		Alberta Industrial Heat Treating Inc.		External Data Sheet	
Issue by:	R&D	Approved by:	Quality Manager	Form-127	
Issue date:	9/10/2019	Revision Date:		Rev.#	0
			PAGE: 1 of 3		

External Data Sheet No.: 20-13

Customer:	<u>AIHT</u>	Drawing/ Spec:	<u>Induction Heat Treatment</u>
PO No.:	<u>N/A</u>	Part Description:	<u>Recipe Design Coupon</u>
Batch No.:	<u>N/A</u>	Material:	<u>4140 H MOD</u>
Heat No.:	<u>H3556</u>	Work Order No.:	<u>N/A</u>

Case Depth Definition: The case depth shall be defined as the deepest perpendicular point from the surface where hardness exceeds 50 HRC as measured with Vickers microhardness indenter and converted to HRC using ASTM E140.

Typical Results:

		Acceptance Criteria
Measured Case Depth (Microhardness) [in. (mm)]:	<u>0.047 (1.2)</u>	<u>N/A</u>
Measured Case Depth (Optical) [in. (mm)]:	<u>0.048 (1.23)</u>	<u>N/A</u>
Surface Hardness [HV _{0.1} (HRC)]:	<u>731 (62)</u>	<u>N/A</u>
Core Hardness [HRC]:	<u>32</u>	<u>N/A</u>
Average Case Hardness [HV _{0.1} (HRC)]:	<u>715 (61)</u>	<u>N/A</u>
Additional Testing Information:	Core Hardness Individual Measurements: 31.0, 33.2, 31.8 HRC	

Other Specification Requirements:

Micrographs:

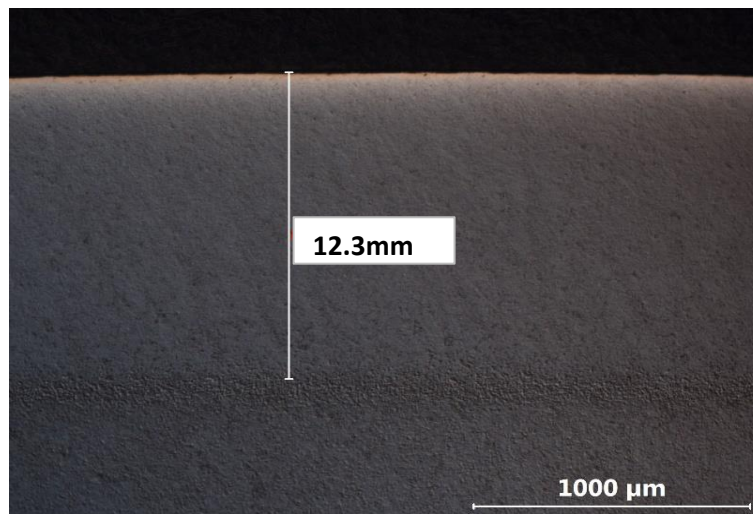


Figure 1: Representative photomicrograph of the hardened section microstructure. DIC Illumination, 3% Nital Etch

Test Results: The material met the requirement of the governing specification.

Date: 6/8/2020

Approved By: _____

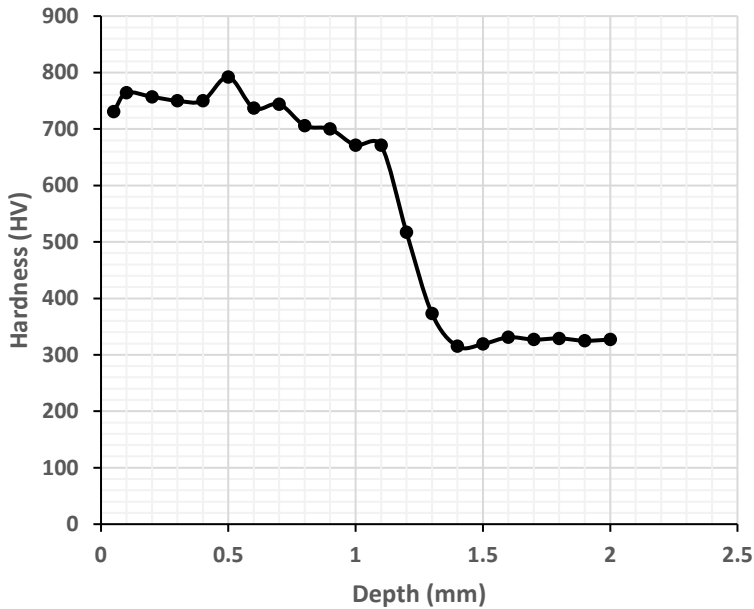
Doug Hamre, P.Eng., Ph.D.



