

Price Schedule

Chemical Analysis	
Spectrographic Analysis	- 2 -
Inductively Coupled Plasma Analysis	- 2 -
Gas Analysis	- 2 -
Combustion Analysis	- 2 -
Mechanical Testing	
Sectioning & Machining	- 3 -
Mechanical Tests	- 4 -
Metallurgy	
Metallography	- 5 -
Scanning Electron Microscopy	- 6 -
Miscellaneous	
Salt Spray Corrosion Tests	- 7 -
Non-Metallic Physical Properties	- 7 -
NDI Penetrant Oils	- 7 -
Weld certification	- 8 -
Plating Solution Analysis	- 8 -
Taber Abrasion Test	- 8 -
Stress Corrosion Test	- 8 -
Conductivity	- 8 -
Heat Treating	- 8 -



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Prices effective January 1, 2009, subject to change without prior notice.

Expedited services may be subject to additional charges, call for price.

Certain test methods requiring special accreditation, approvals or methods may be subject to additional service charges.

All reports are submitted as the confidential property of our clients. Authorization for publication of our reports, conclusions or extracts from or regarding them, is pending our written approval as a mutual protection to clients, the public, and ourselves. METL's liability shall in no case exceed the amount shown on the invoice.

Minimum charge for any service is \$40.00

Chemical Analysis

Spectrographic Analysis (OES)^{1,2}

<u>Alloy Base</u>	<u>Price Each</u>
Aluminum	40.00
Cobalt	60.00
Copper	60.00
Nickel (Trace Elements Additional)	60.00
Alloy Steels, Stainless Steels, and Tool Steels	50.00
Iron Base Superalloys	60.00
Titanium	60.00
Titanium (Plus Gases and Yttrium)	195.00
Single Element Analysis	30.00
Identification Charge For Unknown Alloy	15.00
Sample Preparation Charge for Subsize, Melt or Chemical Strip	17.00

Inductively Coupled Plasma Analysis (ICP)

<u>Sample Type</u>	<u>Price Each³</u>
Braze Alloy Powders	125.00
Metal Alloys: Magnesium, Zinc	125.00
High Sensitivity Detection Analysis (<1ppm)	200.00
Solder Alloys (Pb-Sn)	100.00
Single Element	35.00 Setup + 25.00 /Element

Gas Analysis⁴

<u>Element</u>	<u>Price Each</u>
Hydrogen	55.00
Nitrogen	45.00
Oxygen	45.00

Combustion Analysis⁵

<u>Element</u>	<u>Price Each</u>
Carbon	45.00
Sulfur	45.00
In-lab chemistry services (instrumentation & technician)	125.00 Hr.
Additional chemical laboratory services available	call for price

¹ Solid samples submitted for spectrographic analysis should be approximately one inch across, flat and homogenous. Smaller or larger samples or unidentified alloys may be analyzed at extra cost for sample preparation, sectioning, or identification. Additional charge for identification is \$15.00 per sample where alloys submitted for analysis are unknown. The price for spectrographic analysis of steels, stainless steels, and tool steels includes C, S, and P. The price shown for spectrographic analysis of titanium alloys does not include yttrium, hydrogen, nitrogen, or oxygen. (see gas analysis)

² Lead, tin, (solders), zinc, some nickel and copper alloys, and some single elements are analyzed by other methods as may be required due to sample condition, size, composition, specification or accuracy requirements. Cast irons are analyzed by wet analysis. Drillings, chips, or filings submitted for analysis should be clean and dry. The minimum charge for ICP analysis is \$50.00 per sample.

³ Includes Sample Dissolution

⁴ Extra cost may be incurred for sectioning and sample preparation of materials submitted for gas analysis, due to sample size or condition.

⁵ Samples submitted for carbon and/or sulphur analysis must be clean, oil and dirt free, chips, scrapings, powder, or drillings.

Sample Preparation

Sectioning

Abrasive Cutoff	60.00 /Hour
Wire EDM	25.00 Setup + 70.00 Hr.
Friction Cutting	60.00 /Hour
Oxide Scale Removal (Where Required)	60.00 /Hour
Sawing	
Aluminum and Fe Alloys <40 HRC	60.00 /Hour
Nickel, Cobalt, Titanium and	
Fe Alloys >40 HRC	70.00 /Hour
Minimum Charge For Sectioning	0.2 Hr. Min.
Miscellaneous Machining Charges	75.00/Hour

Machining⁶, Price Each 0.250 inch Round Tensile

<u>Original Diameter or Diagonal Size in inches</u>	<u>Al, Cu, Mg</u>	<u>L.A.S.&BeCu</u>	<u>L.A.S.&BeCu</u>	<u>Co, Ni, Fe,</u>
		<u><40hrc.</u>	<u>>40hrc.</u>	<u>Ti</u>
		<u>PH S/S, C.S.</u>	<u>300/400</u>	<u>Superalloys</u>
			<u>Series S/S</u>	
To 1/2	17.50	22.50	27.50	37.50
1/2 To 1	22.50	32.50	37.50	47.50
1 To 1-1/2	32.50	42.50	52.50	62.50
Threading Where Required ⁷ , 1/2 - 13 or 7/16 - 14	17.50	22.50	27.50	32.50

