifications. All samples remain acceptable (10/19/12 – RDR)

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DURING OUR MANUFACTURING PROCESSES, TESTS, AND INSPECTIONS, THE PRODUCT DID NOT COME IN DIRECT CONTACT WITH MERCURY OR ANY OF ITS COMPOUNDS NOR WITH ANY MERCURY CONTAINING DEVICES EMPLOYING A SINGLE BOUNDARY OF CONTAINMENT.
"NOTE: THE RECORDING OF FALSE, FICTITIOUS, OR FRAUDULENT STATEMENTS OR ENTRIES ON THIS DOCUMENT MAY BE PUNISHABLE AS A FELONY UNDER FEDERAL STATUTES".



INDUSTRIAL TESTING LABORATORY SERVICES, LLC
635 Alpha Drive – RIDC Park
Pittsburgh, PA 15238 Phone: 412.963.1900 Fax: 412.963.1926
e-mail: info@itls.com website: itls.com

TEST REPORT
L20665 Rev. 1
October 10, 2012
Revised October 19, 2012

Purchase Order No: 694689-000 OP

To: Shaw Modular Solutions LLC
3191 West Lincoln Road
Lake Charles, LA 70605

Attn: Nick Koseski

Sample Received:

ITLS received seventeen (17) samples for Chemical, Mechanical, Hardness, Impact, Ferrite and Intergranular Corrosion evaluation, identified as follows:

Sample #	Coupon # Sent to ITLS	Heat #	Lot #	Description	Supplier
1	9096-32-02	421716	244903	1 pc. – 0.5" Thick Duplex Plate	Outokumpu
2	9096-27-02	421716	243906	1 pc. – 1" Thick Duplex Plate	Outokumpu
3	9099-32-02	421717	243988	1 pc. – 0.5" Thick Duplex Plate	Outokumpu
4	9096-23-03	421716	243891	1 pc. – 0.75" Thick Duplex Plate	Outokumpu
5	9099-27-03	421717	243892	1 pc. – 0.75" Thick Duplex Plate	Outokumpu
6	9099-22-02	421717	243907	1 pc. – 1" Thick Duplex Plate	Outokumpu
7	9096-35-03	421716	243990	1 pc. – 0.75" Thick Duplex Plate	Outokumpu
8	9096-22-05	421716	244095	1 pc. – 0.25" Thick Duplex Plate	Outokumpu
9	9080-25-02	421625	243526	1 pc. – 0.5" Thick Duplex Plate	Outokumpu
10	9099-28-02	421717	243890	1 pc. – 0.5" Thick Duplex Plate	Outokumpu
11	9081-12-04	421626	245018	1 pc. – 0.25" Thick Duplex Plate	Outokumpu
12	9080-35-02	421625	243531	1 pc. – 0.75" Thick Duplex Plate	Outokumpu
13	9080-33-03	421625	245672	1 pc. – 0.5" Thick Duplex Plate	Outokumpu
14	9096-31-02	421716	244281	1 pc. – 1" Thick Duplex Plate	Outokumpu
15	9081-24-02	421626	243533	1 pc. – 0.75" Thick Duplex Plate	Outokumpu
16	9081-36-02	421626	243904	1 pc. – 0.75" Thick Duplex Plate	Outokumpu
17	9099-29-02	421717	243991	1 pc. – 1" Thick Duplex Plate	Outokumpu



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Shaw Modular Solutions, LLC
ITLS Report L20665 Rev. 1
October 10, 2012

Acceptance:

Sample #	Test	Acceptance
All	Chemical Analysis	APP-VL52-Z0-023, Rev. 1, ASTM A240-12 (UNS S32101)
All	Mechanical	APP-VL52-Z0-023, Rev. 1, ASTM A240-12 (UNS S32101), A480-12
All	Rockwell B	ASTM A240-12 (UNS S32101), A480-12
All	Ferrite	APP-VL52-Z0-023, Rev. 1, ASTM E562-11, Method A
All	Impact	APP-VL52-Z0-023, Rev. 1, ASTM A923-08, Method B
All	Intergranular Corrosion	ISO 3651-2 Method A

Test References:

Specification	Title
ASTM A751-11	Standard Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products
ASTM A370-12	Standard Test Methods and Definitions for Mechanical Testing of Steel Products
ASTM E8-11	Standard Test Methods for Tension Testing of Metallic Materials
ASTM E140-07	Standard Hardness Conversion Tables for Metals
ASTM E23-07a ⁶¹	Standard Test Methods for Notched Bar Impact Testing of Metallic Materials
ASTM E3-11	Standard Guide for Preparation of Metallographic Specimens
ASTM E18-11	Standard Test Methods for Rockwell Hardness of Metallic Materials
ASTM E1245-03 (2008)	Standard Practice for Determining the Inclusion of Second-Phase Constituent Content of Metals by Automatic Image Analysis
ASTM E562-11	Standard Test Method for Determining Volume Fraction by Systematic Manual Point Count

Quality References:

Reference
10CFR21, 10CFR50.55(e) and 10CFR50 App. B
ASME NQA-1 – 1994 Basic and Supplementary Requirements
USNRC Regulatory Guide 1.28 Rev. 3
ITLS QA Manual Rev. 4 dated 12/3/11
No ITLS subcontractors used for completion of this order



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Shaw Modular Solutions, LLC
ITLS Report L20665 Rev. 1
October 10, 2012

Results:

Impact Test – ASTM A923-08 Method B

Sample #	Temperature (°F)	Absorbed Energy (ft-lbs)
1	-40	96
2	-40	68
3	-40	93
4	-40	83
5	-40	82
6	-40	74
7	-40	84
*8	-40	96
9	-40	87
10	-40	97
*11	-40	88
12	-40	90
13	-40	91
14	-40	67
15	-40	90
16	-40	84
17	-40	66
Required	-40 or below	20 Min

*Note: Specimen size 10mm x 5mm, 1/2 size per ASTM A923. Absorbed energy values converted per ASTM A923 Table 2.

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Shaw Modular Solutions, LLC
ITLS Report L20665 Rev. 1
October 10, 2012

Results (cont.):

Ferrite Testing – ASTM E562-11 Method A

Sample #	Ferrite (%)
1	42
2	44
3	43
4	43
5	41
6	41
7	44
8	41
9	41
10	42
11	44
12	41
13	43
14	41
15	44
16	44
17	42
Required	40 - 60%

Ferrite volume fraction tested with Image Analysis per ASTM E1245-03(2008). ASTM E562 offers the use of ASTM E1245 to determine the same measurements.

ACCEPTABLE



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Shaw Modular Solutions, LLC
ITLS Report L20665 Rev. 1
October 10, 2012

Results (cont.):

Mechanical Properties – ASTM E8-11 (flat) & ASTM E18-11 (HRB)

Sample #	Test Temp (°F)	Initial Dimensions (in)	Initial Area (in ²)	*Yield Strength (ksi)	Tensile Strength (ksi)	Elongation in 2" (%)	Hardness HRB** (Avg. of 3)
1	Room	0.503 x 0.526	0.2646	74	106	45	98
2	Room	0.500 x 1.040	0.5200	74	104	48	97
3	Room	0.503 x 0.543	0.2731	72	104	45	95
4	Room	0.502 x 0.785	0.3941	78	104	47	96
5	Room	0.502 x 0.780	0.3916	75	104	46	97
6	Room	0.501 x 1.020	0.5110	68	102	50	96
7	Room	0.502 x 0.788	0.3956	74	104	46	97
8	Room	0.489 x 0.258	0.1262	85	115	45	95
9	Room	0.502 x 0.552	0.2771	74	105	47	96
10	Room	0.503 x 0.533	0.2681	74	105	46	97
11	Room	0.489 x 0.249	0.1218	87	115	41	98
12	Room	0.502 x 0.786	0.3946	74	104	46	95
13	Room	0.503 x 0.525	0.2641	77	104	43	98
14	Room	0.501 x 1.040	0.5210	75	105	48	96
15	Room	0.501 x 0.795	0.3983	75	105	45	95
16	Room	0.501 x 0.784	0.3928	75	105	46	96
17	Room	0.501 x 1.040	0.5210	75	103	49	96
Required				65 Min	94 Min	30 Min	290 HBW Max

*Yield calculated at 0.20% offset

ACCEPTABLE

**Customer requested hardness in Rockwell B. All measured values were between 95 and 98 HRB which is approximately equal to Brinell 210 to 240 based on ASTM E140 Tables 2 and 5. These values are well below the specified max of 290 HBW and are therefore acceptable.



