

General Services Administration
Federal Supply Service
Authorized Federal Supply Schedule Price List
For
MECHANICAL, CHEMICAL, ELECTRICAL AND GEOPHYSICAL
TESTING SERVICES



FSC CLASS 8734
NAICS Code: 541380, 541690
Contract Number: GS-07F-6087P
Contract Period: 09/14/2009 through 09/12/2024
Pricelist Current Through Modification PO-0025, dated 08/28/2019



6220 Culebra Road
San Antonio, Texas 78238
Contracts Office: 210-522-2231
Fax: 210-522-3559
Email: contract@swri.org
Website: www.swri.org

Business Size: Large

Products and Ordering Information in this Authorized Schedule Price List is also available on the GSA Advantage!™ System. Agencies can browse GSA Advantage!™ by accessing GSA's Home Page via Internet at www.fss.gsa.gov

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CUSTOMER ORDERING INFORMATION

SPECIAL ITEM NUMBERS AWARDED ON THIS SCHEDULE

627-1007 / 627-1007RC Introduction to New Services/Products

873-1 / 873-1RC Mechanical Testing and Analysis

873-2 / 873-2RC Chemical Testing and Analysis Services and Related Chemistries,
Supplies and Consumables

873-3 / 873-3RC Electric Testing and Analysis Services

873-4/ 873-4RC Geotechnical and Thermal/Fire Testing and Analysis Services

PRIMARY DISCIPLINES AWARDED ON THIS SCHEDULE:

Mechanical, Chemical, Electrical and Geophysical Testing Services

CONTRACTOR'S ORDERING ADDRESS:

Southwest Research Institute®
6220 Culebra Road
San Antonio, Texas 78238-5166

CONTRACTORS REMITTANCE ADDRESS:

Southwest Research Institute®
P.O. Drawer 28510
San Antonio, Texas 778228-0510

For information concerning SwRI's technical capabilities, general inquiries, including instructions on how to use the schedule, and submissions of statements of work, contact:

Patrick Merritt
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For SwRI contracting information or to send an order, contact:

Contracts Department
Phone: (210) 522-2231
Fax: (210) 522-3559
Email: contract@swri.org

TERMS AND CONDITIONS

1a. Table of Awarded Special Item Numbers (SINs)

- 627-1007 Introduction to New Services/Products
- 873-1 Mechanical Testing and Analysis
- 873-2 Chemical Testing and Analysis Services and Related Chemistries, Supplies and Consumables
- 873-3 Electric Testing and Analysis Services
- 873-4 Geotechnical and Thermal/Fire Testing and Analysis Services

1b. If the Contractor is proposing hourly rates, a description of all corresponding commercial job titles, experience, functional responsibility and education for those types of employees or subcontractors who will perform services shall be provided. If hourly rates are not applicable, indicate “Not Applicable” for this item. See Pricing Section.

2. Maximum Order:

SIN	Maximum Order Amount
627-1007	\$300,000
873-1	\$100,000
873-2	\$100,000
873-3	\$100,000
873-4	\$100,000

***Ordering activities may request a price reduction at any time before placing an order, establishing a BPA, or in conjunction with the annual BPA review. However, the ordering activity shall seek a price reduction when the order or BPA exceeds the simplified acquisition threshold. Schedule contractors are not required to pass on to all schedule users a price reduction extended only to an individual ordering activity for a specific order or BPA.**

- 3. Minimum Order: \$ 5,000.00**
- 4. Geographic Coverage: 50 United States and Washington DC, Puerto Rico & U.S. Territories**
- 5. Point(s) of Production (city, county and state, or foreign country): United States of America**
- 6. Basic Discount: Prices shown are net; Discounts have been deducted**

7. **Quantity Discounts: None**
8. **Prompt Payment Terms: Net 30. Information for Ordering Offices: Prompt payment terms cannot be negotiated out of the contractual agreement in exchange for other concessions.**
- 9a. **Government purchase cards are accepted up to the micro-purchase threshold**
- 9b. **Government purchase cards are not accepted above the micro-purchase threshold**
10. **Foreign Items: None**
- 11a. **Time of delivery after receipt of Order (ARO): As negotiated**
- 11b. **Expedited Delivery: As negotiated**
- 11c. **Overnight and 2-Day Delivery: Customer may call for availability and rates for overnight and 2-day delivery.**
- 11d. **Urgent Requirement: Customers are encouraged to contact the contractor for the purpose of requesting accelerated delivery**
12. **FOB Point: Destination**
- 13a. **Ordering Address: Same as contractor**
- 13b. **Ordering Procedures: For supplies and services, the ordering procedures, information on Blanket Purchase Agreements (BPA's), and a sample BPA can be found at the GSA/FSS Schedule homepage (fss.gsa.gov/schedules).**
14. **Payment Address: Same as contractor**
15. **Warranty Provision: N/A**
16. **Export Packaging Charges: N/A**
17. **Terms and Conditions of government purchase card acceptance (any threshold above the micro-purchase level): N/A**
18. **Terms and Conditions of Rental, Maintenance, and Repair: N/A**
19. **Terms and Conditions of Installation: N/A**

20. **Terms and Conditions of Repair parts indicating date of parts price lists and any discounts from list prices: N/A**
21. **List of Services and Distribution points: N/A**
22. **List of Participating Dealers: N/A**
23. **Preventative Maintenance: N/A**
- 24b. **If applicable, indicate that section 508 compliance information is available on electronic and information technology (EIT) supplies and services and show where full details can be found (contractor website or other location>) the EIT standards can be found at: www.section508.gov/: N/A**
25. **Data Universal Number System (DUNS) Number: 007936842**
26. **NOTIFICATION REGARDING REGISTRATION IN SYSTEM FOR AWARD MANAGEMENT (SAM) DATABASE: Contractor has an Active Registration in the SAM database.**

CUSTOMER ORDERING PROCEDURES

INTRODUCTION

GSA has established special ordering procedures for services that require a Statement of Work. These special ordering procedures take precedence over the procedures in FAR 8.404 (b)(2) through (b)(3).

GSA has determined that the prices for services contained in the contractor's price list applicable to this Schedule are fair and reasonable. However, the ordering office using this contract is responsible for considering the level of effort and mix of labor proposed to perform a specific task being ordered and for making a determination that the total firm-fixed price or ceiling price is fair and reasonable.

SUGGESTED PROCEDURE

When ordering services, ordering offices shall:

1. Prepare a Request for Quote

- A. A performance-based statement of work that outlines, at a minimum, the work to be performed, location of work, period of performance, deliverable schedule, applicable standards, acceptance criteria, and any special requirements (i.e., security clearances, travel, special knowledge, etc.) should be prepared.
- B. A request should be prepared which includes the performance based statement of work and requests the contractors to submit either a firm-fixed price or a ceiling price to provide the services outlined in the statement of work. A firm-fixed price order shall be requested, unless the ordering office makes a determination that it is not possible at the time of placing the order to estimate accurately the extent or duration of the work or to anticipate cost with any reasonable degree of confidence. When such a determination is made, a labor hour or time-and-materials proposal may be requested. The firm-fixed price shall be based on the prices in the schedule contract and shall consider the mix of labor categories and level of effort required to perform the services described in the statement of work. The firm-fixed price of the order should also include any travel costs or other direct charges related to performance of the services ordered, unless the order provides for reimbursement of travel costs at the rates provided in the Federal Travel or Joint Travel Regulations. A ceiling price must be established for labor-hour and time-and-materials orders.
- C. The request may ask the contractors, if necessary or appropriate, to submit a project plan for performing the task, and information on the contractor's experience and/or past performance performing similar tasks.

- D. The request shall notify the contractors what basis will be used for selecting the contractor to receive the order. The notice shall include the basis for determining whether the contractors are technically qualified and provide an explanation regarding the intended use of any experience and/or past performance information in determining technical qualification of responses.

2. Transmit the Request to Contractors:

- A. Based upon an initial evaluation of catalogs and price lists; the ordering office should identify the contractors that appear to offer the best value (considering the scope of services offered, pricing and other factors such as contractors' locations, as appropriate).
- B. The request should be provided to three (3) contractors if the proposed order is estimated to exceed the micro-purchase threshold, but not exceed the maximum order threshold. For proposed orders exceeding the maximum order threshold, the request should be provided to additional contractors that offer services that will meet the agency's needs. Ordering offices should strive to minimize the contractors' costs associated with responding to requests for quotes for specific orders. Requests should be tailored to the minimum level necessary for adequate evaluation and selection for order placement. Oral presentations should be considered, when possible.

3. Evaluate Responses and Select the Contractor to Receive the Order:

After responses have been evaluated against the factors identified in the request, the order should be placed with the schedule contractor that represents the best value and results in the lowest overall cost alternative (considering price, special qualifications, administrative costs, etc) to meet the Government's needs.

BLANKET PURCHASE AGREEMENTS (BPAS):

The establishment of Federal Supply Schedule Blanket Purchase Agreements (BPAs) for recurring services is permitted when the procedures outlined herein are followed. All BPAs for services must define the services that may be ordered under the BPA, along with delivery or performance time frames, billing procedures, etc. The potential volume of orders under BPAs, regardless of the size of individual orders, may offer the ordering office the opportunity to secure volume discounts. When establishing BPAs, ordering offices shall—

Inform contractors in the request (based on the agency's requirement) if a single BPA or multiple BPAs will be established and indicate the basis that will be used for selecting the contractors to be awarded the BPAs.

