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Section Title: Appendix - Sections

Document Title: Pratt & Whitney Materials Control Laboratory Qualified

**Commercial Laboratory List** 

#### **WARNING**

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### **APPLIES TO: Pratt & Whitney Group**

#### 1. PURPOSE AND SCOPE:

This Appendix provides a listing of Commercial Laboratories Qualified by the Pratt & Whitney Group, Materials Control Laboratory (a.k.a. Quality & Standards Laboratory), and identifies the Type of Testing that each listed Laboratory is qualified for.

#### 2. OWNERSHIP AND APPROVAL:

The Chief, Quality & Standards Laboratories (Q&SL), PW South & Supervisor Supplier Metallurgical Development PW North are the owners of this procedure. All revisions to this procedure must be approved by the owners and balloted in accordance with MCL Manual Section C-5.

#### 3. **DEFINITIONS**:

- 3.1 **Pratt & Whitney Group** encompasses both Pratt & Whitney Canada (PW North) and Pratt &Whitney US (PW South).
- 3.2 **Semi-quantitative Spectrographic Analysis** The Determination of a material's chemistry to detect the presence of the alloying elements to a degree by which a positive identification can be made as to the alloy type, as well as the ability to distinguish between similar alloys.
- 3.3 **Quantitative Spectrographic Analysis** P&W defines quantitative spectrographic analysis as "utilization of a least squares calibration curve".
- 3.4 **Wet Chemical Analysis** P&W defines wet chemical analysis as "gravimetric or titrametric analysis".



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3.5 **Optical Emission Spectroscopy (OES)** – OES is defined as testing which utilizes "ICP (Inductively Coupled Plasma), DCP (Direct Current Plasma) and DR (Direct Reader)".

#### 4. PROCEDURE:

- 4.1 The commercial laboratories listed in <u>Table I</u> and <u>Table II</u> have been reviewed by Pratt & Whitney-Materials Group Control Laboratory (P&W-MCL) and found capable of performing the types of tests for which they are listed. This list shall not be construed as a guarantee by P&W-MCL that testing will be done properly, nor does it relieve the supplier from his contractual obligation to deliver conforming materials and parts based on accurate and valid test results.
- 4.2 The listing of a laboratory in the applicable Tables signifies only that, at the time of review, the laboratory was found capable of performing the tests for which it is listed. The laboratory is not relieved of responsibility for continued conformance as determined by calibrations and operational checks of testing and measuring equipment.
- 4.3 This list shall not be reproduced without written permission from P&W-MCL and should not be considered completely up-to-date at any time, as deletions and additions may be made by P&W-MCL.
- 4.4 Laboratories listed in <u>Table I</u> are required to comply with MCL Manual Section F-23, "Test and Calibration Requirements for Commercial and In-House Laboratories", when that section is specified on orders from their customers. Failure to comply with MCL-Manual Section F-23 will disqualify the laboratory as a testing source for materials or parts.
  - 4.4.1 Laboratories listed in <u>Table I</u> shall forward test specimens together with the applicable test results to P&W-MCL for correlation testing on a yearly basis as outlined in MCL Manual Section F-23. MCL Form 404 (See MCL Manual Section F-23) will be submitted with all correlation testing packages.
- 4.5 Laboratories listed in <u>Table II</u> are required to comply with MCL Manual Section FC-23, "Test and Calibration Requirements for Commercial and In-House Laboratories", when that section is specified on orders from their customers. Failure to comply with MCL-Manual Section FC-23 will disqualify the laboratory as a testing source for materials or parts.
- 4.6 At the discretion of P&W-MCL, any laboratory may be removed from this listing when no longer deemed qualified or when the services are no longer required by P&W or its subcontractors.