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Shaw Modular Solutions, LLC
ITLS Report L20665 Rev. 1
October 10, 2012

Results (cont.):

Chemical Analysis – ASTM A751-11 (OES/Leco)

Sample #	Composition (wt%)													
	C	Mn	P	S	Si	Ni	Cr	Mo	N	Cu	Co*	Al*	V*	Total Others*
1	0.027	5.00	0.018	<0.002	0.54	1.44	21.7	0.20	0.23	0.38	0.01	0.02	0.07	0.09
2	0.026	4.95	0.018	<0.002	0.52	1.40	21.8	0.18	0.23	0.38	0.01	0.02	0.07	0.09
3	0.029	5.11	0.016	<0.002	0.52	1.42	21.7	0.21	0.23	0.39	<0.01	0.02	0.06	0.08
4	0.025	4.94	0.017	<0.002	0.53	1.40	21.7	0.19	0.21	0.37	0.01	0.02	0.06	0.08
5	0.027	5.03	0.014	<0.002	0.51	1.36	21.7	0.21	0.22	0.38	<0.01	0.02	0.06	0.08
6	0.026	5.39	0.015	<0.002	0.52	1.45	21.8	0.21	0.23	0.39	0.01	0.02	0.07	0.08
7	0.024	4.93	0.016	<0.002	0.54	1.39	21.7	0.20	0.22	0.38	0.01	0.02	0.07	0.09
8	0.029	5.03	0.019	<0.002	0.55	1.44	21.8	0.19	0.23	0.39	0.02	0.01	0.07	0.09
9	0.033	4.99	0.019	<0.002	0.57	1.41	21.7	0.27	0.22	0.39	0.02	0.02	0.08	0.10
10	0.030	5.13	0.018	<0.002	0.53	1.40	21.7	0.21	0.23	0.39	0.02	0.02	0.06	0.08
11	0.029	5.34	0.018	<0.002	0.56	1.44	21.8	0.32	0.23	0.38	0.02	0.02	0.08	0.09
12	0.031	5.11	0.019	<0.002	0.56	1.42	21.6	0.26	0.22	0.38	0.02	0.02	0.08	0.09
13	0.034	5.13	0.021	<0.002	0.57	1.45	21.6	0.26	0.22	0.38	0.02	0.02	0.07	0.09
14	0.029	4.94	0.019	<0.002	0.57	1.45	21.7	0.19	0.23	0.39	0.02	0.02	0.07	0.08
15	0.029	5.11	0.019	<0.002	0.54	1.43	21.8	0.31	0.22	0.38	0.02	0.02	0.08	0.09
16	0.027	5.04	0.020	<0.002	0.56	1.39	21.8	0.32	0.23	0.39	0.01	0.02	0.08	0.10
17	0.028	5.13	0.019	<0.002	0.55	1.40	21.8	0.22	0.23	0.40	<0.01	0.02	0.07	0.09
Required	0.040 Max	4.00 6.00	0.040 Max	0.030 Max	1.00 Max	1.35 1.70	21.0 22.0	0.10 0.80	0.20 0.25	0.10 0.80	0.05 Max	0.10 Max	0.10 Max	0.50 Max

*Note: Customer-supplied requirement

ACCEPTABLE



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APR 20 2013
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Shaw Modular Solutions, LLC
ITLS Report L20665 Rev. 1
October 10, 2012

Results (cont.):

Intergranular Corrosion Test – ISO 3651-2 Method A

Sample #	Bend Radius	Bend	Result
1	1T	90°	Accept – No Cracking Observed
2	1T	90°	Accept – No Cracking Observed
3	1T	90°	Accept – No Cracking Observed
4	1T	90°	Accept – No Cracking Observed
5	1T	90°	Accept – No Cracking Observed
6	1T	90°	Accept – No Cracking Observed
7	1T	90°	Accept – No Cracking Observed
8	1T	90°	Accept – No Cracking Observed
9	1T	90°	Accept – No Cracking Observed
10	1T	90°	Accept – No Cracking Observed
11	1T	90°	Accept – No Cracking Observed
12	1T	90°	Accept – No Cracking Observed
13	1T	90°	Accept – No Cracking Observed
14	1T	90°	Accept – No Cracking Observed
15	1T	90°	Accept – No Cracking Observed
16	1T	90°	Accept – No Cracking Observed
17	1T	90°	Accept – No Cracking Observed
Required	1T	90°	No Cracking @ 10X

ACCEPTABLE

This certification affirms that the contents are correct and accurate, and that the test operations performed by Industrial Testing Laboratory Services are in compliance with the material specification, ITLS Quality Assurance Manual Rev. 4 dated 12/3/11, ASME NQA-1 1994, Regulatory Guide 1.28, 10 CFR 50 App. B, 10 CFR Part 21 and any additional requirements of SMS Purchase Order # 694689. Test Results comply with the PO required material specification(s) as noted below.

