

Advanced Plastic & Material Testing, Inc.

42 DUTCH MILL ROAD
WARREN ROAD BUSINESS PARK
ITHACA, NY 14850
www.apmtesting.com

PHONE: (607)257-8378 FAX: (607)257-1586



Testing Cert #
326.01 & 326.02

CERTIFIED TEST REPORT

APM Report M180120

Prepared for:

Ken Palmer
Elliot Manufacturing
11 Beckwith Avenue
Binghamton, NY 13901
USA

P.O. 3091520

Prepared by:

A blue ink signature of Helge Arnold.

Helge Arnold
Senior Engineer

Reviewed by:

A blue ink signature of Joshua Wanagel.

Joshua Wanagel
Laboratory Director

March 5, 2018

- Quality System:** APM Testing maintains a quality system in compliance with ISO 17025-2005.
- Procedures:** All tests and services are done in accordance with the APM Quality Manual, revised June 2016. Pratt & Whitney related work is also done in accordance with the PWA Manual F-23.
- Reproduction:** The information in this report represents only the material tested and may not be reproduced except in full without the written permission of APM Testing.
- Retention:** Samples are retained for 90 days minimum and then discarded unless otherwise specified by the client.
- Limited Liability:** APM Testing's liability to the client or any third party is limited to the amount charged for services provided.
- Signatures:** This report is considered an official copy only if signed by the individuals specified on the lines above.

SUMMARY

The 1141 rod meets the chemical and tensile property requirements of ASTM A311-04(2015) for a grade 1141, cold drawn carbon steel.

The 11L41 rod meets the chemical and tensile property requirements of ASTM A311-04(2015) for a grade 1141/11L41, cold drawn carbon steel.

Rockwell hardness and charpy impact strength was similar between the two samples.

RECEIVED

Two (2) samples for composition, tensile properties, Rockwell hardness and charpy impact testing:

Material: 1141, Size: 3/4 inch diameter, Mfg: Murphy & Nolan

Charpy impact: PO 3085765, P/N 30170-00750

Other tests: PO 3090269, P/N 30170-00750

Material: 11L41, Size: 3/4 inch diameter, Mfg: Murphy & Nolan

All tests: PO 3090977, P/N 30180-00750

CHEMICAL ANALYSIS RESULTS - PASS

Test Method:	Glow Discharge Spectrometer (GDS)
Preparation:	Cut from sample sent by client
Requirement:	ASTM A311-04 (Reapproved 2015), Grade 1141

Sample	Element	Result (weight %)	Low Limit (weight %)	High Limit (weight %)	Result
1141					
	C	0.37	0.37	0.45	Pass
	Fe	rem	rem	rem	Pass
	Mn	1.40	1.35	1.65	Pass
	P	0.010	0.000	0.040	Pass
	S	0.09	0.08	0.13	Pass

CHEMICAL ANALYSIS RESULTS - PASS

Test Method:	Glow Discharge Spectrometer (GDS)
Preparation:	Cut from sample sent by client
Requirement:	ASTM A311-04 (Reapproved 2015), Grade 11L41

Sample	Element	Result (weight %)	Low Limit (weight %)	High Limit (weight %)	Result
11L41					
	C	0.39	0.37	0.45	Pass
	Fe	rem	rem	rem	Pass
	Mn	1.49	1.35	1.65	Pass
	P	0.015	0.000	0.040	Pass
	Pb	0.23	0.15	0.35	Pass
	S	0.13	0.08	0.13	Pass

TENSILE TEST RESULTS – PASS

Test Method:	ASTM A370-15
Test Conditions:	Ambient Temperature
Preparation:	Machined from sample sent by client.
Specimen:	Round tension test bars
Gage Length:	2.00 inches
Elongation:	Measured after fracture using calipers
Test Speed:	0.03/0.1 inches per minute (before/after yield)

Sample	Diameter (inches)	Ultimate Tensile Strength (ksi)	Yield Strength 0.2% Offset (ksi)	Elongation After Fracture (%)	Reduction in Area (%)
1141	0.5057	117.1	97.8	15.0	48.5
11L41	0.5067	119.0	93.6	17.5	43.5
Requirement		95 minimum	90 minimum	11 minimum	35 minimum

ROCKWELL HARDNESS TEST RESULTS

Test Method:	ASTM E18-16
Test Conditions:	Between 50 and 95°F (10 and 35°C)
Preparation:	Cut from sample sent by client, machined surfaces parallel
Specimen:	Disk 0.63 inch tall
Conversion:	N/A

Sample	Replicate	Rockwell Hardness Scale	Rockwell Hardness Value
1141			
	1	HRC	21.8
	2	HRC	21.8
	3	HRC	21.2
	4	HRC	21.7
	5	HRC	21.9
	Mean		21.7
	Std. Dev.		0.3
11L41			
	1	HRC	22.1
	2	HRC	22.2
	3	HRC	22.8
	4	HRC	21.4
	5	HRC	22.2
	Mean		22.1
	Std. Dev.		0.5
Requirement			N/A

CHARPY IMPACT TEST RESULTS

Test Method:	ASTM E23-16a and ASTM A370-17
Test Conditions:	Ambient Temperature
Preparation:	Machined from sample sent by client
Specimen:	Charpy V-notch (figure 1, type A)
The test results in this table are not covered by our current A2LA accreditation and were sub-contracted to a facility that is A2LA accredited for this test.	

Sample	Replicate	Impact Energy (ft-lbf)	Lateral Expansion (mils)	Shear (%)
1141 (Tested at 23 °C)				
	1	31	17	40
	2	24	12	35
	3	18	6	15
	Mean	24	12	30
	Std. Dev.	7	6	13
11L41 (Tested at 23 °C)				
	1	26	9	50
	2	22	7	50
	3	24	8	50
	Mean	24	8	50
	Std. Dev.	2	1	0
Requirement		N/A	N/A	N/A

CHARPY IMPACT TEST RESULTS

Test Method:	ASTM E23-16a and ASTM A370-17
Test Conditions:	-40°C
Preparation:	Machined from sample sent by client
Specimen:	Charpy V-notch (figure 1, type A)
The test results in this table are not covered by our current A2LA accreditation and were sub-contracted to a facility that is A2LA accredited for this test.	

Sample	Replicate	Impact Energy (ft-lbf)	Lateral Expansion (mils)	Shear (%)
1141 (Tested at -40°C)				
	1	8	1	0
	2	5	0	0
	3	8	2	0
	Mean	7	1	0
	Std. Dev.	2	1	0
11L41 (Tested at -40°C)				
	1	7	1	0
	2	6	0	0
	3	7	2	0
	Mean	7	1	0
	Std. Dev.	1	1	0
Requirement		N/A	N/A	N/A