

**ANNEX 5.6**  
**SPECIAL OPERATIONS AND MAINTENANCE TEST COMPLEX**

5.6 OPERATIONS AND MAINTENANCE

5.6.1 General Information

5.6.1.1 Annex Description

This Annex defines the anticipated workload and special requirements for maintenance engineering, operations engineering and the implementation of required work for the Test Complex, Base, Resident Agencies and others. The Test Complex work is by definition in support of test programs and, as such, is critical to performing the mission of SSC as the Lead NASA Test Center for Rocket Propulsion. It is intended that sufficient work will be identified prior to the start of each fiscal year so that a core of dedicated engineers and craft persons will be available to perform test complex, base and resident agency work. This core level of work is identified in the Related Requirements and Information section of this annex and the FAMRP (See 5.1.2).

5.6.1.2 Planning

It is the intent of the Government that those maintenance activities that can be planned in advance (i.e. the design and implementation of the annual facility maintenance projects and design work for the Pressure Vessel Recertification Program) will have a work order issued prior to the start of each fiscal year. The Contractor shall work closely with the Contracting Officer to assure a clear understanding of the workload for each fiscal year.

5.6.1.3 Location of Services

The Contractor will be required to perform maintenance work throughout Stennis Space Center. The metes and bounds of SSC are defined in the SSC Master Plan. Delineation of test complex, institutional base and other areas are clearly defined in the Master Plan. (See 5.1.2)

5.6.1.4 Bench Stock

The Contractor shall be responsible to procure and maintain a level of bench stock to support the various kinds of work defined in this annex, such as machining, welding/fabrication and in the processing of fluid components (FCPF). The requirements for bench stock are defined in the Related Requirements and Information of each sub-annex of this annex. This bench stock is not to be confused with warehouse bench stock as specified in Annex 9.2. Bench stock is defined as material which will turn over at least 3 times per year, cannot be readily obtained through normal purchasing procedures in time to support a need for work requirements, is not carried as part of warehouse stock or there is a cost savings to the Government due to quantity discounts. Exception to the turnover rate can be made by the Government if the material cannot be obtained and certified for use within a turnover cycle (4 months).

5.6.1.5 Restrictions, Limitations & Special Conditions

Access control: The test complexes have strict procedures for daily access to perform work. Delays may be expected for access during testing or data operations. Digging in the test complexes is forbidden on test days without prior approval of the test stand managers. Obtaining permission for access from the test complex test stand engineers or manager is the responsibility of the Contractor. The Contractor is expected to be flexible to reassign workers to alternate work tasks when access is denied.

5.6.1.6 Operation Plan (DR 5-GA15)

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The Contractor will write and submit to the CO within 90 days of contract award an Operation's Plan. This Plan is to define how the Contractor will perform the work in this annex.

5.6.1.7 Documentation

All work shall be accomplished by approved work order. The contractor shall maintain job files for each work request. Documentation shall include: drawings or sketches, cost sheets, cost estimates, engineering calculations, bill of material, Certificate of Completion (COC), vendor data, parts books, work orders or other requirements documents, and other miscellaneous job information. This information shall be readily available to the Government.

5.6.1.8 Reporting

The Contractor shall submit the following reports to the Government (DR 5-GA20):

1. Daily, work schedule: This information will be integrated into the site wide **\*\*Master Schedule Data (See DR 5-GA19)\*\***. It is maintained by others.
2. Monthly: Work Order Completion Report; Backlog Report; Summary Report by Cost Center; Cost of Maintenance by Program and split out into the eight maintenance categories defined by the **\*\*NASA Maintenance Manual NHB 8831.2A \*\*** latest version. The Contractor shall be able to provide cost data for each facility (by facility number) and a lump sum cost for all facilities which do not have facility numbers.
3. Quarterly: Job Completion Report (Status of work orders completed during the fiscal year quarter and a summary of backlog of work)