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4.7 The following laboratories may be used for qualitative analysis using mass spectrograph for information only and will not be surveyed:

- Accu-Labs Research, Inc. 11485 West 48<sup>th</sup> Avenue Wheat Ridge, CO 80033
- Commercial Testing & Engineering Company Instrumental Analysis Division 14335 West 44<sup>th</sup> Avenue Golden, CO 80401
- Ledoux & Company 359 Alfred Avenue Teaneck, NJ 07666
- Shiva Technologies Inc. 6707 Brooklawn Parkway Syracuse, NY 13211

#### 5. RECORDS/FORMS:

MCL Form 404

#### 6. REFERENCES:

- MCL Manual Section F-23
- MCL Manual Section FC-23
- MCL Manual Section S-8



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#### 7. NATURE OF CHANGE FOR THIS ISSUE:

- Table 1 updated:
  - Deleted Code 2 and added codes 18 & 23 to IMR Test Labs
  - Changed Commercial Lab. Metals Technology Inc. SQE name from Silvia to Duffy
  - Removed SQE name Zweifel from Allvac C.T.S.; IncoTest and Timet UK Ltd
  - Changed Accutek Testing Laboratory, Ohio SQE name from Griffin to Farmer
  - Changed Element Materials Technology, Daleville, In SQE name from Griffin to Simos
  - Changed Exova Mexico SQE name from Duffy to Griffin
  - Changed Omega Research Inc. SQE name from Lawrence to Griffin



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	Yellow highlighted fields represent correlation testing per MCLM F23. Light blue highlighted fields represent labs found capable to perform this type of test. Light green highlighted fields with letters represent specific test recognitions. Commercial Laboratories	Tensile, Room Temperature	Tensile, Elevated Temperature	Greep Rupture	Hardness	Impact  Metallographic Examination - All Others (See Note 10)	ture/Grainsize (S	ME - Abusive Machining E166 Supp A (See Note 10)	ME - Surface Contamination of Titanium (See Note 10)	ME - Braze (See Note 10) ME - Weld (See Note 10)	ME - Nonconventional Machining,	steners (See Note 10)	ME - Heat Treat (See Note 10)	ME - Coatings (Vapor/Pack/Thermal) (Commerical Labs by Exception Only) (See Note 10)		OES Quantitative Spectrographic Analysis (See Notes 3, 4, & 5)	Salt Spray	Heat Treating (to condition lab specimens)	Gas Gas	O-Oxygen, N-Nitrogen, H-Hydrogen	Semi-quantitative Analysis (See Note 1) Sieve Analysis	Plastics (See Note 8)	ding Pol	mic Absorption (See Notes 5 & 6)	AA - Tramp Elements (See Notes 5 & 6)	XRF Quantitative Spectrographic Analysis - All Others (See Notes 4 & 5)	XRD (See Note 7)	Fracture Toughness	Sodium, Chloride, Fluoride Analysis	Microscopic Contamination Analysis-SEM	Mass spectroscopy NonMatallice - Tancile/Compressive	NonMetallics - Uncured Properties	NonMetallics - Flex/Short Beam	Particles Size Distribution - Laser Light Scattering		Cryogenic, Coefficient of Thermal Expansion Humid Stress Rupture	RT and ET - Coefficient of Thermal Expansion	Thermal Conductivity - Metal	Totals		SQE
	Specific Test Codes General Testing Codes	1	2 3	4	5 6	7	7-a	7-b	7.c	7-e	7-6	7-g	7-h	ij.	8	9	10	11 1	15-a	1	3 14	15	16 1	17	17-a	18	19 2	0 21	22	23 2	4 2	5 26	27	28 29	30	31 32	33	34 3	5		
1	Accutek Testing Laboratory 3701 Port Union Road Fairfield, Ohio 45014																																						5	F	armer
2	Advanced Plastic & Material Testing 42 Dutch Mill Road Ithaca, NY 14850																																						14	Sar	ntangelo
3	Allvac C.T.S. Blackmore Street Sheffield S4 &TZ United Kingdom																																						11		TBD
4	ATI Wah Chang 1600 N.E. Old Salem Road, P.O. Box 460 Albany, Oregon 97321																																						3		latzke
5	Atlas Testing Labs 9820 6th Street Rancho Cucamonga, California 91730																																						16	Ja	cobson
6	Connecticut Metallurgical Inc. 100 Prestige Park Road East Hartford, Connecticut 06108														П				0	&H															П				24		Facas
7	Dickson Testing 11126 Palmer Avenue Southgate, California 90280																П							F	Pb,Bi,Se,Te, Tl	Y													21	Gh	assemi
8	Dirats Laboratory 41 Airport Road P.O. Box 39 Westfield, Massachusetts 01086																							F	C- Pb,Bi,Se,Te, Tl	Y	R												32	В	erube
9	Durkee Test Labs 15700 Texaco Street Paramount, California 90723																									Υ													19		Duffy
10	Eaton Aerospace Laboratories 23555 Euckid Avenue Cleveland, Ohio 44117																								Pb,Bi,Se,Te, Tl,Ni Base Alloys														20		Zelle
11	Element Materials Technology 5405 Schaaf Road Cleveland, Ohio 44131																							í	Pb,Bi,Se,Te				П						П				22		Zelle
12	Element Materials Technology 1857 Business Center Drive Duarte, CA 91010														Г																								5		cobson
13	Element Materials Technology 15062 Bolsa Chica Huntington Beach, California 92649																												П						$\prod$				25	Gh	assemi
14	Element Materials Technology 2 Pheasant Run Newtown, Pennsylvania 18940																																						22	Мс	Callister