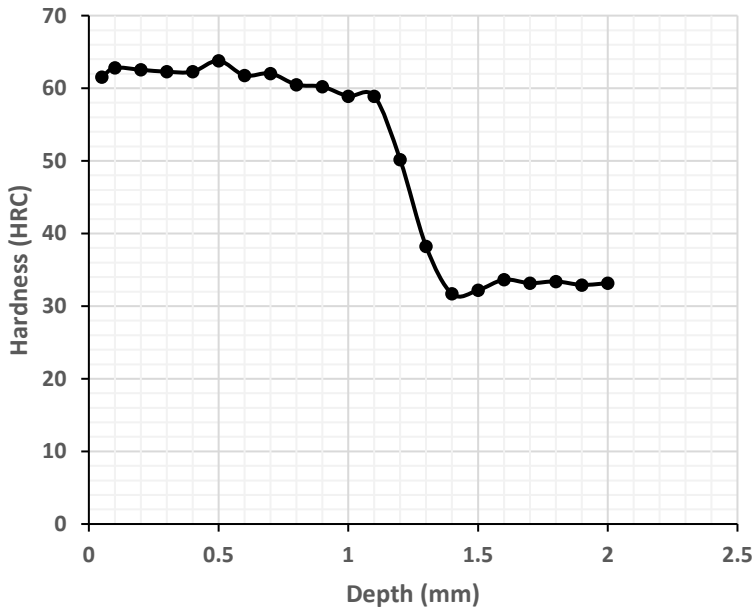
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Issue date:	9/10/2019	Revision Date:	Rev.# 0	PAGE: 2 of 3



Depth		Hardness	
[mm]	[in.]	[HV _{0.2}]	[HRC Conv.]
0.05	0.002	731	61.5
0.1	0.004	764	62.8
0.2	0.008	757	62.5
0.3	0.012	750	62.3
0.4	0.016	750	62.3
0.5	0.020	792	63.8
0.6	0.024	737	61.8
0.7	0.028	744	62.0
0.8	0.031	706	60.5
0.9	0.035	700	60.2
1	0.039	671	58.9
1.1	0.043	671	58.9
1.2	0.047	517	50.2
1.3	0.051	373	38.2
1.4	0.055	315	31.7
1.5	0.059	319	32.2
1.6	0.063	331	33.6
1.7	0.067	327	33.2
1.8	0.071	329	33.4
1.9	0.075	325	32.9
2	0.079	327	33.2



Alberta Industrial Heat Treating Inc. certifies that all samples were prepared and tested in accordance with applicable ASTM standards unless otherwise stated. Conversions from Vickers microhardness test points (HV0.1) to Rockwell hardness (HRC) have been converted using ASTM E140)

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Scope of Service

The agreement of Apollo Machine & Welding Ltd. and its subsidiaries to perform services extends only to those services specifically provided for in writing. Under no circumstances shall such services extend beyond the performance of the requested inspection of specific equipment provided for in writing and the preparation of reports or similar documents. Any descriptions, statements, comments or expressions made reflect the opinion or observations of the Apollo Machine and Welding Ltd. examiner based solely upon data available at the time, and are not intended, nor can they be construed, as representations or warranties as to the actual circumstances. Apollo Machine & Welding Ltd. does not assume any responsibilities of the owner/operator, and the owner/operator retains complete responsibility for all engineering, repair and use decisions.

Standard of Care

In performing the services provided, Apollo Machine & Welding Ltd. shall use the degree of care and skill ordinarily exercised under similar circumstances by others performing such services in the same or similar locality. No other warranty, expressed or implied, is made or intended by Apollo Machine & Welding Ltd., and all other warranties are expressly disclaimed. In the event of any breach of this warranty, Apollo Machine & Welding Ltd.'s sole and exclusive obligation will be to correct or re-perform the deficient service or, at Apollo Machine & Welding Ltd.'s option, to refund the amount paid for the deficient service.

Limitations of Liability

Nothing in this agreement shall be construed to mean that Apollo Machine & Welding Ltd. assumes any liability on account of injury to persons or property, including death, except and only to the extent those directly caused by the willful or negligent misconduct of Apollo Machine & Welding Ltd. in the context of performing the requested services. In no event shall Apollo Machine & Welding Ltd.'s aggregate liability for any reason, in connection with any claim asserted, exceed the amount paid for the services in question. Apollo Machine & Welding Ltd. shall not be held responsible or liable for any loss, damage or delay caused by accidents, strikes, fires, floods, or other circumstances or causes beyond Apollo Machine & Welding Ltd.'s control, including actions taken or not taken by the owner/operator or other third parties. In no event shall Apollo Machine & Welding Ltd. be liable for indirect, incidental, special, punitive, or consequential damages including, without limitation, damages relating to reputation, lost profits, goodwill, downtime, loss of use, business interruption or other economic loss.

Deviation From External Data Sheet

External Data Sheets are for informative purposes only and are in no way binding. Considerations including, but not limited to: geometry, material condition, chemistry, and surface finish can cause deviations from the typical case depth results exemplified herein. To quantify case depth for individual production batches, batch testing and/or sacrificial coupons would be necessary.