- A. SINGLE BPA:** Generally, a single BPA should be established when the ordering office can define the tasks to be ordered under the BPA and establish a firm-fixed

price or ceiling price for individual tasks or services to be ordered. When this occurs, authorized users may place the order directly under the established BPA when the need for service arises. The schedule contractor that represents the best value should be awarded the BPA. (See FAR 8.404)

- B. MULTIPLE BPAs:** When the ordering office determines multiple BPAs are needed to meet its requirements, the ordering office should determine which contractors can meet any technical qualifications before establishing the BPAs. When multiple BPAs are established, the authorized users must follow the procedures in (a)(2)(ii) above and then place the order with the Schedule contractor that represents the best value.

4. Review BPAs Periodically:

Such reviews shall be conducted at least annually. The purpose of the review is to determine whether the BPA still represents the best value (considering price, special qualifications, administrative costs, etc.) and results in the lowest overall cost alternative to meet the agency's needs.

5. Small Business:

The Ordering Office should give preference to small business concerns when two or more contractors can provide the services at the same firm-fixed price or ceiling price.

ABOUT SWRI®

Southwest Research Institute (SwRI) is an independent, nonprofit applied research and development organization. The staff of more than 2,600 specializes in the creation and transfer of technology in engineering and the physical sciences. The Institute occupies more than 1,200 acres in San Antonio, Texas, and provides nearly 2 million square feet of laboratories, test facilities, workshops and offices.

SwRI's Mission:

Benefiting government, industry and the public through innovative science and technology.

Research areas include:

- Chemistry and Chemical Engineering
- Powertrain Engineering
- Fuels and Lubricants Research
- Intelligent Systems
- Applied Power
- Applied Physics
- Space Science and Engineering
- Defense & Intelligence Solutions
- Mechanical Engineering

FACTS ABOUT SWRI®

Southwest Research Institute (SwRI), headquartered in San Antonio, Texas, is one of the oldest and largest independent, nonprofit, applied research and development (R&D) organizations in the United States. Founded in 1947, SwRI provides contract research and development services to industrial and government clients in the United States and abroad. The Institute is governed by a board of directors, which is advised by approximately 100 trustees.

Based on preliminary consultation with a client, SwRI prepares a proposal outlining the project's scope of work. Subject to client wishes, programs are kept confidential. SwRI offers multidisciplinary, problem-solving services in a variety of areas in engineering and the physical sciences. Historically, nearly 2,000 projects are open at the Institute at any one time. These projects are funded almost equally between the government and commercial sectors. SwRI's total revenue for fiscal year 2016 was \$559 million. In 2016, SwRI directed \$7.4 million to its internally sponsored R&D program, which is designed to encourage new ideas and innovative technologies.

The Institute holds more than 900 patents awarded to its staff members, has earned 41 R&D 100 awards, and has been inducted in the U.S. Space Foundation's Space Technology Hall of Fame. The Institute has received two Department of Defense James S. Cogswell Outstanding Industrial Security Achievement Awards. The American Society of Mechanical Engineers has recognized our split-Hopkinson pressure bar apparatus (2006) and the Southern Gas Association analog (1990), developed by SwRI in 1955 for the natural gas industry, as ASME National Historic Engineering Landmarks. Several SwRI divisions have achieved ISO 9001 or ISO 14001 certification and ISO/IEC Guide 25 accreditation. The Ford Motor Company has designated the Institute a Tier 1 product development engineering services supplier and has awarded the Institute its Q1-2000 award.

The Institute has 9 technical divisions cooperating in multidisciplinary approaches to problem-solving. A partial listing of research areas includes: advanced electronics; aircraft structural integrity; antennas, radio wave propagation and electromagnetic modeling; automation, robotics, and intelligent systems; automotive engineering; avionics and support systems; ballistics and explosion hazards; bioengineering, biomechanics and biomaterials; chemistry and chemical engineering; communications systems and signal processing; corrosion and electrochemistry; cyber security and information assurance; earth and planetary sciences; engineering mechanics; environmental and health sciences; fire technology; fluid systems and fluid machinery; fracture mechanics; fuels and lubricants; geochemistry and radiochemistry; geological and mining engineering; geophysical and geological investigations; hydrology and geohydrology; information and electronic warfare; intelligent transportation systems and vehicles; internal combustion engine emissions research; manufacturing technology; marine technology; materials sciences; medical information systems; modeling and simulation; nondestructive evaluation; oil and gas exploration and development; optics

and sensor technology; penetration and armor mechanics; pipeline technology; probabilistic mechanics and uncertainty quantification; risk and hazard assessment; signal exploitation and geolocation; software engineering; space science; space instrumentation and spacecraft systems; structural engineering; surface modification and coatings; surveillance technology, training systems and simulators; unmanned aerial vehicles and systems; vehicle, engine and powertrain design, research and development.

Thomas Baker Slick Jr., an oilman-rancher-philanthropist, founded SwRI. Slick's vision of an internationally known scientific research center in San Antonio, took root with his donation of a ranchland site west of the city -- where Institute operations are still carried out. Slick challenged a group of pioneer scientists and engineers from around the nation to move to the new center to seek revolutionary advancements in many areas by developing and applying technology.

For more information about SwRI and its capabilities, contact the Business Development Office, Southwest Research Institute, 6220 Culebra Road, P.O. Box 28510, San Antonio, Texas 78228-0510, Phone (210) 522-2122, Fax (210) 522-3496.

**USA COMMITMENT TO PROMOTE
SMALL BUSINESS PARTICIPATION
PROCUREMENT PROGRAMS****PREAMBLE**

Southwest Research Institute provides commercial products and services to the Federal Government. We are committed to promoting participation of small, small disadvantaged and women-owned small businesses in our contracts. We pledge to provide opportunities to the small business community through reselling opportunities, mentor-protégé programs, joint ventures, teaming arrangements, and subcontracting.

COMMITMENT

To actively seek and partner with small businesses.

To identify, qualify, mentor and develop small, small disadvantaged and women-owned small businesses by purchasing from these businesses whenever practical.

To develop and promote company policy initiatives that demonstrate our support for awarding contracts and subcontracts to small business concerns.

To undertake significant efforts to determine the potential of small, small disadvantaged and women-owned small business to supply products and services to our company.

To insure procurement opportunities are designed to permit the maximum possible participation of small, small disadvantaged, and women-owned small businesses.

To attend business opportunity workshops, minority business enterprise seminars, trade fairs, procurement conferences, etc., to identify and increase small businesses with whom to partner.

To publicize in our marketing publications our interest in meeting small businesses that may be interested in subcontracting opportunities.

We signify our commitment to work in partnership with small, small disadvantaged and women-owned small businesses to promote and increase their participation in Federal Government contracts. To accelerate potential opportunities please contact:

Southwest Research Institute
Paul Easley
(210) 522- 3077
Fax (210) 522-2262
peasley@swri.org

(CUSTOMER NAME)
BLANKET PURCHASE AGREEMENT

Pursuant to GSA Federal Supply Schedule Contract Number(s) _____, Blanket Purchase Agreements, the Contractor agrees to the following terms of a Blanket Purchase Agreement (BPA) EXCLUSIVELY WITH (Ordering Agency):

- (1) **The following contract items can be ordered under this BPA. All orders placed against this BPA are subject to the terms and conditions of the contract, except as noted below:**

MODEL NUMBER/PART NUMBER	*SPECIAL BPA DISCOUNT/PRICE
_____	_____
_____	_____

- (2) **Delivery:**

DESTINATION DATES / DELIVERY SCHEDULES

- (3) **The Government estimates, but does not guarantee, that the volume of purchases through this agreement will be _____.**
- (4) **This BPA does not obligate any funds.**
- (5) **This BPA expires on _____ or at the end of the contract period, whichever is earlier.**
- (6) **The following office(s) is hereby authorized to place orders under this BPA: OFFICE POINT OF CONTACT.**
- (7) **Orders will be placed against this BPA via Electronic Data Interchange (EDI), FAX, or paper.**
- (8) **Unless otherwise agreed to, all deliveries under this BPA must be accompanied by delivery tickets or sales slips that must contain the following information as a minimum:**
- (a) **Name of Contractor;**
 - (b) **Contract Number;**
 - (c) **BPA Number;**
 - (d) **Model Number or National Stock Number (NSN);**

- (e) Purchase Order Number;**
 - (f) Date of Purchase;**
 - (g) Quantity, Unit Price, and Extension of Each Item (unit prices and extensions need not be shown when incompatible with the use of automated systems; provided, that the invoice is itemized to show the information); and**
 - (h) Date of Shipment.**
- (9) The requirements of a proper invoice are specified in the Federal Supply Schedule contract. Invoices will be submitted to the address specified within the purchase order transmission issued against this BPA.**
- (10) The terms and conditions included in this BPA apply to all purchases made pursuant to it. In the event of an inconsistency between the provisions of this BPA and the Contractor's invoice, the provisions of this BPA will take precedence.**

CONTRACTOR TEAM AGREEMENTS

Federal Supply Schedule Contractors may use “Contractor Team Arrangements” (see FAR 9.6) to provide solutions when responding to a customer agency requirement.

These Team Arrangements can be included under a Blanket Purchase Agreement (BPA). BPAs are permitted under all Federal Supply Schedule contracts.

Orders under a Team Arrangement are subject to terms and conditions of the Federal Supply Schedule Contract.

Participation in a Team Arrangement is limited to Federal Supply Schedule Contractors.

Customers should refer to FAR 9.6 for specific details on Team Arrangements.

