



# **CHICAGO SPECTRO SERVICE LABORATORY, INC.**

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Condensed Schedule of Fees

for

**METAL TESTING**

# **A COMPLETE ANALYTICAL AND METALLURGICAL SERVICE**

## **SPECTROGRAPHIC ANALYSIS**

Spectrographic analysis is radically different from the usual wet chemical method. The sample, as a solid, liquid, or powder is "fired" and the light spectrum produced is photographed on a film or plate, which provides a permanent record of the elements, qualitatively and quantitatively.

This method has several unique advantages. The most important is that qualitatively, 72 of the 100 odd elements can be determined simultaneously. Two photographic spectrographs are used for qualitative and quantitative analysis of metals and non-metals.

### *VACUUM EMISSION SPECTROMETER*

Programmed to do up to 22 elements simultaneously, this instrument precisely handles complete analysis of cast irons, steels and alloy irons.

### *EMISSION QUANTOMETER*

This instrument performs a complete analysis in approximately one minute. It routinely analyzes solid specimens of aluminum, magnesium and zinc alloys. As many as 14 elements are determined simultaneously.

Samples are always run in duplicate on both direct readers (without additional charge) and the results are permanently recorded with a digital printer.

### *COMPUTERIZED X-RAY FLUORESCENCE ANALYZER*

This instrument uses a source of polychromatic x-rays to excite the sample. It will analyze for elements from Aluminum (#13) thru Uranium (#92) in any preprogrammed sequence.

It has the special advantages of high accuracy and speed in the analysis of stainless steels, high temperature alloys and other metals that can be analyzed as solid specimens. It can also be adapted to the analysis of powders and liquids on specific routine problems.

## **CHEMICAL AND ATOMIC ABSORPTION ANALYSIS**

Elements that cannot be handled economically by any of our spectrographic procedures or samples that do not lend themselves to instrumental analysis due to size, segregation, lack of suitable standards and/or physical condition will be analyzed by our highly competent wet chemical or atomic absorption departments.

Referee analyses, when requested, are always performed by ASTM wet chemical methods.

## **METALLURGICAL EXAMINATION**

Metallurgy deals primarily with the physical and solid state characteristics of metals and alloys. Physical properties such as grain size, case depth, heat treatment, hardenability and microstructure are of prime importance.

Our metallurgical staff is not only skilled in theoretical problems, but in practical applications as well and can "trouble shoot" in the field or in our laboratories. They are specialists in metal failure investigations and are available for expert court testimony and consultations

# CHEMICAL ANALYSIS

## INSTRUMENTAL SPECIAL UNIT PRICES

Our advanced equipment allows us to offer our customers the fastest, most accurate and economical chemical analysis on samples suitable for instrumental analysis.

We also have the capabilities of remelting drillings, turnings, powders, etc., thus making suitable samples for analysis by one of our multitude of instruments. This requires 2 ounces of clean material (\$15.00 additional charge if Argon atmosphere is required.)

*Significant volume discounts on multiple similar samples are available on a quote basis.*

### Solder Analysis

Quantitative analysis of Tin plus semi-quantitative analysis for possible contaminants. Includes Sb, Cu, Ag, In, Ni, Bi, Fe, As, Cd, Co, Au, Zn, Al, Te and Hg.....\$90.00

### Qualitative Examination

Used on any material, all detected elements (cations) are reported with a 10 fold concentration estimate and will provide a general over all survey of an unknown specimen. Requires only 0.01 grams of material.

Cost per sample .....\$200.00  
 Ashing if required.....40.00  
 Non-routine preparation.....Time Basis

### Semi-Quantitative Analysis

All detected elements (cations) are reported with a specific concentrational value that should be within a factor of 2 of the quantitative analysis.

Cost per sample.....\$250.00  
 Ashing if required.....40.00  
 Non-routine preparation .....Time Basis

### Alloy Identification

Spectrographic classification of unknown materials giving ASTM, SAE, AISI, etc. designation.....\$30.00  
 (plus charges for any elements which must be determined for classification.)