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Yellow highlighted fields represent correlation testing per MCLM F23.  Light blue highlighted fields represent labs found capable to perform this type of test.  Light green highlighted fields with letters represent specific test recognitions.	fensile, Room Temperature	Tensile, Elevated Temperature	Stress Rupture	Creep Rupture	Hardness	Impact Metallographic Evamination - All Others (See Note 10)	10)	ME - Abusive Machining E166 Supp A (See Note 10)	ME - Surface Contamination of Titanium (See Note 10)	ME - Braze (See Note 10)	ME - Weld (See Note 10)	ME - Nonconventional Machining, ECMR, EDMR, LBMR, EBMR (See Note 10)		ME - Heat Treat (See Note 10)	r/Pack/Thermal)	Commerical Labs by Exception Only) (See Note 10)	Wet Chemical Analysis (See Note 2)	OES Quantitative Spectrographic Analysis (See Notes 3, 4, & 5)	Salt Spray	Heat Treating (to condition lab specimens)	Gas Analysis - Combustion (C, S)	<b>Gas Analysis - Inert Gas Fusion</b> O-Oxygen, N-Nitrogen, H-Hydrogen	Semi-quantitative Analysis (See Note 1)	alysis		Rubber Materials including Polymers (See Note 8) Atomic Absorption (See Notes 5 & 6)	ts (See Notes 5		XRF Quantitative Spectrographic Analysis - All Others (See Notes $4 \ \& 5)$	XRD (See Note 7)	Fatigue	racture Toughness	Sodium, Cnioride, Fluoride Analysis Microscopic Contamination Analysis-SEM	Mass Spectroscopy	NonMetallics - Tensile/Compressive	NonMetallics - Uncured Properties	NonMetallics - Flex/Short Beam	articles size Distribution - Laser Light Scattering	fensile, Cryogenic	Cryogenic, Coefficient of Thermal Expansion	Humid Stress Kupture RT and ET - Coefficient of Thermal Expansion	Thermal Conductivity - Metal	Plating Embrittlement	otals	SQE
Specific Test Codes General Testing Codes		2					-			V p-2		7-6	7-g N				8			11		12-a G				6 17	Ġ		18		1											3 34			
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Daleville, IN 47334-0569  Exova Inc Freeman					+	+		H							٠									Н	+		51.5			H	Н		+		Н	Н	+	+	Н	$\vdash$	+	Н	1	22	Simos
7 10005 Freeman Avenue Santa Fe, Springs, California 90670															ı												PD,E	Bi,Se,Te, TI			Ш													18	Jacobso
Exova Inc Glendale Heights Lab  194 International Blvd Glendale Heights, Illinois 60139																																				П						П		21	Works
Exova Mexico L9 Col: Privade de Santa Catarina Santa Catarina, Nuevo Leon, Mexico																																												6	Griffin
IMR KHA - Portland 5687 S. E. International Way, Ste. A Portland, Oregon 97222																																										П		13	Matze
IMR Singapore Pte. Ltd. 30 Loyang Way #03-16 Singapore 508769																																										П		15	Santange
IMR Test Labs 131 Woodsedge Drive Lansing, New York 14882																																												31	Santange
IncoTest Homer Road Hereford, HR4 9SL United Kingdom																																												15	TBD
Joliet Metallurgical Laboratories 305 North Republic Avenue Joliet, Illinois 60435														T																			T											5	Works
Laboratory Testing Inc. 2331 Topaz Drive Hatfield, Pennsylvania 19440																															П													22	McCallist
Lehigh Testing Laboratory 308 West Basin Road P.O. Box 903 New Castle, Delaware 19720																																												6	McCallist
Luvak Inc. P.O. Box 597 Boylston, Massachusetts 01505-597														T													Pb,	Bi,Te,Tl			П		T											7	Berube
Massachusetts Materials Research, Inc. 1500 Century Drive West Boylston, Massachusetts 01583		П						Ĺ							ı					П				П	T					T	П		$^{\dagger}$	T	П	П	Ť	$\dagger$		$\sqcap$		$\Box$			



