

IMR Metallurgical Services 4102 Bishop Lane Louisville, KY 40218

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# **CERTIFIED CHEMICAL ANALYSIS**

#### **Emseal**, LLC

120 Carrier Drive Toronto, Ontario M9W5R1 *Attention*: Bill Witherspoon Project No.: 28790

Date Received: 5/26/09 Date Tested: 5/28/09 Reported: 5/29/09

## SAMPLE DESCRIPTION AND CONDITION:

Three (3) Stainless Steel Plates, with three test areas on each plate, were received for Chemical Analysis.

### **SPECIFICATION(S)/METHOD(S)/PROCEDURE(S) FOLLOWED:**

Optical Emission Spectroscopy (ASTM E1086-94 (05))

### EQUIPMENT USED: Spectrolab CCD.

CHEMICAL ANALYSIS IN WEIGHT PERCENT							
ELEMENT	Plate #1 Area #1	Plate #1 Area #2	Plate #1 Area #3	SAE 304L SPECIFICATIONS	SAE 304 SPECIFICATIONS		
Carbon	0.03	0.03	0.03	0.030 max	0.08 max		
Silicon	0.39	0.42	0.44	0.75 max	0.75 max		
Manganese	1.65	1.66	1.67	2.00 max	2.00 max		
Phosphorus	0.026	0.026	0.027	0.045 max	0.045 max		
Sulfur	0.002	0.001	0.002	0.030 max	0.030 max		
Chromium	18.23	18.14	18.26	18.00 - 20.00	18.00 - 20.00		
Molybdenum	0.42	0.42	0.41				
Nickel	8.13	8.04	8.02	8.00 - 12.00	8.00 - 10.50		
Aluminum	< 0.01	< 0.01	< 0.01				
Cobalt	0.16	0.16	0.16				
Copper	0.49	0.49	0.51				
Niobium	< 0.01	< 0.01	< 0.01				
Titanium	< 0.01	< 0.01	< 0.01				
Vanadium	0.07	0.07	0.07				
Tungsten	0.04	0.04	0.05				
Lead	< 0.01	< 0.01	< 0.01				
Iron	Remainder	Remainder	Remainder	Remainder	Remainder		

NOTES: Plate #1 meets the chemical requirements of SAE 304/304L Stainless Steel.

5/29/09

Date

avid Zaulen

5/29/09

Date

Jacob M. Goran Analytical Chemist



ISO 17025 Mechanical 1140-03 Chemical 1140-04

All procedures were performed in accordance with the IMR Quality Manual, current revision, and related procedures. The information contained in this test report represents only the material tested and may not be reproduced, except in full, without the written approval of IMR Metallurgical Services. IMR Metallurgical Services maintains a quality system in compliance with the ISO/IEC 17025:2005 and is accredited by the American Association for Laboratory Accreditation (A2LA), certificates #1140.03 and #1140.04. IMR Metallurgical Services' liability to the customer or any third party is limited to the amount charged for services provided. All samples will be retained for a minimum of 60 days and may be destroyed thereafter unless otherwise specified by the customer. The recording of false, fictitious, or fraudulent statements or entries on this document may be punished as a felony under federal statutes.

David Zauler

Senior Chemist



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Optical Emission Spectroscopy (ASTM E1086-94 (05))

### EQUIPMENT USED: Spectrolab CCD.

CHEMICAL ANALYSIS IN WEIGHT PERCENT							
ELEMENT	Plate #2 Area #1	Plate #2 Area #2	Plate #2 Area #3	SAE 304L SPECIFICATIONS	SAE 304 SPECIFICATIONS		
Carbon	0.02	0.02	0.02	0.030 max	0.08 max		
Silicon	0.48	0.48	0.53	0.75 max	0.75 max		
Manganese	1.42	1.42	1.41	2.00 max	2.00 max		
Phosphorus	0.028	0.028	0.030	0.045 max	0.045 max		
Sulfur	0.005	0.004	0.007	0.030 max	0.030 max		
Chromium	18.13	18.15	18.14	18.00 - 20.00	18.00 - 20.00		
Molybdenum	0.21	0.20	0.22				
Nickel	8.06	8.07	8.05	8.00 - 12.00	8.00 - 10.50		
Aluminum	< 0.01	< 0.01	< 0.01				
Cobalt	0.16	0.16	0.16				
Copper	0.29	0.29	0.29				
Niobium	< 0.01	< 0.01	< 0.01				
Titanium	< 0.01	< 0.01	< 0.01				
Vanadium	0.08	0.08	0.08				
Tungsten	0.03	0.03	0.04				
Lead	< 0.01	< 0.01	< 0.01				
Iron	Remainder	Remainder	Remainder	Remainder	Remainder		

NOTES: Plate #2 meets the chemical requirements of SAE 304/304L Stainless Steel.

5/29/09

Date

avid Zaulen

5/29/09

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Jacob M. Goran Analytical Chemist



ISO 17025 Mechanical 1140-03 Chemical 1140-04

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### EQUIPMENT USED: Spectrolab CCD.

CHEMICAL ANALYSIS IN WEIGHT PERCENT								
ELEMENT	Plate #3 Area #1	Plate #3 Area #2	Plate #3 Area #3	SAE 304L SPECIFICATIONS	SAE 304 SPECIFICATIONS			
Carbon	0.02	0.02	0.01	0.030 max	0.08 max			
Silicon	0.58	0.57	0.56	0.75 max	0.75 max			
Manganese	1.38	1.38	1.40	2.00 max	2.00 max			
Phosphorus	0.028	0.028	0.028	0.045 max	0.045 max			
Sulfur	0.005	0.005	0.005	0.030 max	0.030 max			
Chromium	18.08	18.05	18.11	18.00 - 20.00	18.00 - 20.00			
Molybdenum	0.23	0.23	0.23					
Nickel	8.04	8.07	8.01	8.00 - 12.00	8.00 - 10.50			
Aluminum	< 0.01	< 0.01	< 0.01					
Cobalt	0.16	0.16	0.16					
Copper	0.32	0.34	0.32					
Niobium	< 0.01	< 0.01	< 0.01					
Titanium	< 0.01	< 0.01	< 0.01					
Vanadium	0.08	0.08	0.08					
Tungsten	0.05	0.04	0.05					
Lead	< 0.01	< 0.01	< 0.01					
Iron	Remainder	Remainder	Remainder	Remainder	Remainder			

NOTES: Plate #3 meets the chemical requirements of SAE 304/304L Stainless Steel.

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