Here is a general outline on how it works:

- The customer identifies their requirements.
- Federal Supply Schedule Contractors may individually meet the customer’s needs, or
- Federal Supply Schedule Contractors may individually submit a Schedules “Team Solution” to meet the customer’s requirement.

Customers make a best value selection.

MECHANICAL, CHEMICAL, ELECTRICAL AND GEOPHYSICAL TESTING SERVICES DESCRIPTIONS

Southwest Research Institute provides all resources including personnel, management, supplies, services, materials, equipment, facilities and transportation necessary to support and conduct a wide range of Mechanical, Chemical, Electrical and Geophysical Testing Services. SwRI will provide the requisite mechanical, chemical, electrical and/or geophysical technical and associated support expertise for the services specified, but not limited to, in the following SIN descriptions:

627-1007 Introduction to New Services/Products

This SIN includes new or improved commercial services or products that perform new tasks or procedures not currently available under any GSA contract. An example of the types of New Services that SwRI can offer are:

Locomotive and Marine Diesel Emissions Testing

The SwRI Locomotive Technology Center (LTC) has extensive exhaust emission testing capabilities. The LTC provides direct access to a Class 1 railroad main line, and is equipped with two test tracks, each capable of performing locomotive exhaust emissions testing as specified by EPA in 40 CFR, Part 92. With a full time staff, SwRI routinely performs locomotive exhaust emission tests in support of EPA certification.

Heavy-duty and Non-road Engine Testing

SwRI's emissions laboratory has 30 test cells capable of performing emissions tests on truck, bus, and non-road engines, in conformance with EPA CFR requirements. Facilities are capable of testing diesel, gasoline, and alternative-fueled engines. The division can also provide certification and emission reduction technology development for non-road engines, including small utility engines, forklift engines, marine outboard engines and inboard pleasure craft.

Vehicle Testing

SwRI has chassis dynamometer facilities for light and medium-duty vehicle testing. Facilities are in conformance with EPA requirements, and can accommodate gasoline, diesel and alternative fuels. A heavy-duty chassis dynamometer is available that can test full size on-highway truck tractors and buses.

Emissions Measurements of Internal Combustion Engines

In addition to characterizing regulated emissions of HC, CO, NO_x, PM, and smoke from engine and vehicle exhaust, SwRI has sampling and analysis facilities for quantifying

unregulated emissions, many that are considered to be toxic compounds. Capability for chemical characterization of exhaust gas constituents includes the following list:

- Aldehydes and ketones by collection and derivitization with dinitrophenylhydrazine (DNPH) and analysis by HPLC/UV;
- Alcohols by GC-FID;
- Detailed C₁ – C₁₂ hydrocarbon speciation by GC-FID;
- Real-time FTIR monitoring of NO, NO₂, N₂O, NH₃, CO, CO₂, CH₄, C₂H₂, C₂H₄, C₂H₆, C₃H₈, C₃H₆, formaldehyde, SO₂, H₂O; additional compounds are possible.
- N₂O by GC-ECD;
- Ammonia and sulfate by IC;
- Real time mass spectroscopy monitoring
- High resolution (HR) GC/HR MS capabilities for polycyclic aromatic hydrocarbons (PAH), nitrated PAH, dioxins/furans analyses;
- ICP capabilities for metals and elements analyses;
- Particulate filter characterization for soluble organic fraction and volatile organic fraction;
- Sampling and analysis of mobile source particulate, including particulate sizing, counting, particle size differentiated number, mass, morphology, and chemical characterization can all be performed at SwRI.

Environmental Analyses

SwRI has extensive analytical chemistry laboratories. The Analytical and Environmental Chemistry Department in the Chemistry and Chemical Engineering Division at SwRI has devoted more than 35 years to resolving environmental issues through research and development of new technologies for sample analysis of both inorganic and organic species in various complex matrices. Capabilities include:

- High Resolution Mass Spectrometry
- Mass Spectrometry
- Gas Chromatography
- Atomic emission and absorption spectroscopy
- Atomic emission mass spectrometry
- Ion chromatography
- Liquid Chromatography
- Radiochemistry

873-1 Mechanical Testing and Analysis

Services for mechanical testing and analysis, include, but are not limited to material strength testing (compression, ductility, fracture, fatigue, shear, torsion, and metallography); calibration and testing of mechanical equipment; acoustic/vibration testing (noise, shock resistance); hydraulic/pneumatic testing; Metrology (time, length, mass, volume, pressure,, etc.); non-destructive evaluation (x-ray, radiographic, ultrasonic, leak); environmental simulation/climatic testing; forensic, failure analysis, and expert testimony; building and welding inspection (site monitoring, field surveys, quality assurance, certification; and related training.

873-2 Chemical Testing and Analysis Services and Related Chemistries, Supplies and Consumables

Services for chemical testing and analysis include, but are not limited to, wet chemistry and associated physical tests; viscosity/density testing; electrochemistry testing; chromatography (GC, LC, SFC, SFE, HPLC, GS/MS, LC/MS, GPC, GFC, IC, column, thin layer, paper); spectroscopy (AA, FT-IR, UV/VIS, XRD, NMR, ICP, MS, fluorescence, Raman); thermal analysis (DSC, DTA, TGA, TMA); surface analysis/microscopy (SAM, SEM, TEM, SIMS, ion); Optic/photometry testing (appearance, color, reflectance, gloss, transmittance, luminance); occupational/drug testing (monitor or measure employees exposure to hazardous substance abuse screening); biological testing (biochemical, toxicological, pharmacological, bacteriological); environmental and hazardous waste analysis (priority pollutants, pesticides, herbicides, metals, PCB's, petroleum); water analysis; food testing (taste, odor, texture); and related training. Includes, but not limited to, reagents, solutions and other directly related supplies.

873-3 Electrical Testing and Analysis Services

Services for electrical testing and analysis include, but are not limited to, qualification, inspection, safety, performance, certification, and compliance testing of manufactured goods to nationally and internationally recognized reliability standards and regulatory requirements and directives (UL, CSA, FCC, ANSI, MIL-STD, etc.); marking services; circuit testing of semiconductors and microprocessors; EMI/EMC testing; dielectric strength and dielectric constant; dissipation factor; electrical insulating materials testing; electrostatic discharge testing; arc resistance testing; hi-pot testing, electrical power system components testing (transformers, dielectric oil, relays, circuit breakers, switchboards, power plants, substations, etc.); screening and destructive analysis of electronic components; and related training.

873-4 Geotechnical and Thermal/Fire Testing and Analysis

Services for geophysical and thermal/fire testing and analysis include, but are not limited to, construction material testing (concrete, roof, asphalt, etc.); geological material testing (soil, rock, etc.); geophysical testing; geosynthetic testing, seismographic testing, oceanographic testing; metrological testing; thermal/heat testing (temperature, fire, flammability, smoke/toxicity, conductivity): and related training.

APPENDIX A

OVERVIEW AND LABOR CATEGORY DESCRIPTIONS

CHEMISTRY AND CHEMICAL ENGINEERING DIVISION OVERVIEW

The Chemistry and Chemical Engineering Division performs research and technical services for industrial and government clients using chemistry and chemical engineering technology. Some of the disciplines covered in the division are environmental engineering evaluations; chemical and process engineering; microencapsulation of substances to achieve a variety of targeted goals; polymer and material sciences; fire protection, certification, and testing services; and analytical services including analysis of any sample in any matrix, drug metabolism investigations, and method development component. SwRI's Chemistry and Chemical Engineering Division is ISO 9001:2008 registered. The division is organized into four departments, as follows:

- Pharmaceuticals and Bioengineering
- Fire Technology
- Analytical and Environmental Chemistry
 - Organic Chemistry
 - Inorganic Chemistry and Radiochemistry
 - Forensic and Specialty Analysis
- Chemical Engineering
 - Fuels Development

POWERTRAIN ENGINEERING DIVISION OVERVIEW

The Powertrain Engineering Division (PED) conducts design, development, and test programs on a wide range of components, engines, transmissions, and vehicles. This is supported by research and modeling of fuel mixing, combustion, tribology, filtration, structural analysis, noise, vibration and harshness (NVH), and fluid flow analysis. The division organizes multi-client cooperative industry research programs in many areas to help manufacturers achieve lower exhaust emissions and to increase fuel economy. The division also develops specialized instruments, control systems, test apparatus, and data acquisition systems to aid in achieving engine and vehicle performance and emissions goals.

PED can accommodate engines and vehicles run on conventional, alternative, and exotic fuels. Each emission dynamometer/test cell has its own dedicated emissions sampling capabilities that include a full flow exhaust constant volume sampling system and analytical instruments. In addition to characterizing regulated emissions of HC, CO, NO_x, PM, and smoke from engine and vehicle exhaust, PED has sampling and analysis facilities for quantifying unregulated emissions, many that are considered to be toxic compounds. Emission sampling, analysis, and engine and vehicle operations comply with EPA Federal Test Procedures (FTP). For processes outside existing practices of FTP, PED uses existing FTP practices as a guide, along with sound engineering judgment, to expand capabilities to satisfy client and research needs.

A primary focus of PED is the study of engine and vehicle emissions. Our staff and facilities have been developed around the science of characterizing emissions from mobile sources. A formal quality system is in place, and our staff is intent on generating accurate and reliable data for our clients. Over more than 45 years, we have served regulatory groups, as well as those subject to regulation and those developing technology to control or reduce emissions from internal combustion engines. SwRI has the facilities, equipment, and the expertise necessary to address the needs of almost any program related to mobile source emissions characterization and control.