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	Yellow highlighted fields represent correlation testing per MCLM F23. Light blue highlighted fields represent labs found capable to perform this type of test. Light green highlighted fields with letters represent specific test recognitions.  Commercial Laboratories	ensile, Room Temperature	Tensile, Elevated Temperature	Suess Kupture Creep Rupture	Hardness	Impact	allog	ucture/Grainsize (See Note 10)	- Abusive Machining E166 Supp A (See Not	- Surface Contam	- Braze (See Note	ME - Weld (See Note 10)	ME - Nonconventional Machining, ECMR, EDMR, LBMR, EBMR (See Note 10)	ME - Fasteners (See Note 10)	ME - Heat Treat (See Note 10)	IE - Coatings (Vapor/Pack/Thermal) Commercial Labs by Exception Only) (See Note 10)		OES Quantitative Spectrographic Analysis	(See Notes 5, 4, & 5)	Heat Treating (to condition lab specimens)	Gas Analysis - Combustion (C, S)	<b>Gas Analysis - Inert Gas Fusion</b> O-Oxygen, N-Nitrogen, H-Hydrogen	Semi-quantitative Analysis (See Note 1)	ieve Analysis	of N of S	Kubber Materials Including Polymers (See Note 6)  Atomic Absorption (See Notes 5 & 6)	ts (See Notes 5	XRF Quantitative Spectrographic Analysis - All Others (See Notes 4 & 5)	XRD (See Note 7)	Fatigue	Fracture Toughness	Sodium, Chloride, Fluoride Analysis	Microscopic Contamination Analysis-SEM Mass Spectroscopy	VonMetallics - Tensile/Compressive	NonMetallics -Uncured Properties	VonMetallics - Flex/Short Beam	Particles Size Distribution - Laser Light Scattering	Tensile, Cryogenic	Cryogenic, Coefficient of Thermal Expansion	ss Rupture	RT and ET - Coefficient of Thermal Expansion	Thermal Conductivity - Metal Plating Embrittlement	Totals	sqi
	Specific Test Codes General Testing Codes		2 3										7- 	7-g -7	7-h N	<u>.</u>	8	9	т	0 11		12-a G		14	15 1		rg .	18						1	Ť	-					Π.	34 35		JQ.
29	Metals Technology Inc. 19801 Nordoff Street Northridge, California 91324		2 3					7	_	7		_	_	_	_			9	10	0 11	12	-	13	14	15 1	.6 17	Pb,Bi Wrought Alloys Only	10	19	20	21	22 2	.5 24	23	20	21	26 2	9 30	7 31	32 3	33 3	4 33	22	Duff
30	Northern Analytical Laboratory 23 Depot Street Merrimack, NH 03054																																										1	Okav
31	NSL Analytical Services Inc. 4450 Cranwood Parkway Cleveland, Ohio 44128				Т																						Se,Te											T	Т	П			7	Zelle
32	NSL Metallurgical 4535 Renaissance Pkway Cleveland, OH 44128																																					T	Т	П			9	Zelle
	Omega Research Inc. 15843 Guy James Road Justin, Texas 76247																								T				T				T	T				T	T	П			3	Griffi
34	QC Metallurgical Inc 2870 Stirling Road Hollywood, Florida 33020																																					T					5	Okav
35	RTM Breda S.r.l. Via Biancge 18 Carre' (VI) Italy 36010																																					T		П			8	Raba
36	Singapore Test Services PTE Ltd. 249 Jalan Boon Lay Jurong Town, Singapore 619523																																										9	Korenkie
37	Southern Research Institute 757 Tom Martin Drive Birmingham, Alabama 35211																																										3	Lawre
38	Timet UK Ltd P.O. Box 704, Witton Birmingham B6 &UR United Kingdom																																					T					15	ТВС
39	UL Verification Services Inc. 1559 King St. Enfield, CT 06082				T																																	T	T	П			4	Vidal O
	Westmoreland Mechanical Testing &																ĺ																					1	T	П		T	16	Zelle