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5.6.2	Provide Test Complex Capability	<p>The Contractor shall maintain work capability sufficient to support anticipated base-load work in the test complexes. The crews assigned to support test programs are to be experienced and have a corporate knowledge of the procedures, systems and the types of work in the test complexes. It is important that the crews be flexible to changes in work place and type of work due to daily flexing of test schedules. Daily coordination with test stand managers is mandatory to avoid conflicts with test schedules and other testing functions. Workload is a combination of very short turn-a-round repairs post test, repairs and fabrications in-situ between tests, internal repairs and modifications. Overtime demands for these crews can be high depending on customer requirements and the frequency of testing activities. It is normal practice to provide a repair crew within one hour of a breakdown or failure. These repair efforts can range from a few hours to two weeks or longer, and may involve an all out effort to complete the repair and get the test stands back into service.</p> <p>Historical annual work effort for craftwork is as follows: base workload in test complex requires 15 manyears of welding, 6 manyears of carpenters/laborers and 3 manyears of expediting/tool crib effort. Historical peak workload is : 30 manyears of welding/fabrication, 12 manyears of carpenters/laborers and 4 manyears of expediting/tool crib effort.</p> <p>The workload for engineering is defined in 5.6.2.4.</p>		<p>The Contractor shall be able to respond within one hour from notification and be able to provide 24 hours/day repair capability 7 days per week for a period not to exceed 3 weeks. The Contractor shall be able to set up a crew, be on the job site and be prepared to work continuously until the job is completed. The contractor shall complete all work within schedule. Rework shall not be an excusable delay.</p>

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5.6.2.1	Provide Fabrication and Welding Capability	<p>The contractor shall have or have access to the capability to perform shop and field fabrication for the: manufacture, repair and modification of on-site structures, piping, pressure vessels, equipment and other various fabrications and assembled items. Welding procedures must be developed (if not already available) to be able to weld complicated structures and welding of various steel alloys and other metals. The Contractor shall be able to provide capability to weld using: SMAW (stick welding), GTAW (gas tungsten arc), GMAW (gas metal arc) and use other techniques such as silver soldering, arc gouging and oxygen/acetylene cutting to achieve exceedingly high quality end results. Welding shall pass radiograph, dye penetrant, ultrasonic, acoustic and other inspection criteria equal to standards of the nuclear power industry. Welders must be certified in order to perform work on the particular work being accomplished. The work consists of fabricating and repairing piping, structures and components utilizing the latest welding and fabricating techniques. The materials used may be of various metals and other materials including, but not limited to: stainless steels, aluminum, carbon steel, cast iron, copper, bronze, alloys, Teflon, and non-metallics. The Contractor shall be able to provide pressure vessels to <b>**ASME Division I and Division II standards**</b> and be ASME certified and stamped with a "U" code stamp for new pressure vessels and an "R" code stamp for repairs to pressure vessels. The work also includes extensive welding in field locations, including welding on and around flight hardware. The welding and fabrication work is normally</p>	<p>Maximum Workload:  154 work packages/year (average 385mh/work package including overtime) This equates to the minimum work load defined in the Related Requirements Section. The Contractor shall have the ability to augment the welders to achieve a work load of 150% of the minimum for a period of up to two weeks with a 7 day advance notice. This peak work load may occur up to 4 times in one year.</p>	<p>Unless otherwise stated on the approved engineering packages, all fabrication and welding shall be accomplished in accordance with the <b>**SSC Engineering Standards, ASME Unfired Pressure Vessel Code, Division I and II, ANSI**</b> or other industry standards. All welding shall be free from defects as determined by inspection procedures as defined in the standards and requirements documents.</p> <p>Initial acceptance rate for welds shall exceed 90%.</p>