The Engine, Emissions and Vehicle Research Division is certified to ISO 9001:2000 "Quality Management Systems - Requirements" and ISO 14001:2004 "Environmental Management Systems." The Emissions Research and Development Department is accredited to ISO/IEC 17025:2005 "General Requirements for the Competence of Testing and Calibration Laboratories." The division has also achieved Ford Tier 1 status for providing engineering services and has received the Ford Q1 Quality Award.

The PED is organized into three departments, as follows:

- Diesel Engines and Emissions R&D
 - Engine Certification and Emission Development
 - Emissions Chemistry
 - Particle Science and Technology
 - Aftertreatment R&D
 - Engine and Aftertreatment Evaluation
 - Diesel Engine R&D

- Spark Ignited Engine and Vehicle R&D
 - Advanced Powertrain and Emissions
 - Ann Arbor Technical Center
 - Powertrain Controls
 - Vehicle Electrification & Energy Storage Technology
 - SI Engine R&D

- Design and Development
 - Large Engine Development
 - Powertrain Design and Development
 - Medium Speed Diesel Engines
 - Powertrain Technology

FUELS AND LUBRICANTS RESEARCH DIVISION OVERVIEW

Since 1952, we have been at the forefront of providing extensive petroleum products research services, including testing to ASTM international, CEC (coordinating European Council) and OEM (original equipment manufacturer) specification testing. We are recognized worldwide for our extensive facilities, experienced staff and innovations in the field of fuels and lubricants testing. We measure the quality and determine regulatory compliance of fuels, automatic transmission fluids, gear lubricants, hydraulic oils, coolants, antifreeze, and gasoline and diesel engine lubricants. We help lubricant, additive, and equipment manufacturers improve and qualify their lubricants. We are the global leader in engine lubricant and driveline fluid testing for factory fill and service fill requirements. Facilities are available to evaluate lubricants against ASTM International (ASTM) and American Petroleum Institute (API) standards as well as International Lubricant Standardization and Approval Committee (ILSAC) requirements. For European ACEA lubricant specifications, we use bench test methods to evaluate service-fill lubricants for gasoline and diesel engines. Gasoline and diesel engine lubricants are evaluated with respect to engine sludge, oxidation, component wear, oil consumption, piston deposits and fuel economy. New engine components are also evaluated to determine acceptability with current lubricants. SwRI offers the lubricant industry diverse research, development and evaluation capabilities unequaled by any of our competitors.



We measure the quality and determine regulatory compliance of fuels, automatic transmission fluids, gear lubricants, hydraulic oils, coolants, antifreeze, and engine lubricants.

SwRI operates a large fuel sampling program where samples are gathered from service stations across the country for analysis in our laboratories. Our test equipment includes octane and cetane engines meeting ASTM Coordinating Fuels Research (CFR) specifications and injector systems for induction system and fuel injector deposit and clean-up studies.

Diesel engine designs continue to evolve to meet ever-changing emissions and fuel economy requirements. The technologies in newer engines, such as high exhaust gas recirculation (EGR), complex exhaust aftertreatment systems, improved combustion systems and higher peak cylinder pressures, place increased demands on crankcase lubricants. Lubricants and lubricant test procedures also continue to evolve to meet these demands.

We are one of the oldest and largest service providers for the evaluation of engine lubricants used in diesel engines for factory fill and service fill requirements. Facilities and staff are available to evaluate lubricants against the American Petroleum Institute (API) CH-4, CI-4, CI-4 PLUS, CJ-4, CK-4 and FA-4 as well as Cummins, Mack, and John Deere requirements. Evaluations are performed with respect to engine oil soot handling, oil oxidation, wear (camshaft lobes, camshaft followers, piston rings, piston liners, and connecting rod bearings), oil consumption, piston deposits, and fuel economy. New design engine components are also evaluated to determine acceptability with current day lubricants. In addition to engine based testing, we perform all related analytical bench tests required to qualify lubricants. SwRI has 43 test stands available for diesel lubricant test procedures, which utilize engines representative of heavy-duty diesel engines operating in modern commercial fleets and off-highway applications, including:

- Caterpillar 1-R (ASTM D6923)
- Caterpillar 1K and 1N (ASTM D6750)
- Caterpillar 1M-PC (ASTM D6618)
- Caterpillar 1P (ASTM D6681)
- Caterpillar C13 (ASTM D7549)
- Cummins ISB (ASTMD7484)
- Cummins ISM (ASTM D7468)
- EOAT (Engine Oil Aeration Test) (ASTM D6894)
- COAT (Caterpillar Oil Aeration Test) (ASTM D8047)
- Detroit Diesel DD13 scuff and fuel economy test (ASTM D8074)
- GM RFWT (ASTM D5966)
- JASO M336 - Detergency Test
- JASO M354 – Valve Train Wear Test
- Mack T-8 (ASTM D5967)
- Mack T-11 (ASTM D7156)
- Mack T-12 (ASTM D7422)
- Mack T-13 (ASTM D8048)

We offer complete testing services for a variety of lubricant specifications for passenger vehicles including International Lubricants Standardization (ILSAC) and ASTM International. The current ILSAC specification for gasoline passenger cars is GF-5. SwRI performs all of the necessary engine-based ASTM lubricant tests required by GF-5 Details are available below for each of these. GF-6 is being defined, and we run all of the tests slated for that specification.

- Sequence IIIF (ASTM D6984)
- Sequence IIIG, IIIGA, IIIGB (ASTM D7320)

- Sequence IIIH (ASTM D8111)
- Sequence IVA (ASTM D6891)
- Sequence IVB (ASTM D8114)
- Sequence VIE/F (ASTM D8226)
- Sequence VIII (ASTM D6709)

We evaluate lubricants used in a variety of two- and four-stroke cycle, air- and water-cooled engines used in outboard marine, and small utility engine applications. Over a dozen test methods based on ASTM-TC, National Marine Manufacturers Association (NMMA), International Standards Organization (ISO) and JASO standards are available to evaluate lubricants ability to resist combustion chamber deposit-induced pre-ignition, prevent ring sticking, inhibit deposit formation, reduce scuffing, resist spark plug fouling and reduce exhaust smoke.

- JASO M340-92 lubricity test
- JASO M341-92 and CEC L-79-T97 detergency tests
- JASO M342-92 smoke test
- JASO M343-92 exhaust system blocking test
- NMMA AF-27 lubricity test
- NMMA CE50S lubricity test
- NMMA CE50S pre-ignition test
- NMMA 15 HP detergency test
- NMMA 40 HP general performance test
- NMMA 115 HP general performance engine test (GPET)

We evaluate transmission fluids, hydraulic fluids, manual transmission rear axle gear lubricants and dry dual clutch transmission fluids, and tractor testing. Automotive fleet lab testing, truck lubricant fuel economy and improvements, durability and reliability evaluation of engine/vehicle compatibility, road simulators, test tracks, on-road coastdown and off-highway evaluations as well as specialized fuel testing.

- SwRI IVS Test Procedure - Top Tier Detergent Gasoline Deposit Control Performance Standards: Intake Valve Sticking (IVS)
- ASTM D6973 - Method for Indicating Wear Characteristics of Petroleum Hydraulic Fluids in a High Pressure Constant Volume Vane Pump
- CEC L-07-95 - Same as 1.08.04-001-002 D5182 - Load Carrying Capacity Test for Transmission Lubricants
- CEC L-84-02 - FZG Scuffing Load Carrying Capacity Test for High EP Oils
- ASTM D7038 - Method for Evaluation of Moisture Corrosion Resistance of Automotive Gear Lubricants
- ASTM D7038 (L-33) - Performance Test for Evaluating Moisture Corrosion Tendencies of Automotive Gear Lubricants
- ASTM D5182 - Standard Test Method for Evaluating the Scuffing Load

Capacity of Oils (FZG Visual Method)

- FZG “S19-2-Verschleiss” - FZG “S19-2-Verschleiss” (ZF Standard Wear)
- ASTM D4998 - FZG Gear Testing
- ASTM D6121 (L-37) - Evaluation of Load-Carrying Capacity of Lubricants Under Conditions of Low Speed and High Torque Used for Final Hypoid Drive Axles
- ASTM D7452 Section 3 - Performance of Gear Lubricants in Axles Under High Speed Pressure and Shock Loading
- ASTM D5704 (L-60-1) - Evaluation of the Thermal and Oxidative Stability of Lubricating Oils Used for Manual Transmissions and Final Drive Axles
- ASTM D5579 - Evaluating the Thermal Stability of Manual Transmission Lubricants in a Cyclic Durability Test
- SSP-180 - Synchronizer Test
- Denison A-TP-30533 - Evaluation of Hydraulic Fluid using the Denison Test Procedure for Hydraulic Fluid Performance Evaluation on Denison Pumps with T6H Hybrid Pump
- JDQ 84 - Water Contamination / Dynamic Corrosion Using Sauer-Danfoss 90 Series Pump
- JDQ 94 - Powershift Transmissions
- JDQ 95 - Spiral Bevel and Final Drive Gear Wear
- JDQ 96 - As Performed with a 1400 Series Axle Brake Torque Variation & Friction Retention
- JDQ 102A - John Deere 102A Shear Rig Test Procedure
- ASTM D5500 - Method for Vehicle Evaluation of Unleaded Automotive Spark-Ignition Engine Fuel for Intake Valve Deposit Formation – BMW IVD
- ASTM D5598 - Method for Evaluating Unleaded Automotive Spark-Ignition Engine Fuel for Electronic Port Fuel Injector (PFI) Fouling
- ASTM D6201 - Method for Dynamometer Evaluation of Unleaded Spark-Ignition Engine Fuel for Intake Valve Deposit Formation - Ford 2.3 L IVD
- TES 389 - Appendix D Frictional Properties
- TO-4 Sect 5 - Wear Properties, Gears - Pumps
- TES 389 - Wear Properties
- TO-4 Sect 6 - Friction Properties
- GMW16444 Appendix K - DEXRON® - VI Aeration
- GMW16444 Appendix F - DEXRON® - VI Cycling
- Appendix J - DEXRON® - VI Low Speed Clutch Friction & Torque Capacity
- Appendix E - DEXRON® - VI Oxidation
- Appendix C - DEXRON® - VI Plate Clutch Friction
- Mercon Appendix 4 - MERCON® V Anti-Shudder Durability
- Mercon Appendix 4 - MERCON® / V / SP Clutch Friction Durability (30,000 Cycles)
- Mercon Appendix 4 - MERCON® / V / SP μ -V Characterization (Negative Slope)
- Mercon Appendix 4 - MERCON® Ford Over-Running Clutch Wear
- ASTM D7043 - Method for Indicating Wear Characteristics of Non-Petroleum