0.500 inch Round Tensile, Price Each

<u>Original Diameter or Diagonal Size in inches</u>	<u>Al, Cu, Mg</u>	<u>L.A.S.&BeCu</u>	<u>L.A.S.&BeCu</u>	<u>Co, Ni, Fe, Ti</u>
		<u><40hrc.</u>	<u>>40hrc.</u>	<u>Superalloys</u>
		<u>PH S/S, C.S.</u>	<u>300/400</u>	
			<u>Series S/S</u>	
To 1	22.50	42.50	47.50	67.50
1 To 1-1/2	27.50	47.50	52.50	72.50

0.500 inch Wide by 2 inch Gage Length Flat Tensile⁸, Price Each

<u>Sheet or Plate Original Thickness</u>	<u>Al, Cu, Mg</u>	<u>L.A.S.&BeCu</u>	<u>L.A.S.&BeCu</u>	<u>Co, Ni, Fe, Ti</u>
		<u><40hrc.</u>	<u>>40hrc.</u>	<u>Superalloys</u>
		<u>PH S/S, C.S.</u>	<u>300/400</u>	
			<u>Series S/S</u>	
0.01 To 0.07	17.50	27.50	32.50	42.50
0.07 To 0.13	22.50	32.50	42.50	52.50
0.13 To 0.38	27.50	37.50	52.50	62.50
0.38 To 0.50	32.50	42.50	62.50	82.50
Pinned Flat Add ⁷ :				42.50

Charpy V Notch, per ASTM E-23, Set of Three, Machining Only

<u>Low Alloy, Carbon</u>	<u>Precipitation</u>	<u>300 Series</u>	<u>Ni, Co, Fe</u>
<u>Steels</u>	<u>Hardening & 400</u>	<u>S/S</u>	<u>Superalloys</u>
	<u>Series S/S</u>		
95.00	140.00	185.00	230.00

Hydrogen Embrittlement Test Bars

Machined and Inspected per ASTM F-519 25.00 Each

⁶ Machining not listed will be quoted upon request. Prices reflect minimum charges for standard ASTM configuration test specimens. Machining prices do not include extra charges for sectioning, special grinding, polishing, notching, threading, or where difficulty in machining is encountered due to condition, size, or configuration. Pre-machined or cast specimens not conforming to ASTM specifications will be brought into conformance, or noted on test report. All standard test specimens are machined to ASTM e-8.

⁷ Threaded or pinned test specimens are required for stress rupture and elevated temperature tensile tests.

⁸ Prices shown are for flat specimens that are machined from a submitted sample size of 0.750 inch wide by 8 inches long. Prices for subsize or larger specimens will be quoted upon request.

Mechanical Testing

<u>Test</u>	<u>Price Each</u>
Bend	20.00
Flaring or Flattening (Tubing)	20.00
Hardness (Brinell or Rockwell):	15.00 + 5.00 each additional
Hydrogen Embrittlement (200 Hour Test)	20.00 /Bar
Impact (Charpy)	25.00 Setup
Ambient	+ 10.00 Each
To -100E F	+ 15.00 Each
In-Lab Services (Technician and Equipment)	125.00 /Hour (125.00 Min.)
Oven Certification:	275.00
Nine Tensiles Tested per Mil-H-6088	
Includes Machining, Test and	
Metallography	
Portable Hardness (Outside Lab)	125.00 /Hour +Travel Expenses
Proof Load (To 60,000 lb)	Call for Price
Shear (Double or Single)	20.00 + Fixturing
Stress Rupture:	40.00 Setup
To 1200E F	+2.00 /Hour
To 1600E F	+3.00 /Hour
To 2000E F	+4.00 /Hour
Tensile/Proof Load/Wedge: ⁹	
Ambient Temperature (To 60,000 lbf)	15.00
Ambient Temperature (To 120,000 lbf)	25.00
Elevated Temperature (To 1200E F)	50.00
(To 1600E F)	70.00
(To 2000E F)	90.00
Tubing (1.25" Max. O.D., Tested Full Size)	20.00
Other Mechanical Testing Services Available	Call for Price

⁹

Tensile tests include yield strength at 0.2% offset, ultimate tensile strength, percent elongation, and percent reduction of area where applicable and/or possible.