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		<p>performed from detailed engineering drawings, sketches or from a work order that requires the development of a shop work package.</p> <p>Historical work data:</p> <p>The welding/fabrication personnel have historically been part of the multi-craft capability as defined in Item No. 5.6.2.5. with augmentation from the institutional base shop as required during periods of high work load.</p> <p>Maximum work load can be as high as:            Craft Labor straight time = 60,000 mh/yr            Craft Labor overtime = 8,000 mh/yr</p> <p>Minimum work load is anticipated to be at least:</p> <p>Craft Labor straight time = 36,000 mh/yr            Craft Labor overtime = 2,500 mh/yr</p> <p>Overtime work is common for repair work with 60-hour weeks occurring approximately 10% of the time.            Note: this workload is for the test complexes only. Institutional Base work is defined in Item No. 5.4</p>		
5.6.2.1.1	Reserved			
5.6.2.1.2	Operational Requirements	The Contractor shall provide welding and fabrication capability to perform all requirements associated with: fabrication of shapes, repair of structures and components, and fabrication of new structures	Contractor determined	Contractor shall complete all Work Plans within schedule and cost.

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		<p>Special Test Equipment (STE) as defined by the requirements from test programs, base activities and resident agencies at SSC. The Contractor shall determine staffing levels, skill mix, and perform the training and certification required to accomplish work elements identified in this annex.</p> <p>Welding personnel certification requirements must provide assurance that the stringent requirements for precision and weld quality for test programs can be met. Work must pass rigid inspection criteria by methods such as dye-penetrant, ultrasound, hydrotest, pneumostatic, acoustic, radiographic and magnaflux inspections.</p> <p>The requirements for quick turn-a-round repairs and fabrication are common. The Contractor must have in place a work control process that can assess the prioritization between multiple customers and to communicate on a daily basis with the customer leads on statusing and scheduling changes.</p> <p>The contractor shall have capability to perform field repairs and fabrication of items. The requirements for repairs and fabrications are frequently determined by others, but the method to meet the requirements is the responsibility of the contractor.</p> <p>Major equipment currently available and utilized to perform fabrication and welding operations is listed in Table 5.6-1</p>		

Fabrication and Welding requirements include the

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5.6.2.1.3	Reserved	preparation of detailed documents which list the steps required in the fabrication and repair activities. These documents (work plans) are required prior to working on any critical system.		
5.6.2.1.4	Maintain Bench Stock	The Contractor shall be required to procure and maintain bench stock at the existing value at start of contract. Replenishment shall be by approved work order or by specific funding line item. Bench stock is defined as: fabrication material such as pipe, plate, shapes, welding rod and wire and other materials which are not unique to any particular job effort but does not include operating supplies. It is intended that bench stock will be a zero cost against shop overhead, which means that any usage must be charged against the shop orders and then reordered to keep the dollar level of the bench stock at the agreed to level. Historically, bench stock value is approximately \$75,000.	Contractor Determined	Inventory level will be attained within 120 days after contract award. Dollar level of bench stock inventory shall be maintained plus or minus 20% from the inventory value. Inventory level shall not be more than 10% below the baseline value for more than 30 consecutive calendar days in any 6-month period. Inventory mix shall be continually adjusted to fit the current workflow through the shop.
5.6.2.2	Provide Machining Capability	The nature of the mission of SSC requires that many parts and components are manufactured to special order or repaired as required. The Contractor shall have the capability to provide this service in a timely manner in accordance with customer requirements. The Contractor shall have the capability to provide	Maximum 248 work packages per year. Work packages average 34 mh each. The contractor shall be able to work at 150%	Complete all work plans on schedule and in accordance with drawings or <b>**SSC Engineering Standards**</b> tolerances.