and Petroleum Hydraulic Fluids in a Constant Volume Vane Pump

- JASO T-903 - Clutch Friction
- TES 439 - Appendix C Frictional Properties

We have used radioactive tracer technology (RATT®) for over 50 years to make highly accurate and sensitive, real-time wear measurements in operating engines and other mechanical systems. Friction and wear are typically measured in engines to evaluate lubricant chemistries, component design, and surface coatings. Wear measurements of components can be made using bulk-activated as well as surface-layer-activated methods. Using sophisticated instrumentation, our engineers study real-time wear to instantly detect wear and wear rate changes.

Our fully functional tribology laboratory supports research programs with innovative ideas, technology, and equipment. Our facilities have carefully controlled environmental conditions that house a variety of test benches. We have the tools required for comprehensive tribological studies, including equipment for cooperative research studies, engine benchmarking, lubricant characterization, materials analysis, metrology, research engines and surface analysis. Friction and wear of materials and geometries of engine components and subsystems are characterized using single-cylinder research engines that allow oil changes and oil sampling from the liner or piston assembly while the engine is running, engine component rigs and bench rigs selected to maximize the range of contact geometries and materials. We offer full-scale and laboratory wear-test design, mathematical model development, research, rheology and evaluation and analysis of wear mechanisms.

For the last 60 years, the U.S. Army TARDEC Fuels and Lubricants Research Facility (TFLRF) at SwRI has provided state-of-the-art research, development and engineering services for the U.S. Army's fuels and lubricants needs. The government-owned contractor-operated (GOCO) facility provides technical support services and helps to develop and maintain the Army's specifications for fluids used in ground equipment.

We conduct bespoke fuel and/or lubricant test projects based on individual client needs. These custom projects can range from glassware tests to full vehicle tests, and may include benchtop rigs, stationary dynamometer test rigs, and vehicle evaluations on chassis dynamometers, over the road, and on closed test tracks.

The Fuels and Lubricants Division is organized into four departments, as follows:

- Engine Lubricants Research
- Fuels and Driveline Lubricants Research
- Fuel and Lubricants Technology
- Petroleum Products Research

LABOR CATEGORY DESCRIPTIONS

CHEMISTRY AND CHEMICAL ENGINEERING DIVISION

CHEMISTRY LAB TESTING AND ANALYSIS 1

Task Description

This is the highest technical and management level position at the Institute. Individuals at this level have achieved true technical or managerial eminence in his or her field through technical and program accomplishments and an outstanding record of achievement at the Institute. Individuals assigned in this position:

- Are the senior technical persons in their field and contribute directly to the planning and development of staff and new technology in the chemistry, analytical testing, and chemical engineering area.
- Apply advanced scientific and engineering principles in the development of original research programs.
- Plan future staff, technology, testing and laboratory requirements.
- Generate program ideas based on innovative approaches and knowledge of client needs.
- Perform the technical aspects of investigation at the highest degree of competence.
- Lead program development.
- Manage Institute Divisions and/or Departments.
- Are internationally renowned in their profession.
- Assumes responsibility for highly specialized technical objectives or problems.

Qualifications

Individuals successfully lead major business and technical activities primarily in chemistry, fire technology, and chemical engineering and have built a program or direct multiple program activities in a wide technical field. Technical areas of expertise include, but are not limited to, design, integration, evaluation, instrumentation, method development, research development, chemical analysis and testing. Individuals are capable of formulating a broad perspective of Institute technical activities through technical accomplishments, typically greater than 25 years of experience and an advanced technical degree. Individuals are recognized through peer-review publications, patents, appointments to national or international committees and extensive client and peer interaction. Individuals lead the growth of subordinate staff in their field of expertise.

CHEMISTRY LAB TESTING AND ANALYSIS 2

Task Description

Individuals assigned are recognized as a vital technical resource, having established a reputation for scientific excellence at the Institute and to some extent in the external community. Individuals manage projects, programs and staff members in the pursuit of technical and financial objectives. Individuals assigned in this position:

- Accomplish advanced scientific and engineering work within technical area of expertise and discipline.
- Are recognized as highly qualified in a research specialty and possess a similar reputation with clients and the professional community.
- Develop collaborative efforts in research and development across division and company lines.
- Take the lead in the promotion of new projects and programs while advancing technology.
- Oversee the preparation, presentation, and follow-up of major proposals and/or program results that normally require a high degree of creativity and technical organization.
- Are recognized both internally and externally as an authority in a research specialty.
- Receive invitations to participate in technical conferences and serve on national committees.
- Manage Institute employee sections or large complex programs.

Qualifications

This position requires a bachelor's degree in the individual's field of specialization and twelve years of experience as a minimum. Individuals have superb verbal, written and interpersonal communications skills and are successful in building a technical program and/or program group primarily in chemistry, fire technology, and chemical engineering and have built a program or direct multiple program activities in a wide technical field. Technical areas of expertise include, but are not limited to, design, integration, evaluation, analytical instrumentation, method development, research development, and testing. Acceptable Substitutions: AS and 27 years experience; MA and 11 years experience; PhD and 10 years experience.

CHEMISTRY LAB TESTING AND ANALYSIS 3

Task Description

Individuals at this level demonstrate significant technical leadership within Institute Science and Engineering staff. Individuals contribute to and guide the technical direction of projects. Individuals comprise the corps of knowledgeable, responsible and experienced project managers operating under the technical management line of authority. Individuals serve as project managers of smaller and less complex initiatives or tasks of larger, more complex projects. Individuals assigned in this position:

- Plan, design, coordinate and control the progress of project work to meet client objectives.
- Supervise others as project managers, assuming full responsibility for technical, financial, and work product project completion goals.
- Lead proposal efforts and new promotional work.
- Provide recommendations to management regarding planning, program development and project and promotional efforts.
- Present and publish technical papers.
- Manage technical groups of employees with specific skill sets.

Qualifications

This position requires a bachelor's degree in the individual's field of specialization and 7 years of experience as a minimum. Individuals are successful in managing laboratory, testing and development projects and have the aptitude to lead others and administer the technical, financial, client interaction and organizational aspects of programs primarily in chemistry, fire technology, and chemical engineering and have built a program or direct multiple program activities in a wide technical field. Technical areas of expertise include, but are not limited to, design, integration, evaluation, analytical instrumentation, method development, research development, and testing. Acceptable Substitutions: AS and 22 years experience; MS and 6 years experience; PhD and 5 years experience.

CHEMISTRY LAB TESTING AND ANALYSIS 4**Task Description**

Individuals at this level generally perform project activities in a support capacity. Emphasis at this level is on the development of skills as a project team member, the development of individual technical specializations, the development of abilities to innovatively support technical objectives and to serve as future program leaders. Individuals may manage tasks associated to larger programs and interact with client technical representatives. Individuals assigned in this position:

- Perform work involving conventional chemical investigation within a technical specialty.
- Identify ideas for new projects and ensure technical quality of current project activities.
- Establish working relationships with clients.
- Develop proficiency in writing and verbal presentation skills
- Deal regularly with other researchers across the Institute to collaborate in studies of interest.
- Supervise laboratory staff in testing activities.

Qualifications

This position requires a bachelor's degree in the individual's field of specialization and zero years of experience as a minimum. The individual exercises judgment, diligence and has an aptitude for carrying out assignments primarily in chemistry, fire technology, and chemical engineering and have built a program or direct multiple program activities in a wide technical field. Technical areas of expertise include, but are not limited to, design, integration, evaluation, analytical instrumentation, method development, research development, and testing. Acceptable Substitutions: AS and 15 years experience.

CHEMISTRY LAB TESTING AND ANALYSIS SUPPORT 1**Task Description**

Individuals assigned in these non-exempt positions possess in-depth skills and expertise in a specialty field and provide key support to scientific and engineering project personnel.

Individuals exercise wide latitude in carrying out technical instructions and require minimum supervision. Individuals assigned in this position:

- Utilize personal discretion and knowledge to construct components, modifications and adaptations of standard equipment.
- Troubleshoot problems with test equipment and components.
- Interact with senior staff and clients in discussion of current tests or future activities.
- Provide input to technical reports, proposals and procedures.
- Analyze technical data to uncover anomalies and/or report pertinent data elements.
- Provide training and assist with development of subordinate staff.
- Mentor subordinate technical laboratory staff.