Metallurgy

Metallography

<u>Test</u>	<u>Price Each</u>
Case Depth (Visual Method) ¹⁰	45.00
Case Depth (Microhardness Method) ¹⁰	45.00
Failure Analysis	Call for Price
Grain Flow	Call For Price
Grain Size ¹⁰	
ASTM E-112, Visual Comparison Method	45.00
ASTM E-112, Intercept Method	50.00 /Hour
Inclusion Rating, Visual Comparison Method ¹⁰	45.00
Intergranular Attack, Examination ¹⁰	45.00
Macro/Sample Preparation and Examination	35.00 Minimum
Metallurgical Report	125.00 /Hour
Includes examination, Data Compilation, Research, Writing, Report Assembly, etc.	
Metallurgical Services Outside Lab, Portal to Portal	125.00 /Hour + Expenses
In-Lab Metallographic Services (technician & equipment)	125.00/Hour
Metallurgical Engineering/Consulting Services	Call for Price
Metallographic Services Available Not Listed	Call for Price
Microhardness Test, Knoop or Vickers ¹⁰	35.00 +1.50 /Indentation
Microstructural Examination ¹⁰	125.00/Hour (45.00 min.)
Mount and Sample Preparation	
Standard Bakelite Type	45.00
Castable Resin/Epoxy	50.00
Plating, Electroless Nickel, Where Required For Mounted Specimen Edge Retention	30.00
Photography-Digital Image Transfer - CD-Rom	15.00
Photomicrographs/Photomacrographs	
4x5	15.00
8x10	25.00
Extra Prints (4x5)	5.00
" " (8x10)	10.00
Plating/Coating Thickness ¹⁰	45.00 Minimum
Sectioning	60.00 /Hour

¹⁰ Requires mounting and sample preparation. May require sectioning and plating.

Scanning Electron Microscopy

Procedure

Price Each

Scanning Electron Microscopy (SEM) Including Imaging, Energy Dispersive X-Ray Spectroscopy (EDS/EDX), Semi- Quantitative or Qualitative Chemical Analysis, and X-Ray Dot Mapping	160.00 /Hour
Sample Preparation, Cellulose Acetate Replication, Gold Deposition, Optical Microscopy, Data Analysis, Consultation, Preparation of Reports, Failure Analysis	85.00 /Hour
Minimum Charge, SEM Services	80.00
Qualitative Chemical Analysis by EDX (Peak spectrum only)	55.00

Miscellaneous

Salt Spray Corrosion Tests

<u>Test</u>	<u>Price Each</u>
ASTM B-117 (standard panels)	
0 To 168 Hours	20.00
169 To 336 Hours	32.50
Over 336 Hours	P.O.A.
Non-standard sized components or panels	P.O.A.
Minimum Charge	40.00

Non-Metallic Physical Properties

<u>Test</u>	<u>Price Each</u>
Bond Strength of Sprayed Coatings (Epoxy Bond, Cure and Tension Test)	50.00 single bond 55.00 double bond
Coating Weight	25.00
Density	35.00
Dimensional Measurements	75.00 /Hour
Shore Hardness (A or D Scale)	25.00
Solderability per mil-std-202,method 208	25.00 set-up 7.50/sample
Specific Gravity	35.00
Visual Examination	20.00

Non-Destructive Penetrant Oils

<u>Test</u>	<u>Price Each</u>
Fluorescent Penetrant Oil (water content, fluorescence, removability, sensitivity)	60.00
Emulsifier Oil (removability, water content, contamination)	45.00
Magnetic Inspection Oil (viscosity)	35.00
Water Base Emulsifier (removability, contamination)	40.00

Weld Certification¹¹
per AMS-STD-1595/AWS D17.1

<u>Joint Name</u>	<u>Description</u>	<u>Lot Charge Per Material</u>
0.063 or Less Sheet Groove	Cut, Machine and Bend Test One (1) Longitudinal Weld	30.00
0.063 - 0.125 Sheet Groove	Cut, Machine and Bend Test Two (2) Longitudinal Welds	50.00
T-fillet, To 0.125 Thick	Cut, Polish, and Examine Eight (8) Cross Sections	90.00
T-fillet .126-.375" thick	Cut, Polish, and Examine Eight (8) Cross Sections	125.00
Sheet Groove	Radiographic Inspection	50.00
Tube Groove	"	70.00
Tube Fillet, to 0.125 Thick	Cut, Polish, and Examine Eight (8) Cross Sections	125.00
Tube Fillet over .126 thick	Cut, Polish, and Examine Eight (8) Cross Sections	150.00

Plating Solution Analysis
Call for Price

Taber Abrasion Test

<u>Test</u>	<u>Price Each</u>
10,000 Cycles per MIL-A-8625 F and FED STD I41, Method 6192	42.50
Abrasion Test on other Materials and/or per Other Specifications	P.O.A.

Stress Corrosion Test per ASTM G-34

<u>Operation</u>	<u>Price Each¹²</u>
Machining C-Ring Specimen	135.00
20 Day Exposure	150.00
30 Day Exposure	215.00

Conductivity

<u>Test</u>	<u>Price Each</u>
Conductivity (IACS)	25.00

Heat Treating

<u>Cycle</u>	<u>Price Each</u>
to 2000°F	30.00 Set-Up 5.00/Hour

¹¹ Qualification to other specifications may require radiographic inspection, in addition to the tests listed, at additional cost. Some materials must be radiographically inspected only. Refer to the specification for information.

¹² Includes exam and report