### 9 Standard Elements in Low Alloy Iron and Steel

Carbon	Nickel
Manganese	Chromium
Phosphorus	Molybdenum
Sulfur	Copper
Silicon.....	\$75.00

### 11 Standard Elements in Aluminum Alloys

Silicon	Manganese
Copper	Lead
Magnesium	Tin
Titanium	Nickel
Zinc	Chromium
Iron.....	\$75.00

### 8 Standard Elements in Zinc Alloys, Nos. 3, 5, 7

Copper	Lead
Cadmium	Tin
Aluminum	Iron
Magnesium	Nickel.....
	\$45.00

### Tramp Element Survey

Complete spectrographic survey of detected contaminants, such as Al, Sb, As, Bi, B, Cd, Co, Pb, Mg, Nb, Ag, Te, Sn, Ti, W, V, Zn, Zr, Si.....\$75.00

# CHEMICAL ANALYSIS

ELEMENT	Low Alloy Iron and Steel	High Alloy Iron and Steel, Stainless, Nickel and Cobalt Base, Tool Steel	Aluminum Alloys	Lead and Tin Alloys
Aluminum (acid soluble)	16.00	18.00	-	-
Aluminum (total)	10.00	13.00	-	14.00
Antimony	15.00	15.00	-	14.00
Arsenic	22.00	22.00	-	17.50
Beryllium	16.00	16.00	15.00	-
Bismuth	15.00	15.00	15.00	20.00
Boron	15.00	30.00	22.00	-
Cadmium	15.00	16.00	15.00	20.00
Calcium	15.00	20.00	22.00	22.00
Carbon (total) routine	12.00	12.00	-	14.50
Carbon (total) EXTRA Low places	25.00	25.00	-	-
Carbon (graphitic)	25.00	25.00	-	-
Cerium	15.00	-	-	-
Chromium	9.00	10.00	9.00	-
Cobalt	9.00	10.00	-	-
Copper	9.00	10.00	9.00	13.50
Gold	-	40.00	-	40.00
Iron	-	25.00	9.00	17.50
Lanthanum	-	-	-	15.00
Lead	15.00	15.00	9.00	14.00
Magnesium	11.00	13.50	10.00	-
Manganese	9.00	10.00	9.00	-
Molybdenum	9.00	10.00	-	-
Nickel	9.00	10.00	9.00	14.00
Niobium	13.00	13.50	-	-
Phosphorus	8.00	8.00	-	-
Rare Earths (total)	-	-	-	-
Selenium	10.00	10.00	-	-
Silicon	9.00	10.00	9.00	-
Silver	9.00	20.00	22.00	17.50
Sodium	-	-	25.00	-
Sulfur	8.00	8.00	-	9.00
Tantalum	13.00	15.00	-	-
Tellurium	15.00	15.00	-	17.50
Thorium	-	-	-	-
Tin	9.00	15.00	9.00	20.00
Titanium	9.00	10.00	9.00	-
Tungsten	18.00	20.00	-	-
Vanadium	9.00	10.00	15.00	-
Zinc	15.00	15.00	9.00	14.00
Zirconium	15.00	15.00	15.00	-
Hydrogen	50.00	50.00	-	-
Nitrogen	50.00	50.00	-	-
Oxygen	50.00	50.00	-	-

**Minimum Sample Charge: \$25.00**

# CHEMICAL ANALYSIS

ELEMENT	Copper Alloys	Magnesium Alloys	Titanium Alloys	Zinc Alloys
Aluminum (acid soluble)	-	-	-	-
Aluminum (total)	20.00	13.50	20.00	20.00
Antimony	20.00	-	-	15.00
Arsenic	24.00	-	-	-
Beryllium	18.00	13.50	-	15.00
Bismuth	20.00	-	-	-
Boron	-	-	12.00	-
Cadmium	24.00	-	-	20.00
Calcium	-	-	-	-
Carbon (total) routine	-	-	-	-
Carbon (total) EXTRA Low places	-	-	24.00	-
Carbon (graphitic)	-	13.50	-	-
Cerium	15.00	-	12.00	10.00
Chromium	15.00	-	-	-
Cobalt	-	-	-	-
Copper	15.00	10.00	12.00	10.00
Gold	40.00	-	-	-
Iron	15.00	10.00	12.00	10.00
Lanthanum	-	22.00	-	-
Lead	15.00	13.00	-	10.00
Magnesium	15.00	-	-	12.00
Manganese	15.00	10.00	12.00	10.00
Molybdenum	-	-	12.00	-
Nickel	15.00	10.00	-	10.00
Niobium	-	-	12.00	-
Phosphorus	18.00	-	-	-
Rare Earths (total)	-	22.00	-	-
Selenium	-	-	-	-
Silicon	15.00	10.00	-	10.00
Silver	20.00	20.00	-	-
Sodium	-	-	-	-
Sulfur	15.00	-	-	-
Tantalum	-	-	-	-
Tellurium	20.00	-	-	-
Thorium	-	16.00	-	-
Tin	15.00	10.00	12.00	10.00
Titanium	15.00	-	-	10.00
Tungsten	-	-	-	-
Vanadium	-	-	12.00	-
Zinc	15.00	10.00	12.00	-
Zirconium	15.00	20.00	12.00	-
Hydrogen	50.00	-	50.00	-
Nitrogen	-	-	40.00	-
Oxygen	50.00	-	50.00	-