Qualifications

This position requires a High School diploma or equivalent education, an associate degree, trade school education or continuing education and five years of relevant experience as a minimum. Individuals supervise and train subordinate staff and interact with project managers and client technical representatives to ensure proper laboratory testing of products or prototypes primarily in chemistry, fire technology, and chemical engineering and have built a program or direct multiple program activities in a wide technical field. Technical areas of expertise include, but are not limited to, design, integration, evaluation, instrumentation, method development, research development, and testing.

CHEMISTRY LAB TESTING AND ANALYSIS SUPPORT 2

Task Description

Individuals assigned at these non-exempt positions provide support to the skilled senior technical staff. Using developed skills and practical knowledge. The technician is expected to do assigned tasks in the laboratory and/or testing environment under supervision. Individuals assigned in this position:

- Set up experimental apparatus following written or verbal instructions.
- Prepare samples, specimens, prototype instruments and/or test materials following defined procedures.
- Conduct, observe and document standardized test and analyses data following established protocols.
- Conduct routine maintenance on equipment.
- Maintain and order required materials.

Qualifications

This position requires a High School diploma or equivalent education, an associate degree, trade school education or continuing education, and one year of relevant experience as a minimum. Individuals have basic knowledge of tasks associated with the technical area of work with skills in the application of mathematical functions, the use of PC software and hands-on craft abilities. Individuals are able to read schematics, drawings, sketches and technical instructions of testing protocols primarily in chemistry, fire technology, and chemical engineering and have built a program or direct multiple program activities in a wide technical field. Technical areas of expertise include, but are not limited to, design,

integration, evaluation, instrumentation, method development, research development, and testing.

CHEMISTRY LAB TESTING AND ANALYSIS SUPPORT 3

Task Description

Individuals assigned in these non-exempt positions execute all clerical and administrative duties required to support the scientific and engineering staff in the performance of project responsibilities. Individuals use office equipment, and using internal processes to complete required project and Institute correspondence and filing requirements. Individuals organize meetings, make travel arrangements and deal effectively with clients. Individuals assigned in this position:

- Have good communication skills to interact with Institute staff and client representatives.
- Answer telephones and exhibit good judgment in answering basic questions.
- Compile administrative, operating or program data and formats based on instructions or established standards.
- Prepare correspondence, proposals and reports editing for format, spelling, punctuation and grammar.
- Act on their own initiative within defined responsibility to carry out routine tasks and procedures.
- Interact with vendors and support services in the normal execution of duties.

Qualifications

This position requires a High School diploma or equivalent education as a minimum, trade school education or continuing education, certification as a professional secretary, and a minimum of zero years of clerical experience. Individuals provide administrative support to projects primarily in chemistry, fire technology, and chemical engineering and have built a program or direct multiple program activities in a wide technical field. Technical areas of expertise include, but are not limited to, design, integration, evaluation, instrumentation, method development, research development, and testing.

POWERTRAIN ENGINEERING DIVISION

AUTOMOTIVE LAB TESTING AND ANALYSIS 1

Task Description

This is the highest technical and management level position at the Institute. Individuals at this level have achieved true technical or managerial eminence in his or her field through technical and program accomplishments and an outstanding record of achievement at the Institute. Individuals assigned in this position:

- Are the senior technical persons in their field and contribute directly to the planning and development of staff and new technology.
- Apply advanced scientific and engineering principles in the development of original research programs related to powertrains and all components of mobility engineering.
- Plan future staff, technology and laboratory requirements.
- Generate program ideas based on innovative approaches and knowledge of client needs.
- Perform the technical aspects of investigation at the highest degree of competence.
- Lead program development.
- Manage Institute Divisions and/or Departments.
- Are internationally renowned in their profession.

Qualifications

Individuals successfully lead major business and technical activities primarily in automotive engineering and have built a program or direct multiple program activities in a wide technical field. Technical areas of expertise include, but are not limited to, testing and analysis of powertrains, fuel systems, chassis, hydraulics, electronics, control systems, test systems, and contamination control. Individuals are capable of formulating a broad perspective of Institute technical activities through technical accomplishments, typically greater than 25 years of experience and an advanced technical degree. Individuals are recognized through peer-review publications, patents, appointments to national or international committees and extensive client and peer interaction. Individuals lead the growth of subordinate staff in their field of expertise.

AUTOMOTIVE LAB TESTING AND ANALYSIS 2

Task Description

Individuals assigned are recognized as a vital technical resource, having established a reputation for scientific excellence at the Institute and to some extent in the external community. Individuals manage projects, programs and staff members in the pursuit of technical and financial objectives. Individuals assigned in this position:

- Accomplish advanced scientific and engineering work within technical area of expertise and discipline related to powertrains and all components of mobility engineering.
- Are recognized as highly qualified in a research specialty and possess a similar reputation with clients and the professional community.

- Develop collaborative efforts in research and development across division and company lines.
- Take the lead in the promotion of new projects and programs while advancing technology.
- Oversee the preparation, presentation, and follow-up of major proposals and/or program results that normally require a high degree of creativity and technical organization.
- Are recognized both internally and externally as an authority in a research specialty.
- Receive invitations to participate in technical conferences and serve on national committees.
- Manage Institute employee sections or large complex programs.

Qualifications

This position requires a bachelor's degree in the individual's field of specialization and twelve years of experience as a minimum. Individuals have superb verbal, written and interpersonal communications skills and are successful in building a technical program and/or program group primarily in automotive engineering and have built a program or direct multiple program activities in a wide technical field. Technical areas of expertise include, but are not limited to, testing and analysis of powertrains, fuel systems, chassis, hydraulics, electronics, control systems, test systems, and contamination control. Acceptable Substitutions: AS and 27 years experience; MA and 11 years experience; PhD and 10 experience.

AUTOMOTIVE LAB TESTING AND ANALYSIS 3***Task Description***

Individuals at this level demonstrate significant technical leadership within Institute Science and Engineering staff. Individuals contribute to and guide the technical direction of projects. Individuals comprise the corps of knowledgeable, responsible and experienced project managers operating under the technical management line of authority. Individuals serve as program managers of smaller and less complex initiatives or tasks of larger, more complex projects. Individuals assigned in this position:

- Plan, design, coordinate and control the progress of project work to meet client objectives related to powertrains and all components of mobility engineering.
- Supervise others as project managers, assuming full responsibility for technical, financial, and work product project completion goals.
- Lead proposal efforts and new promotional work.
- Provide recommendations to management regarding planning, program development and project and promotional efforts.
- Present and publish technical papers.
- Manage technical groups of employees with specific skill sets.

Qualifications

This position requires a bachelor's degree in the individual's field of specialization and 7 years of experience as a minimum. Individuals are successful in managing laboratory, testing and development projects and have the aptitude to lead others and administer the technical, financial, client interaction and organizational aspects of programs primarily in

automotive engineering and have built a program or direct multiple program activities in a wide technical field. Technical areas of expertise include, but are not limited to, testing and analysis of powertrains, fuel systems, chassis, hydraulics, electronics, control systems, test systems, and contamination control. Acceptable Substitutions: AS and 22 years experience; MS and 6 years experience; PhD and 5 years experience.

AUTOMOTIVE LAB TESTING AND ANALYSIS 4

Task Description

Individuals at this level generally perform project activities in a support capacity. Emphasis at this level is on the development of skills as a project team member, the development of individual technical specializations, the development of abilities to innovatively support technical objectives and to serve as future program leaders. Individuals may manage tasks associated to larger programs and interact with client technical representatives. Individuals assigned in this position:

- Perform work involving conventional investigation within a technical specialty related to powertrains and all components of mobility engineering.
- Identify ideas for new projects and ensure technical quality of current project activities.
- Establish working relationships with clients.
- Develop proficiency in writing and verbal presentation skills
- Deal regularly with other researchers across the Institute to collaborate in studies of interest.
- Supervise laboratory staff in testing activities.

Qualifications

This position requires a bachelor's degree in the individual's field of specialization and zero years of experience as a minimum. The individual exercises judgment, diligence and has an aptitude for carrying out assignments primarily in automotive engineering and have built a program or direct multiple program activities in a wide technical field. Technical areas of expertise include, but are not limited to, testing and analysis of powertrains, fuel systems, chassis, hydraulics, electronics, control systems, test systems, and contamination control. Acceptable Substitutions: AS and 15 years experience.

AUTOMOTIVE LAB TESTING AND ANALYSIS SUPPORT 1

Task Description

Individuals assigned in these non-exempt positions possess in-depth skills and expertise in a specialty field and provide key support to scientific and engineering project personnel. Individuals exercise wide latitude in carrying out technical instructions and require minimum supervision. Individuals assigned in this position:

- Utilize personal discretion and knowledge to construct components, models and adaptations of standard equipment.
- Troubleshoot problems with test equipment and components.

- Interact with senior staff and clients in discussion of current tests or future activities.
- Provide input to technical reports, proposals and procedures.
- Analyze technical data to uncover anomalies and/or report pertinent data elements.
- Provide training and assist with development of subordinate staff.
- Mentor subordinate technical laboratory staff.

Qualifications

This position requires a High School diploma or equivalent education, an associate degree, trade school education or continuing education and five years of relevant experience as a minimum. Individuals supervise and train subordinate staff and interact with project managers and client technical representatives to ensure proper laboratory testing of products or prototypes primarily in automotive engineering and have built a program or direct multiple program activities in a wide technical field. Technical areas of expertise include, but are not limited to, testing and analysis of powertrains, fuel systems, chassis, hydraulics, electronics, control systems, test systems, and contamination control.