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		<p>precision machining support in materials such as stainless steel alloys, carbon steel, various alloys, other metals and non-metallic materials such as Teflon. The work is accomplished by approved work order and as a normal practice is produced from detailed drawings. Tolerances must meet or exceed the accuracy given in the SSC engineering standards <b>**SSC Engineering Standard 66-505**</b> or drawings. The contractor shall also be able to produce machined components from sketches or from verbal instructions from the requestor. The Contractor shall produce cost estimates as requested on the work order. This service is normally utilized for quick turn-a-round requirements which cannot be obtained from outside vendors or manufacturers in a timely or cost effective manner.</p> <p>The historical work load for machining is 3 manyears/year. Peak workload is 6 manyears/year.</p>	<p>of this work rate for a period not to exceed two weeks with 7 days advance notice. This rate may occur up to 4 times/yr.</p>	
5.6.2.2.1	Reserved			
5.6.2.2.2	Operational Requirements	<p>The Contractor shall provide sufficient capability to be able to supply accurately machined parts used in the support of test programs, base activities, other on-site contractors and tenant agencies at SSC.</p> <p>Machining tolerance requirements are stringent for components used in test programs. Components must be manufactured to strict design criteria and pass rigid inspection criteria. It is normal for the machine shop to work to detailed engineering drawings, but sketches or verbal concept requirements may be utilized as necessary and the machinists must be able to interpret sketches and verbal requirements</p>	Contractor Determined	

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		<p>definition and then to manufacture the items in accordance with <b>**SSC Engineering Standards**</b>.</p> <p>The requirements for quick turn-a-round repairs are common. The Contractor must have in place a work control organization that can assess the prioritization between multiple customers and to communicate on a daily basis with the customer leads on statusing and scheduling changes.</p> <p>The major portion of work requirements involve work in a machine shop environment; however, there may be minimal requirements for field work. (An example might be to reface a flange surface on a piping system in the field.)</p>		
5.6.2.2.3	Provide operation and maintenance of machine shop equipment	Maintain machine shop equipment and tooling. The list of major equipment is tabulated in Table 5.6-2. Should the Contractor elect not to utilize any piece or pieces of equipment, the Contractor shall provide a cost estimate to the Government to preserve the equipment in-situ such that the equipment will be preserved for a period of at least 5 years. The Contractor will assess and report on the operating condition of the equipment before it is taken out of service.	Nothing additional	Machine shop equipment and tooling and the work area shall be maintained free of corrosion. Equipment shall be capable of machining to accuracies expected from this age of equipment.
5.6.2.2.4	Maintain Bench Stock	The Contractor is required to procure and maintain bench stock at the existing value at start of contract. Bench stock for machining work includes such items such as bar stock, shapes, plate, forgings and other items that fall under the category of bench stock as defined in 5.6.1.4.	Contractor determined	Inventory level will be attained within 120 days after contract award. Dollar level of bench stock inventory shall be maintained plus or minus

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		The Contractor shall manage the bench stock in accordance with Annex 9.2 of this Contract.		20% from the inventory value. Inventory level shall not be more than 10% below the baseline value for more than 30 consecutive calendar days in any 6 month period. Inventory mix shall be continually adjusted to fit the current work flow through the shop.
5.6.2.3	Operate Fluid Component Processing Facility (FCPF)	The Fluid Component Processing Facility currently located in Building 2205 provides extensive component inspection, repair, cleaning, and packaging capability in the shop and in the field. The Contractor shall staff, operate and maintain this facility in accordance with the sub-elements listed in this Annex.  Historic work load: 34,000 man-hours/year craft labor and 13,000 man-hours/year engineering services. See Table 5.6-3	Maximum 20,600 tasks/yr. The average task is 2 mh for craft labor. Engineering services should be included in 5.6.2.4.2.	See Below
5.6.2.3.1	Reserved			
5.6.2.3.2	Operate Systems and Equipment	The Contractor is responsible for operator maintenance of the installed and tagged equipment used by FCPF in performing work on components. Table 5.6-4 lists the significant equipment used by FCPF.		Equipment and systems shall be operable.
5.6.2.3.2.1	Operate and Maintain Clean Line	The Contractor shall operate the clean line that uses chemicals to clean component parts. All materials and chemicals used to operate the clean line are to be		Chemicals shall be controlled such that cleaning levels can be