All Samples **ACCEPTABLE**

Signature _____

Date 10/19/12

Electronic Copy – Original and Signed Report Located at ITLS



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APR 20 2013

005

Rev. 1 – Made to update year of acceptance specifications. All samples remain acceptable (10/19/12 – RDR)

Page 7 of 7

DURING OUR MANUFACTURING PROCESSES, TESTS, AND INSPECTIONS, THE PRODUCT DID NOT COME IN DIRECT CONTACT WITH MERCURY OR ANY OF ITS COMPOUNDS NOR WITH ANY MERCURY CONTAINING DEVICES EMPLOYING A SINGLE BOUNDARY OF CONTAINMENT.
"NOTE: THE RECORDING OF FALSE, FICTITIOUS, OR FRAUDULENT STATEMENTS OR ENTRIES ON THIS DOCUMENT MAY BE PUNISHABLE AS A FELONY UNDER FEDERAL STATUTES".

**OUTO
KUMPU****Certificate of Analysis and Tests**

OUR ORDER 0278834 - 16

HEAT & PIECE 853733-3A 04/27/12

SOLD TO: SHAW MODULAR SOLUTIONS, L.L.C. SHIP TO: SHAW MODULAR SOLUTIONS, L.L.C.
3191 W LINCOLN ROAD 3191 W LINCOLN ROAD

LAKE CHARLES

LA 70605

LAKE CHARLES

LA 70605

----- YOUR ORDER & DATE -----
 746363 12/22/11 TAG# P/N #2232421
 ----- ITEM DESCRIPTION -----
 HEAT & PIECE 853733 - 3A
 WEIGHT 7253
 FINISH 1
 GRADE 2101 UNS S32101
 DIMENSIONS 1.000 X 102.000 X 240.000 EXACT

----- SPECIFICATIONS -----
 *** MFG IN NEW CASTLE, IN, USA
 ASTM A240-11A ASMESA240-11ED
 REQUIRES PRODUCT ANALYSIS
 ASTM E562-08 (10% ACCURACY)
 ASTM A923-06 METHOD A&B ONLY
 U. T. TEST TO ASTM A 577-90
 APP-VL52-ZO-023 R1 W/EXCEPTS
 COUPONS REQUIRED
 ASTM A262-02A PRACTICE E
 NO GRIPPER MARKS

FROM SLABS IMPORTED FROM BRITAIN
 ASTM A480-11A ASMESA480 11ED
 OSI QA MAN ED 2 R 1 10/15/02
 UHA 51 CHARPY @ -40F (-40C)
 UT ASTM A578-07 LEVEL B S1
 NON STANDARD PROPERTIES REQD
 ISO 3651-2
 ASTM A262-02A PRACTICE A
 SMS PO REQMTS WITH EXCEPTS
 NO WELD REPAIRS

SMS QC
ACCEPT

13

6-29-12

PLATES & TEST PCS SOLUTION ANNEALED @ 1900 DEGREES FAHRENHEIT MINIMUM.
 THEN WATER QUENCHED
 FREE FROM MERCURY CONTAMINATION AT CURRENT DETECTION LIMITS
 HOT ROLLED, ANNEALED & PICKLED (HRAP)

----- MECHANICAL & OTHER TESTS -----
 HARDNESS HRC 15
 YIELD STRENGTH (PSI) 70164
 TENSILE STRENGTH (PSI) 94420
 BEND OK
 INTERGRANULAR CORROSION OK
 ELONGATION % IN 2" 41.2
 REDUCTION OF AREA % 61.6
 ASTM E-562 POINT COUNT FERRITE = 48.0%
 CHARPY TEST AT -40F (TRANS) 42, 52, 57 FT-LBS. FULL SAMPLE SIZE
 LATERAL EXPANSION = 26, 21, 34 (MILS)