AUTOMOTIVE LAB TESTING AND ANALYSIS SUPPORT 2

Task Description

Individuals assigned at these non-exempt positions provide support to the skilled senior technical staff. Using developed skills and practical knowledge. The technician is expected to do assigned tasks in the laboratory and/or testing environment under supervision. Individuals assigned in this position:

- Set up experimental apparatus following written or verbal instructions.
- Prepare samples, specimens, prototype instruments and/or test materials following defined procedures.
- Conduct, observe and document standardized test and analyses data following established protocols.
- Conduct routine maintenance on equipment.
- Maintain and order required materials.

Qualifications

This position requires a High School diploma or equivalent education, an associate degree, trade school education or continuing education, and one year of relevant experience as a minimum. Individuals have basic knowledge of tasks associated with the technical area of work with skills in the application of mathematical functions, the use of PC software and hands-on craft abilities. Individuals are able to read schematics, drawings, sketches and technical instructions of testing protocols primarily in automotive engineering and have built a program or direct multiple program activities in a wide technical field. Technical areas of expertise include, but are not limited to, testing and analysis of powertrains, fuel systems, chassis, hydraulics, electronics, control systems, test systems, and contamination control.

AUTOMOTIVE LAB TESTING AND ANALYSIS SUPPORT 3

Task Description

Individuals assigned in these non-exempt positions execute all clerical and administrative duties required to support the scientific and engineering staff in the performance of project responsibilities. Individuals use office equipment and using internal processes to complete required project and Institute correspondence and filing requirements. Individuals organize meetings, make travel arrangements and deal effectively with clients. Individuals assigned in this position:

- Have good communication skills to interact with Institute staff and client representatives.
- Answer telephones and exhibit good judgment in answering basic questions.
- Compile administrative, operating or program data and formats based on instructions or established standards.
- Prepare correspondence, proposals and reports editing for format, spelling, punctuation and grammar.
- Act on their own initiative within defined responsibility to carry out routine tasks and procedures.
- Interact with vendors and support services in the normal execution of duties.

Qualifications

This position requires a High School diploma or equivalent education as a minimum, trade school education or continuing education, certification as a professional secretary, and a minimum of zero years of clerical experience. Individuals provide administrative support to projects primarily in automotive engineering and have built a program or direct multiple program activities in a wide technical field. Technical areas of expertise include, but are not limited to, testing and analysis of powertrains, fuel systems, chassis, hydraulics, electronics, control systems, test systems, and contamination control.

AUTOMOTIVE LAB TESTING AND ANALYSIS SUPPORT 4

Task Description

Individuals assigned in these non-exempt positions perform entry-level technical support functions of a routine nature under the close supervision of senior technical staff. Individuals at this level have an ability to learn, knowledge of general technical areas and materials and equipment. Individuals assigned in this position:

- Clean laboratory equipment, materials, and components for testing following defined procedures.
- Assist skilled personnel in performing technical work.
- Use PCs and PC applications to maintain test data.
- Conduct routine tests as directed by supervisors following written or verbal protocols.
- Assists with data documentation and analysis.

Qualifications

This position requires a High School diploma or equivalent education, trade school education or continuing education and zero years of relevant experience.

Individuals perform general technical activities that support projects primarily in automotive engineering and have built a program or direct multiple program activities in a wide technical field. Technical areas of expertise include, but are not limited to, testing and analysis of powertrains, fuel systems, chassis, hydraulics, electronics, control systems, test systems, and contamination control.

FUELS AND LUBRICANTS RESEARCH DIVISION**FUELS AND LUBES LAB TESTING AND ANALYSIS 1****Task Description**

This is the highest technical and management level position at the Institute. Individuals at this level have achieved true technical or managerial eminence in his or her field through technical and program accomplishments and an outstanding record of achievement at the Institute. Individuals assigned in this position:

- Are the senior technical persons in their field and contribute directly to the planning and development of staff and new technology.
- Apply advanced scientific and engineering principles in the development of original research programs.
- Plan future staff, technology and laboratory requirements.
- Generate program ideas based on innovative approaches and knowledge of client needs.
- Perform the technical aspects of investigation at the highest degree of competence.
- Lead program development.
- Manage Institute Divisions and/or Departments.
- Are internationally renowned in their profession.

Qualifications

Individuals successfully lead major business and technical activities primarily in automotive engineering and have built a program or direct multiple program activities in a wide technical field. Technical areas of expertise include, but are not limited to, testing and analysis of fuel properties and performance, lubricants, automotive fluids, engine and vehicle components, wear, contamination, failure modes, long-term durability; development of test systems and procedures. Individuals are capable of formulating a broad perspective of Institute technical activities through technical accomplishments, typically greater than 25 years of experience and an advanced technical degree. Individuals are recognized through peer-review publications, patents, appointments to national or international committees and extensive client and peer interaction. Individuals lead the growth of subordinate staff in their field of expertise.

FUELS & LUBES LAB TESTING AND ANALYSIS 2

Task Description

Individuals assigned are recognized as a vital technical resource, having established a reputation for scientific excellence at the Institute and to some extent in the external community. Individuals manage projects, programs and staff members in the pursuit of technical and financial objectives. Individuals assigned in this position:

Accomplish advanced scientific and engineering work within technical area of expertise and discipline.

- Are recognized as highly qualified in a research specialty and possess a similar reputation with clients and the professional community.
- Develop collaborative efforts in research and development across division and company lines.
- Take the lead in the promotion of new projects and programs while advancing technology.
- Oversee the preparation, presentation, and follow-up of major proposals and/or program results that normally require a high degree of creativity and technical organization.
- Are recognized both internally and externally as an authority in a research specialty.
- Receive invitations to participate in technical conferences and serve on national committees.
- Manage Institute employee sections or large complex programs.

Qualifications

This position requires a bachelor's degree in the individual's field of specialization and twelve years of experience as a minimum. Individuals have superb verbal, written and interpersonal communications skills and are successful in building a technical program and/or program group primarily in fuels and fluids engineering and have built a program or direct multiple program activities in a wide technical field. Technical areas of expertise include, but are not limited to, managing fuels, lubricants, functional fluids research, development, and evaluation programs, testing and analysis of fuel properties and performance, lubricants, automotive fluids, engine and vehicle components, wear, contamination, failure modes, long-term durability; development of test systems and procedures. Acceptable Substitutions: AS and 27 years experience; MA and 11 years experience; PhD and 10 years experience.

FUELS & LUBES LAB TESTING AND ANALYSIS 3

Task Description

Individuals at this level demonstrate significant technical leadership within Institute Science and Engineering staff. Individuals contribute to and guide the technical direction of projects. Individuals comprise the corps of knowledgeable, responsible and experienced project managers operating under the technical management line of authority. Individuals serve as program managers of smaller and less complex initiatives or tasks of larger, more complex projects. Individuals assigned in this position:

- Plan, design, coordinate and control the progress of project work to meet client objectives.
- Supervise others as project managers, assuming full responsibility for technical, financial, and work product project completion goals.
- Lead proposal efforts and new promotional work.
- Provide recommendations to management regarding planning, program development and project and promotional efforts.
- Present and publish technical papers.
- Manage technical groups of employees with specific skill sets.

Qualifications

This position requires a bachelor's degree in the individual's field of specialization and 7 years of experience as a minimum. Individuals are successful in managing laboratory, testing and development projects and have the aptitude to lead others and administer the technical, financial, client interaction and organizational aspects of programs primarily in fuels and fluids engineering and have built a program or direct multiple program activities in a wide technical field. Technical areas of expertise include, but are not limited to, managing fuels, lubricants, functional fluids research, development, and evaluation programs, testing and analysis of fuel properties and performance, lubricants, automotive fluids, engine and vehicle components, wear, contamination, failure modes, long-term durability; development of test systems and procedures. Acceptable Substitutions: AS and 22 years experience; MS and 6 years experience; PhD and 5 years experience.

FUELS & LUBES LAB TESTING AND ANALYSIS 4

Task Description

Individuals at this level generally perform project activities in a support capacity. Emphasis at this level is on the development of skills as a project team member, the development of individual technical specializations, the development of abilities to innovatively support technical objectives and to serve as future program leaders. Individuals may manage tasks associated to larger programs and interact with client technical representatives. Individuals assigned in this position:

- Perform work involving conventional investigation within a technical specialty.
- Identify ideas for new projects and ensure technical quality of current project activities.
- Establish working relationships with clients.
- Develop proficiency in writing and verbal presentation skills
- Deal regularly with other researchers across the Institute to collaborate in studies of interest.
- Supervise laboratory staff in testing activities.

Qualifications

This position requires a bachelor's degree in the individual's field of specialization and zero years of experience as a minimum. The individual exercises judgment, diligence and has an aptitude for carrying out assignments primarily in fuels and fluids engineering and have built a program or direct multiple program activities in a wide technical field. Technical areas

of expertise include, but are not limited to, managing fuels, lubricants, functional fluids research, development, and evaluation programs, testing and analysis of fuel properties and performance, lubricants, automotive fluids, engine and vehicle components, wear, contamination, failure modes, long-term durability; development of test systems and procedures.

Acceptable Substitutions: AS and 15 years experience.