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		charged to this annex. The Contractor will have an operating procedure that clearly defines safe operation of this system.		obtained.
5.6.2.3.2.2	Operate and Maintain Clean Room	The clean room shall be operated by certified technicians and maintained to <b>**Federal Standard 209E, Class 10,000**</b> . The Contractor shall prepare an internal operating procedure to assure that this system will maintain cleanliness of cleaned components.		Cleanliness level shall be maintained. All components shall be cleaned and certified in accordance with requirements as defined in DR 6-RA01, <b>**SSC Engineering Standards 79-001, 79-002, 79-010 and TP 0144**</b>
5.6.2.3.2.3	Operate and Maintain Valve Testing Systems	The Contractor shall operate and maintain the pressure testing equipment for the certified pressure testing of relief valves and other components.		Equipment shall be in calibration and able to test to design level.
5.6.2.3.2.4	Operate and Maintain the Component Inspection Room	The Contractor shall operate and maintain an area utilized for the inspection, buy-off and packaging of cleaned components.		Area shall be orderly and components available for Government inspection.
5.6.2.3.2.5	Operate Installed and NASA Tagged Equipment	Operate and maintain the equipment listed in table 5.6-4 If the Contractor elects not to use any piece of equipment, the Contractor shall furnish the Government with a cost estimate to preserve the equipment for a period of 5 years.		The Contractor shall be responsible for inventorying and maintaining the equipment at a 90% availability factor.
5.6.2.3.2.6	Operate Tubing Manufacturing System	The Contractor will operate and maintain the tubing manufacturing system that is used to make flared tubing. The FCPF shall have the capability of manufacturing, bending and installing high pressure		The equipment will be capable of a 95% availability factor.

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		tubing (up to 15,000 psi working pressure) up to 2 inches in diameter.		
5.6.2.3.3	Capability Requirements: Repair Components and Other Devices on Demand	The FCPF will receive, inspect, provide ROM repair, test, clean, certify cleanliness, package and ship components/assemblies/ subassemblies and document all inspection, testing and repairs in accordance with SSC engineering standards. In addition to shop work, the FCPF crew will provide field labor to test, and/or remove components to the shop for testing and repair and reinstall the components in the field.	Contractor Determined	All work packages will be scheduled, prioritized in accordance with customer need date and completed within the schedule. Work shall meet or exceed standards, specifications or other requirements.
5.6.2.3.4	Shop Equipment and Tooling	See Table 5.6-4		
5.6.2.3.5	Purchase and Maintain Soft Goods and Other Bench Stock	The Contractor shall be required to procure and maintain bench stock at the existing value at the start of the contract. Replenishment shall be by approved work order or by specific funding line item. Bench stock is defined as: lox compatible soft goods, miscellaneous soft goods, component repair kits, teflon, bags, tape, grease, miscellaneous bolts, washers and nuts, miscellaneous tubing fittings, and miscellaneous cleaning supplies which are not unique to any particular job effort but does not include operating supplies. It is intended that bench stock will be a zero cost against shop overhead, which means that any usage must be charged against the shop orders and then reordered to keep the dollar level of the bench stock at the agreed to level. Historically, bench stock value is about \$300,000.00.		Inventory level will be attained within 120 days after contract award. Dollar level of bench stock inventory shall be maintained plus or minus 20% from the inventory value. Inventory level shall not be more than 10% below the baseline value for more than 30 consecutive calendar days in any 6 month period. Inventory mix shall be continually adjusted to fit the current work flow through the shop.
5.6.2.4	Provide Test Complex Engineering	There are special requirements for engineering work	See Below	