- Notes:

  1. P&W defines semi-quantitative spectrographic analysis as "The Determination of a material's chemistry to detect the presence of the alloying elements to a degree by which a positive identification can be made as to the alloy type, as well as the ability to distinguish between similar alloys".

  2. P&W defines wet chemical analysis as "gravimetric or titrametric analysis".

- 4. P&W defines quantitative analysis as "utilization of a least squares calibration curve".



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Yellow highlighted fields represent correlation testing per MCLM F23. Light blue highlighted fields represent labs found capable to perform this type of test. Light green highlighted fields with letters represent specific test recognitions.  Commercial Laboratories	Tensile, Room Temperature	Tensile, Elevated Temperature	Stress Rupture Creep Rupture	Hardness	Impact	Metallographic Examination - All Others (See Note 10)	tructure/Grainsize	<ul> <li>Abusive Machining</li> <li>Surface Contaminat</li> </ul>	- Braze (See Note 10)	ME - Weld (See Note 10)	ME - Nonconventional Machining, ECMR. EDMR. LBMR. EBMR (See Note 10)	steners (See Note 10)	ME - Heat Treat (See Note 10)	ME - Coatings (Vapor/Pack/Thermal) (Commercal also by Exception Only) (See Note 10)	t Chemical Analysis (See Note 2)	OES Quantitative Spectrographic Analysis (See Notes 3, 4, 8, 5)	Salt Spray	eating (to condition lab sp	Gas Analysis - Combustion (C, S)	Gas Alialysis - Infert Gas Fusion O-Oxygen, N-Nitrogen, H-Hydrogen	Semi-quantitative Analysis (See Note 1)	Sieve Analysis Plastics (See Note 8)	Rubber Materials including Polymers (See Note 8)	AA - Tramp Elements (See Notes 5 & 6)	XRF Quantitative Spectrographic Analysis - All Others (See Notes 4 & 5)	XRD (See Note 7)	0	Fracture Toughness Sodium, Chloride, Fluoride Analysis	Microscopic Contamination Analysis-SEM	Mass Spectroscopy	s - Tensile/Co	NonMetallics - Oncured Properties NonMetallics - Flex / Short Beam	17	Tensile, Cryogenic Cronenir Coefficient of Thermal Exnancion	d Stress Rupture	RT and ET - Coefficient of Thermal Expansion	Thermal Conductivity - Metal		SQE	
Specific Test Codes General Testing Codes		2 3		4- '		,	7-a 7-h	ې م	P.	7-e	7.	7-9	4.	Ę		9		11		9				17-a	18					ا ــا	.	۔ اے		_			34 3	_		

- 5. Code numbers with an element suffix (e.g., 17Pb) designate qualification for analysis of that element on cast turbine airfoil alloys by the specified test method.
  6. The letter "C" suffix to Code 17 (Atomic Absorption) also designates qualification for residual cerrobend analysis in hollow core blades and vanes.
- 7. The letter "R" suffix to Code 19 (XRD) also designates qualification for retained austenite.
- The letter 'K sum'x to Code 19 (XKD) also designates qualification for retained austentie.
   Qualification for Codes 15 and 16 is not required for simple identification tests such as those listed in MCL Manual Section S-8.
   The letter "A" suffix to Code 29 (yttrium analysis) indicates the ICP method. The letter "B" suffix to Code 29 (ytrium analysis) indicates the DCP method.
   Code 7 does not include metallographic examination of thermal spray coatings, pack process diffusion coatings, plasma or vapor deposition coatings at qualified commercial laboratories.