FUELS & LUBES LAB TESTING AND ANALYSIS SUPPORT 1

Task Description

Individuals assigned in these non-exempt positions possess in-depth skills and expertise in a specialty field and provide key support to scientific and engineering project personnel. Individuals exercise wide latitude in carrying out technical instructions and require minimum supervision. Individuals assigned in this position:

- Utilize personal discretion and knowledge to construct components, models and adaptations of standard equipment.
- Troubleshoot problems with test equipment and components.
- Interact with senior staff and clients in discussion of current tests or future activities.
- Provide input to technical reports, proposals and procedures.
- Analyze technical data to uncover anomalies and/or report pertinent data elements.
- Provide training and assist with development of subordinate staff.
- Mentor subordinate technical laboratory staff.

Qualifications

This position requires a High School diploma or equivalent education, an associate degree, trade school education or continuing education and five years of relevant experience as a minimum. Individuals supervise and train subordinate staff and interact with project managers and client technical representatives to ensure proper laboratory testing of products or prototypes primarily in fuels and fluids engineering and have built a program or direct multiple program activities in a wide technical field. Technical areas of expertise include, but are not limited to, managing fuels, lubricants, functional fluids research, development, and evaluation programs; testing and analysis of fuel properties and performance, lubricants, automotive fluids, engine and vehicle components, wear, contamination, failure modes, long-term durability; development of test systems and procedures.

FUELS & LUBES LAB TESTING AND ANALYSIS SUPPORT 2

Task Description

Individuals assigned at these non-exempt positions provide support to the skilled senior technical staff. Using developed skills and practical knowledge. The technician is expected to do assigned tasks in the laboratory and/or testing environment under supervision. Individuals assigned in this position:

- Set up experimental apparatus following written or verbal instructions.
- Prepare samples, specimens, prototype instruments and/or test materials following defined procedures.
- Conduct, observe and document standardized test and analyses data following established protocols.
- Conduct routine maintenance on equipment.
- Maintain and order required materials.

Qualifications

This position requires a High School diploma or equivalent education, an associate degree, trade school education or continuing education, and one year of relevant experience as a minimum. Individuals have basic knowledge of tasks associated with the technical area of work with skills in the application of mathematical functions, the use of PC software and hands-on craft abilities. Individuals are able to read schematics, drawings, sketches and technical instructions of testing protocols primarily in fuels and fluids engineering and have built a program or direct multiple program activities in a wide technical field. Technical areas of expertise include, but are not limited to, managing fuels, lubricants, functional fluids research, development, and evaluation programs; testing and analysis of fuel properties and performance, lubricants, automotive fluids, engine and vehicle components, wear, contamination, failure modes, long-term durability; development of test systems and procedures.

FUELS & LUBES LAB TESTING AND ANALYSIS SUPPORT 3

Task Description

Individuals assigned in these non-exempt positions execute all clerical and administrative duties required to support the scientific and engineering staff in the performance of project responsibilities. Individuals use office equipment and using internal processes to complete required project and Institute correspondence and filing requirements. Individuals organize meetings, make travel arrangements and deal effectively with clients. Individuals assigned in this position:

- Have good communication skills to interact with Institute staff and client representatives.
- Answer telephones and exhibit good judgment in answering basic questions.
- Compile administrative, operating or program data and formats based on instructions or established standards.
- Prepare correspondence, proposals and reports editing for format, spelling, punctuation and grammar.
- Act on their own initiative within defined responsibility to carry out routine tasks and procedures.
- Interact with vendors and support services in the normal execution of duties.

Qualifications

This position requires a High School diploma or equivalent education as a minimum, trade school education or continuing education, certification as a professional secretary, and a minimum of zero years of clerical experience. Individuals provide administrative support to projects primarily in fuels and fluids engineering and have built a program or direct multiple

program activities in a wide technical field. Technical areas of expertise include, but are not limited to, managing fuels, lubricants, functional fluids research, development, and evaluation programs; testing and analysis of fuel properties and performance, lubricants, automotive fluids, engine and vehicle components, wear, contamination, failure modes, long-term durability; development of test systems and procedures.

FUELS & LUBES LAB TESTING AND ANALYSIS SUPPORT 4

Task Description

Individuals assigned in these non-exempt positions perform entry-level technical support functions of a routine nature under the close supervision of senior technical staff. Individuals at this level have an ability to learn, knowledge of general technical areas and materials and equipment. Individuals assigned in this position:

- Clean laboratory equipment, materials, and components for testing following defined procedures.
- Assist skilled personnel in performing technical work.
- Use PCs and PC applications to maintain test data.
- Conduct routine tests as directed by supervisors following written or verbal protocols.
- Assists with data documentation and analysis.

Qualifications

This position requires a High School diploma or equivalent education, trade school education or continuing education and zero years of relevant experience. Individuals perform general technical activities that support projects primarily in fuels and fluids engineering and have built a program or direct multiple program activities in a wide technical field. Technical areas of expertise include, but are not limited to, managing fuels, lubricants, functional fluids research, development, and evaluation programs; testing and analysis of fuel properties and performance, lubricants, automotive fluids, engine and vehicle components, wear, contamination, failure modes, long-term durability; development of test systems and procedures.

APPENDIX B

LABOR RATES

Schedule 66 - Contract No. GS-07F-6087P	Rate	Rate	Rate	Rate	Rate	Rate
Labor Category	FY19 9/13/18 to 9/12/19	FY20 9/13/19 to 9/12/20	FY 21 09/13/20 to 09/12/21	FY22 09/13/21 to 09/12/22	FY23 09/13/22 to 09/12/23	FY24 09/13/23 to 09/12/24
Chemistry and Chemical Engineering Division						
Chemistry Lab Testing and Analysis 1	\$ 373.86	\$ 386.00	\$ 398.43	\$ 409.88	\$ 422.25	\$ 435.20
Chemistry Lab Testing and Analysis 2	\$ 240.10	\$ 247.89	\$ 255.87	\$ 263.23	\$ 271.18	\$ 279.50
Chemistry Lab Testing and Analysis 3	\$ 174.12	\$ 179.77	\$ 185.56	\$ 190.89	\$ 196.65	\$ 202.68
Chemistry Lab Testing and Analysis 4	\$ 126.16	\$ 130.26	\$ 134.45	\$ 138.32	\$ 142.50	\$ 146.87
Chemistry Lab Testing and Analysis Support 1	\$ 89.56	\$ 92.47	\$ 95.45	\$ 98.19	\$ 101.15	\$ 104.25
Chemistry Lab Testing and Analysis Support 2	\$ 64.86	\$ 66.97	\$ 69.13	\$ 71.12	\$ 73.27	\$ 75.52
Chemistry Lab Testing and Analysis Support 3	\$ 77.84	\$ 80.37	\$ 82.96	\$ 85.35	\$ 87.93	\$ 90.63
Powertrain Engineering Division						
Automotive Lab Testing and Analysis 1	\$ 387.00	\$ 399.56	\$ 412.42	\$ 424.28	\$ 437.09	\$ 450.50
Automotive Lab Testing and Analysis 2	\$ 269.09	\$ 277.82	\$ 286.76	\$ 295.00	\$ 303.91	\$ 313.23
Automotive Lab Testing and Analysis 3	\$ 188.29	\$ 194.40	\$ 200.66	\$ 206.43	\$ 212.66	\$ 219.18
Automotive Lab Testing and Analysis 4	\$ 150.92	\$ 155.82	\$ 160.84	\$ 165.46	\$ 170.46	\$ 175.69
Automotive Lab Testing and Analysis Support 1	\$ 102.62	\$ 105.95	\$ 109.36	\$ 112.50	\$ 115.90	\$ 119.45
Automotive Lab Testing and Analysis Support 2	\$ 64.58	\$ 66.68	\$ 68.83	\$ 70.81	\$ 72.95	\$ 75.19
Automotive Lab Testing and Analysis Support 3	\$ 102.28	\$ 105.60	\$ 109.00	\$ 112.13	\$ 115.52	\$ 119.06
Automotive Lab Testing and Analysis Support 4	\$ 79.80	\$ 82.39	\$ 85.04	\$ 87.48	\$ 90.12	\$ 92.88
Fuels and Lubricants Research Division						
Fuels and Lubes Lab Testing and Analysis 1	\$ 396.85	\$ 409.73	\$ 422.92	\$ 435.08	\$ 448.22	\$ 461.97
Fuels and Lubes Lab Testing and Analysis 2	\$ 264.67	\$ 273.26	\$ 282.06	\$ 290.17	\$ 298.93	\$ 308.10
Fuels and Lubes Lab Testing and Analysis 3	\$ 188.74	\$ 194.87	\$ 201.14	\$ 206.92	\$ 213.17	\$ 219.71
Fuels and Lubes Lab Testing and Analysis 4	\$ 145.54	\$ 150.26	\$ 155.10	\$ 159.56	\$ 164.38	\$ 169.42
Fuels and Lubes Testing and Analysis Support 1	\$ 103.87	\$ 107.24	\$ 110.69	\$ 113.87	\$ 117.31	\$ 120.91
Fuels and Lubes Lab Testing and Analysis Support 2	\$ 59.26	\$ 61.18	\$ 63.15	\$ 64.97	\$ 66.93	\$ 68.98
Fuels and Lubes Lab Testing and Analysis Support 3	\$ 70.80	\$ 73.10	\$ 75.45	\$ 77.62	\$ 79.96	\$ 82.41
Fuels and Lubes Lab Testing and Analysis Support 4	\$ 57.87	\$ 59.75	\$ 61.67	\$ 63.44	\$ 65.36	\$ 67.36