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		<p>for test programs and for test complex facility maintenance. These requirements are divided into three areas: Component Engineering, Area Engineering and Field engineering. The special requirements for each of these requirements are listed in the sub-annexes below: Historical Work Load Data:</p> <p>Component Engineering:            Test Complex – 6-1/2 my/yr            Base – 1/2 my/yr</p> <p>Area Engineering:            Area Engineering – 1-1/2 my/yr            Rapid Designs – 3-1/2 my/yr            PVR Program – 1-1/2 my/yr            Drafting Support – 2 my/yr</p> <p>Field Engineering            Field Engineers – 3 my/yr            Expediting/Material Gathering – 2 my/yr</p>		
5.6.2.4.1	Reserved			
5.6.2.4.2	Provide Engineering Services	See below		
5.6.2.4.2.1	Provide Component Engineering Capability	<p>The requirements are:</p> <ol style="list-style-type: none"> <li>Maintain, update and write specifications for components. These standards are called <b>**Standardized Control Drawings (SCD's or commonly called B00-Specs.)**</b>. The responsibility for selection of components for the correct application and maintenance of all component site standards and procurement specifications falls within this organization.</li> </ol>	<p>Maximum 430 tasks/yr for SCD's</p> <p>Maximum 215 tasks/yr in FCPF</p> <p>1 annual task for spares requirements document</p>	<p>SCD's will be current and changes will be input within 3 months of requirement. Engineering decisions will be completed within 1 day for shop work. Customer coordination will be timely and technically in accordance with SSC</p>

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		<ol style="list-style-type: none"> <li>2. This includes engineering in the FCPF and, as such, makes all engineering decisions regarding repair techniques, application of components and piece parts, and disposition of Discrepancy and Corrective Action reports for components. Close interface with shop and quality personnel is required along with good customer relations.</li> <li>3. This function coordinates the procurement of spare parts for various programs and base side. As part of this effort, maintain a data base on all backlog of spares requirements, canvas customers annually on their requirements for the next year, and provide a prioritized listing of requirements for spares prior to the start of each fiscal year. The requirements for spares shall be segregated by program. Synergy and commonality between programs shall be cost reduction emphasis. This function shall serve as the advocate for spares procurement and coordinate all annual requirements with the various NASA Program Offices and Construction Group. Construction and maintenance activities shall develop spare parts lists which are divided into: large dollar spares, operating spares and consumable startup items.</li> <li>4. This function coordinates spares procurements to meet customer need dates, maintain a data base on the status of each item and provides the customer with weekly or monthly updates in delivery information. (Depending on the criticality of the customer requirements, this update procedure may be required daily but no less often than monthly.)</li> </ol>		standards.

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		<p>5. Review shop bench stock and assure that quantities and type of material are adequate to meet customer needs.</p> <p>6. Provide cost estimates for repairs.</p>		
5.6.2.4.2.2	Provide Area Engineering Capability	The following functions are performed: Provide design engineering and drafting for the Pressure Vessel Recertification Program; Plan and coordinate all facility maintenance projects; Provide support to field engineering for maintenance and construction projects; Provide coordination and corporate knowledge for all test complex facilities maintenance; Provide drafting support for design packages, and construction drawings; and coordinate the Annual Facilities Maintenance Inspection, maintain the Backlog of Maintenance (BMAR) databases and develop the maintenance five-year plan.	<p>Designs: 43/year</p> <p>Write Shop Packages: 160/year</p> <p>Studies, &amp; engineering evaluations: 54/yr</p> <p>Work Coordination: 140/yr</p> <p>Status Meetings: 52/yr</p> <p>Reports: 12/month</p> <p>Quick response/problem solving: 27/yr</p> <p>Pressure Vessel initial certifications: 15/yr.</p> <p>Recertifications: 10/yr.</p> <p>Periodic inspections of pressure vessels: 80/yr.</p> <p>CADD: 325/yr.</p>	
5.6.2.4.2.3	Provide Field Engineering Services	The Field Engineering function is responsible for managing, planning and implementing craft type work in the test complexes. These functions are critical functions and require extensive maintenance and construction experience on high pressure gas, liquid and cryogenic systems. The field engineers are responsible for assuring that work is accomplished in accordance with the work packages or designs and	410 tasks/year	Complete all tasks within schedule and cost.