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	Light blue highlighted fields represent labs found capable to perform this type of test.  Light green highlighted fields with letters represent specific test recognitions.	ensile, Room Temperature	Tensile, Elevated Temperature	Stress Rupture	Creep Rupture	Hardness	Impact	Metallographic Examination	Chemical Analysis (See Note 2)	Spectrographic Analysis (Quantitative)	Salt Spray	Heat Treating (to condition lab specimens)	Gas Analysis	Spectrometric Analysis (semi-quantitative, as defined below)	Sieve Analysis	Plastics (See Note 8)	Rubber Materials including Polymers (See Note 8)	Atomic Absorption (See Notes 5 & 6)	XRF (See Notes 4 & 5)	XRD (See Note 7)	Low Cycle Fatigue	Fracture Toughness	Sodium, Chloride, Fluoride Analysis	Microscopic Contamination Analysis	Particles Size Distribution - Laser Light Scattering	EDAX Analysis on S.E.M.	uel Analysis (See Note 9)	lardenability on Disc & Jominy (See Note 9)	lash Point Testing (See Note 9)	Totals	SQE
	Specific Test Codes General Testing Codes	1	2						8		П	11	т		14	П	16	т	18		20	21		23	28		C30	C31	C32		
1	Pratt & Whitney Canada Corp. Plant 1 "Chemical Technology & Test" Department 1000 Marie Victorin Longueuil, Quebec J4G 1A1				_	_		_	_									1,	10		20				20	23	CSO	CJI	LJZ	7	Halle
2	Allvac Ltd. Atlas House, Attercliffe Rd. Sheffield, United Kingdom S4 7UY																													4	Jones
3	Exova Cambridge 15 Highridge Court P.O. Box 363 Cambridge, Ontario, N1R 71.3													Galt/6 LT Labs																6	Bale
4	Exova Pointe-Claire 121 boul. Hymus Pointe-Claire, Québec, H9R 1E6																													8	Lobo
5	Etablissement de Nantes 74, route de la Jonalière B.P. 82617 44326 Nantes Cedex 3																													3	Jones
6	Allvac Ltd Commercial Testing Services Ltd. Blackmore Street Sheffield, United Kingdom, S4 7TZ																													6	Jones
7	Genitest Inc. 3472 Frontenac, Montréal, Québec. H2K 3A5																													10	Routhier
8	Team Industrial Services TCM Division 105 Chester Road Woodlawn, Cincinnati OH 45215																													2	Mackenzie
9	Mitchell Aerospace Inc. 350 Décarie Ville St-Laurent, Québec, H4L 3K1																													4	Lu
10	SGS Canada 11000-A Sherbrooke E. Montréal, Québec, H1B SW1														L															2	Caron
11	SGS Canada Inc. – Industrial Services 3420 St-Joseph Blvd East Montréal, Québec H1X 1W6																													1	Caron



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	Light blue highlighted fields represent labs found capable to perform this type of test.  Light green highlighted fields with letters represent specific test recognitions.  Commercial Laboratories  Specific Test Codes	Tensile, Room Temperature	Tensile, Elevated Temperature	Stress Rupture	Creep Rupture	Hardness	Impact	Metallographic Examination	Chemical Analysis (See Note Z)	Spectrographic Analysis (Quantitative)	Salt Spray	Heat Treating (to condition lab specimens)	Gas Analysis	Spectrometric Analysis (semi-quantitative, as defined below)	Sieve Analysis	Plastics (See Note 8)	Rubber Materials including Polymers (See Note 8)	Atomic Absorption (See Notes 5 & 6)	XRF (See Notes 4 & 5)	XRD (See Note 7)	Low Cycle Fatigue	Fracture Toughness	Sodium, Chloride, Fluoride Analysis	Microscopic Contamination Analysis	Particles Size Distribution - Laser Light Scattering	EDAX Analysis on S.E.M.	Fuel Analysis (See Note 9)	Hardenability on Disc & Jominy (See Note 9)	Flash Point Testing (See Note 9)	Totals	SQE
L	General Testing Codes	1	2	3	4	5	6 7	7 8	9	1	0 1	11	12	13	14	15	16	17	18	19	20	21	22	23	28	29	C30	C31	C32		
12	L5S 1A1																													6	Bale
13	Poland																													3	Skoczylas
14	Engineering Material Research 35 Carl Hall Road, Unit 3 Downsview, Ontario, M3K 2B6 CANADA																													3	Bale
15	Exova Plzen Podnikatelska 39Plzen 301 00 Czech Republic																													5	Jones
16	Vac Aero Kalisz 62-800 Kalisz / Poland ul. Elektryczna 8 Metcut Research Inc.								Ī																					3	Skoczylas
17	3980 Rosslyn Drive Cincinnati, OH, USA 45209-9511																													4	Mackenzie
18	Exova Mississauga 2395 Speakman Drive Mississauga, Ontario L5K 183, CANADA																													3	Bale
19	Holwick Road Middlesbrough, Cleveland TS2 1QS United Kingdom																													3	Jones
20	Red Jacket Works, Neath SA11 1NJ South Wales United Kingdom										T																			3	Jones
21	WSK "PZL-Rzeszow" S.A. Hetmanska 120 35-78 Rzeszow Poland																													8	Skoczylas
22	R&D Laboratory for Aerospace Materials Rzeszow University of Technology Ul. W.Pola 2 Rzeszow, Poland 35-959																													6	Skoczylas