----- CHEMICAL COMPOSITION ----- PRODUCT ANALYSIS -----

CARBON (C)	.023	(C)	.011
MANGANESE (MN)	4.86	(MN)	4.57
PHOSPHORUS (P)	.027	(P)	.020
SULFUR (S)	.001	(S)	.007
SILICON (SI)	.68	(SI)	.69
CHROMIUM (CR)	21.42	(CR)	21.20
NICKEL (NI)	1.67	(NI)	1.67
COBALT (CO)	.04	(CO)	.04
COPPER (CU)	.43	(CU)	.40
MOLY (MO)	.22	(MO)	.22
NITROGEN (N)	.22	(N)	.24
COLUMBIUM (CB)	.012	(CB)	.006
TITANIUM (TI)	.004	(TI)	.003
ALUMINUM (AL)	.011	(AL)	.009
TIN (SN)	.009	(SN)	.004

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AUG 30 2012

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WE HEREBY CERTIFY THAT THE MATERIAL HEREIN HAS BEEN MADE AND TESTED IN
 ACCORDANCE WITH THE LISTED SPECIFICATION(S) AND THAT THE RESULTS OF ALL
 TESTS ARE ACCEPTABLE.

JAMES DOUBMAN, QUALITY ASSURANCE MANAGER

CERTIFICATE IN CONFORMANCE WITH EN10204-95 3.1.B/EN10204-2004 3.1

Outokumpu Stainless Plate, Inc.
 P.O. Box 370
 New Castle, Indiana 47362



INDUSTRIAL TESTING LABORATORY SERVICES, LLC
635 Alpha Drive – RIDC Park
Pittsburgh, PA 15238 Phone: 412.963.1900 Fax: 412.963.1926
e-mail: info@itls.com website: itls.com

TEST REPORT
L19638
June 15, 2012

Purchase Order No: 694689-000 OP

To: Shaw Modular Solutions LLC
3191 West Lincoln Road
Lake Charles, LA 70605

Attn: Nick Koseski

Sample Received:

ITLS received six (6) samples for Chemical, Mechanical, Hardness, Impact, Ferrite and Intergranular Corrosion evaluation, identified as follows:

Sample #	Heat #	Description	Supplier
1	853732-1A	1.500" thick Duplex Plate	Outokumpu
2	853732-1A	1.500" thick Duplex Plate	Outokumpu
3	853841-3A	1.500" thick Duplex Plate	Outokumpu
4	853841-3A	1.500" thick Duplex Plate	Outokumpu
5	853733-4A	1.000" thick Duplex Plate	Outokumpu
6	853733-4A	1.000" thick Duplex Plate	Outokumpu

Acceptance:

Sample #	Test	Acceptance
All	Chemical Analysis	APP-VL52-Z0-023, Rev. 1, ASTM A240-11b (UNS S32101)
All	Mechanical	APP-VL52-Z0-023, Rev. 1, ASTM A240-11b (UNS S32101), A480-11b
All	Rockwell B	ASTM A240-11b (UNS S32101), A480-11b
All	Ferrite	APP-VL52-Z0-023, Rev. 1, ASTM E562-11, Method A
All	Impact	APP-VL52-Z0-023, Rev. 1, ASTM A923-08, Method B
All	Intergranular Corrosion	ISO 3651-2 Method A

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Test References:

Specification	Title
ASTM A751-11	Standard Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products
ASTM A370-12	Standard Test Methods and Definitions for Mechanical Testing of Steel Products
ASTM E8-11	Standard Test Methods for Tension Testing of Metallic Materials
ASTM E140-07	Standard Hardness Conversion Tables for Metals
ASTM E23-07a ^{e1}	Standard Test Methods for Notched Bar Impact Testing of Metallic Materials
ASTM E3-11	Standard Guide for Preparation of Metallographic Specimens
ASTM E18-08b	Standard Test Methods for Rockwell Hardness of Metallic Materials
ASTM E1245-03 (2008)	Standard Practice for Determining the Inclusion of Second-Phase Constituent Content of Metals by Automatic Image Analysis
ASTM E562-11	Standard Test Method for Determining Volume Fraction by Systematic Manual Point Count

Quality References:

Reference
10CFR21, 10CFR50.55(e) and 10CFR50 App.B
ASME NQA-1 – 1994 Basic and Supplementary Requirements
USNRC Regulatory Guide 1.28 Rev. 3
ITLS QA Manual Rev. 3 dated 06/20/08
No ITLS subcontractors used for completion of this order



10-03-2012

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Results:

Chemical Analysis – ASTM A751-11 (OES/Leco)