**Minimum Sample Charge: \$25.00**

# METALLURGICAL & MECHANICAL TESTING

ROUTINE MOUNTING & POLISHING.....	\$35.00
MINIMUM SAMPLE PREPARATION.....	10.00
ROUGH SAMPLE PREPARATION.....	50.00/Hour

## ROUTINE MICROSTRUCTURAL EXAMINATION

Visual case depth/decarburization, ferritic grain size, plating depth, identification of microstructure.....	35.00
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## MICROHARDNESS TESTING

1-5 Indentations.....	7.00/Each
Each Additional.....	5.50/Each

ROUTINE ROCKWELL HARDNESS TEST .....	8.00
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## TENSILE TESTS

Includes ultimate tensile strength, yield strength, % elongation and % reduction of area ( <i>flat and round</i> ).....	57.00
Less \$2.00 for each addition sample	
Specimens already machined.....	18.00/Each
Procedure Qualification Test	
2 Tensiles, 4 Bends.....	210.00
Welder Qualification Test	
2 Bends.....	48.00
Welder Qualification Test ( <i>Fillet</i> )	
1 Bend, 1 Macro.....	74.00

## METALLOGRAPHIC EXAMINATION

Including mount & polishing	
Minimum sample preparation.....	80.00
Macro.....	50.00
Photos.....	35.00/Each

## IMPACT TESTS

*Impact tests performed on charpy "V," "U," or keyhole notch samples per ASTM and Federal standards.*

Samples (3) per Lot <i>Includes Machining</i>	Room Temperature	Room Temperature To -100°F	-100°F to -321°F
1-3 Lots	141.00	162.00	240.00
4 lots or more	138.00	153.00	222.00
Machined samples	8.00/Each	15.00/Each	41.00/Each
(test only)	7.00/Each	12.00/Each	35.00/Each
Machining charge \$39.00/Hr			

# METALLURGICAL & MECHANICAL TESTING

## JOMINY END QUENCH HARDENABILITY PER ASTM A255

Furnace Test Treat.....	22.00/Hour
Jominy	
<i>Includes heat treatment and machining</i>	
24 position.....	180.00
16 position.....	150.00

METALLURGICAL CONSULTING.....	110.00/Hour
Field Time (Five Hour Minimum).....	150.00/Hour

LEGAL WORK & INVESTIGATIONS.....	175.00/Hour
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SCANNING ELECTRON MICROSCOPY.....	200.00/Hour
<i>Includes Operator</i>	

## ELECTRON BEAM MICROPROBE

Energy Dispersive Analysis.....	250.00/Hour
Wavelength Dispersive Analysis.....	275.00/Hour
<i>Includes Operator</i>	

The following tests are individually quoted: corrosion, dimensional, hydrostatic pressure, density, porosity, impact, coating weight, special projects and contract work. Special quotes for quantity discounts.

**A surcharge may be applied for rush orders.**

## **WHAT TYPES OF SAMPLES SHOULD BE SUBMITTED FOR ANALYSIS?**

The samples that you send should be representative of the "lot". . . be it scrap, incoming stock, fabricated parts or castings. We will be pleased to recommend suitable sampling procedures and molds for casting molten metal.

We can handle almost any sample form . . . However, to get best service and price, specimens should require minimum surface preparation and be of sufficient size to be analyzed by instrumental methods.

## **DO YOU HAVE OTHER PROBLEMS?**

If this brief descriptive brochure has not covered your metallurgical or analytical problem, we are as close as your phone. One of our staff would be most happy to discuss your requirements. We have many capabilities beyond the scope of this condensed schedule.

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You'll like the scope of our service. . . the ease of transaction . . . the speed, accuracy and completeness of our reports, bringing our facilities into your plant and adding laboratory control to your operation without investment and maintenance.