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#### PWC - MCL - Qualified Commercial Laboratory - Table II

	Light blue highlighted fields represent labs found capable to perform this type of test.  Light green highlighted fields with letters represent specific test recognitions.	Tensile, Room Temperature	Tensile, Elevated Temperature	Stress Rupture	Creep Rupture	Hardness	Impact		Chemical Analysis (See Note 2)	Spectrographic Analysis (Quantitative) (See Notes 3, 4, 8, 5)	Salt Spray	Heat Ireating (to condition lab specimens)		Spectrometric Analysis (semi-quantitative, as defined below)	Sieve Analysis	Plastics (See Note 8)	Rubber Materials including Polymers (See Note 8)	Atomic Absorption (See Notes 5 & 6)		KRD (See Note 7)	Low Cycle Fatigue	Fracture Toughness	Sodium, Chloride, Fluoride Analysis	Microscopic Contamination Analysis	Particles Size Distribution - Laser Light Scattering	EDAX Analysis on S.E.M.	Fuel Analysis (See Note 9)	Hardenability on Disc & Jominy (See Note 9)	Flash Point Testing (See Note 9)	<b>Fotals</b>	SQE
L	Specific Test Codes General Testing Codes	1	2	3	4	5	6 7	7	В	9	10 1	1	12	13	14	15	16	17	18	19	20	21	22	23	28	29	C30	C31	C32		
23	Montréal, Québec H1L 3R4																													1	Caron
24	Timet UK Ltd. P.O. Box 704 Witton, Birmingham B6 7UR England																													1	Jones
2!	Exova (UK) Ltd. 182 Halesowen Road 5 Netherton, Dudley DY2 9PL United Kingdom																													1	Jones

Totals Notes:

1. P&W defines semi-quantitative spectrographic analysis as "The Determination of a material's chemistry to detect the presence of the alloying elements to a degree by which a positive identification can be made as to the alloy type, as well as

12 8 4 2 12 2 11 9 9 4 2 4 4 0 0 0 0 4 2 0 4 1 0 0 0 2 3 2 1 1 103

- the ability to distinguish between similar alloys".
- P&W defines wet chemical analysis as "gravimetric or titrametric analysis".
   ICP, DCP, Direct Reader.
- P&W defines quantitative analysis as "utilization of a least squares calibration curve".
- 5. Code numbers with an element suffix (e.g.; 17Pb) designate qualification for analysis of that element on cast turbine airfoil alloys by the specified test method.
- 6. The letter "C" suffix to Code 17 (Atomic Absorption) also designates qualification for residual cerrobend analysis in hollow core blades and vanes.
- 7. The letter "R" suffix to Code 19 (XRD) also designates qualification for retained austenite.
- Qualification for Codes 15 and 16 is not required for simple identification tests.
   Codes C30, C31 and C32 are formerly PWC Codes 30, 31, and 32, respectively

\* \* \* End of Document \* \* \*