Sample #	Composition (wt%)													
	C	Mn	P	S	Si	Ni	Cr	Mo	N	Cu	Co	Al	V	Total Others
1	0.023	5.03	0.022	0.001	0.72	1.55	21.2	0.20	0.22	0.40	0.03	0.01	0.08	0.09
2	0.023	5.04	0.022	<0.001	0.73	1.55	21.1	0.20	0.22	0.41	0.03	0.01	0.08	0.09
3	0.030	5.05	0.021	<0.001	0.71	1.43	21.5	0.20	0.21	0.38	0.02	0.02	0.09	0.11
4	0.030	5.08	0.022	<0.001	0.71	1.42	21.4	0.20	0.21	0.38	0.02	0.02	0.09	0.11
5	0.022	4.99	0.021	0.001	0.74	1.55	21.1	0.21	0.22	0.42	0.03	0.01	0.08	0.09
6	0.022	5.01	0.021	<0.001	0.74	1.58	21.1	0.21	0.21	0.41	0.03	0.01	0.08	0.09
Required	0.040 Max	4.00 6.00	0.040 Max	0.030 Max	1.00 Max	1.35 1.70	21.0 22.0	0.10 0.80	0.20 0.25	0.10 0.80	0.05 Max	0.10 Max	0.10 Max	0.50 Max

ACCEPTABLE



AMS



10-03-2012

Impact Test – ASTM A923-08 Method B

Sample #	Temperature (°F)	Absorbed Energy (ft-lbs)
1	-40	41
2	-40	45
3	-40	19
4	-40	16
5	-40	40
6	-40	41
Required	-40	20 Min

AMS



10-03-2012

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ITEMS 3 AND 4 NOT ACCEPTABLE
ALL OTHER ITEMS ACCEPTABLE



Shaw Modular Solutions, LLC
ITLS Report L19638
June 15, 2012

Results (cont):

Ferrite Testing – ASTM E562-11 Method A

Sample #	Ferrite (%)
1	46
2	44
3	51
4	51
5	48
6	47
Required	40 - 60%

Ferrite volume fraction tested with Image Analysis per ASTM E1245-03(2008). ASTM E562 offers the use of ASTM E1245 to determine the same measurements.

ACCEPTABLE

Mechanical Properties – ASTM E8-11 (Round) & ASTM E18-08b (HRB)

Sample #	Test Temp (°F)	Initial Dimensions (in)	Initial Area (in ²)	*Yield Strength (ksi)	Tensile Strength (ksi)	Elongation (%) in 2"	Hardness HRB** (Avg. of 3)
1	Room	0.500 dia.	0.1963	71	101	42	94
2	Room	0.499 dia.	0.1956	69	101	44	96
3	Room	0.499 dia.	0.1956	70	100	45	93
4	Room	0.499 dia.	0.1956	71	99	42	93
5	Room	0.499 dia.	0.1956	71	101	44	95
6	Room	0.500 dia.	0.1963	69	99	44	94
Required				65 Min	94 Min	30 Min	290 HBW Max

*Yield calculated at 0.20% offset

ACCEPTABLE

**Customer requested hardness in Rockwell B. All measured values were between 93 and 96 HRB which is approximately equal to Brinell 200 to 226 based on ASTM E140 Tables 2 and 5. These values are well below the specified max of 290 HBW and are therefore acceptable.

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10-03-2012

Shaw Modular Solutions, LLC
ITLS Report L19638
June 15, 2012

Results (cont.):

Intergranular Corrosion Test – ISO 3651-2 Method A

Sample #	Bend Radius	Bend	Result
1	1T	90°	Accept – No Cracking Observed
2	1T	90°	Accept – No Cracking Observed
3	1T	90°	Accept – No Cracking Observed
4	1T	90°	Accept – No Cracking Observed
5	1T	90°	Accept – No Cracking Observed
6	1T	90°	Accept – No Cracking Observed
Required	1T	90°	No Cracking @ 10X

ACCEPTABLE

This certification affirms that the contents are correct and accurate, and that the test operations performed by Industrial Testing Laboratory Services are in compliance with the material specification, ITLS Quality Assurance Manual Rev. 3 dated 6/20/2008, ASME NQA-1 1994, Regulatory Guide 1.28, 10 CFR 50 App. B, 10 CFR Part 21 and any additional requirements of SMS Purchase Order # 694689. Test Results comply with the PO required material specification(s) as noted below.

Samples 3 & 4: NOT ACCEPTABLE
Samples 1, 2, 5, & 6: ACCEPTABLE

Signature

Date 6/15/2012

Electronic Copy – Original and Signed Report Located at ITLS



10-03-2012

SHAW
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