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		that the end product of the work meets or exceeds the requirements.		
		Required personnel qualifications shall be compatible with Annex 3.		
5.6.2.5	Provide multi-craft capability	Craft capability is required to implement repair and construction projects and to perform normal maintenance activities in the Test Complexes. The work is normally quick turn-on and completion in nature. The expediting, field warehouse, tool crib, and bench stock and storage yard. All of these activities are for quick response capability and to manage and implement the basic workload within the test complexes.	380 tasks/year plus 150 tasks/year for minor maintenance trouble calls.	All tasks shall be completed within the scheduled completion date and the quality of work shall be in accordance with specifications and site wide standards.
		Historic work load: 6 manyears of carpenters/laborers, 5 electricians, 1 tool crib person, 1-1/2 expeditor/runner, 3 painters (This is the minimum work load; historic average work load exceeds this by a factor of 2 for the hands-on craftsmen.)		
		In addition to the personnel in the test complex, support is required for rapid response from the base shops. For example, support is required from: heavy equipment, carpentry, high voltage electrical, mechanical plumbing, roads and grounds, and other various shops.		
5.6.2.5.1	Reserved			
5.6.2.5.2	Craft Capability Requirements	Craft persons must be highly skilled in their respective trades and be trained and certified to operate equipment and perform work to detailed		

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		specifications, work plans and blueprints. Workers assigned to the test complex must be knowledgeable of the access control procedures.		
5.6.2.6	Reports and Submits	5 year maintenance plan for test complexes Annual facility inspection data sheets Backlog of Maintenance (BMAR)-update 4 times/yr Annual facility maintenance project list Project Status List (monthly)	See Annex 5.7	See Annex 5.7

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**TABLE 5.6-1  
FABRICATING SHOP EQUIPMENT**

<b>TYPE OF EQUIPMENT</b>	<b>EQUIPMENT NUMBER</b>	<b>DESCRIPTION</b>	<b>CAPACITY</b>
BREAK	590010	PLATE BENDER	¼" X 12"
SHEAR	1010738	METAL SHEAR	¾" X 12"
ROLL	589987	METAL ROLL	½" X 6"
ROLL	1910806	METAL ROLL	½" X 12"
BREAK	8191136	METAL BREAK, MANUAL	1/8" X 6"
BREAK	1910807	METAL BREAK, MANUAL	1/8" X 6"
CHOP SAW	1010715	METAL CUTTING SHOP SAW	
PUNCH	590004	METAL PUNCH AND ANGLE CUTTER	2" HOLES/6" ANGLES
PIPE BENDER	590026	PIPE BENDER	3"
SHEET ROLL	1542237	SMALL SHEET METAL ROLL	4"
SHEAR	753403	SHEET METAL SHEAR	¼"
CIRCLE CUTTER	590400	CIRCLE CUTTER	UP TO 36"
GRINDER	590357	METAL GRINDER	
BELT SANDER		BELT SANDER	10"
DRILL PRESS	819131	DRILL PRESS	
BAND SAW	133468	BAND SAW	20"
PIPE NIPPER	1323372	WELD PREPARE PIPE	2"

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CUTOFF SAW	132666	MANUAL CUTOFF SAW	24"
ROLL	1012131	METAL ROLL	1"
PRESS	1011234	HYDRAULIC PRESS	36" X 100 TON
FORKLIFT	120-129	FORK LIFT	6,000#
FORKLIFT	120-147	FORK LIFT	1,200#
CUTTER	397088	PAK 45 METAL CUTTER	3"
WATER CUTTER	G32886	ESAB PLASMA CUTTER	3" THICK
WELDER	G034298	WELDER-LINCOLN 250D	STICKWELD, GTAW, TIG
WELDER	G034341	WELDER-LINCOLN 500	GTAW
WELDER	G034448	WELDER-LINCOLN 300	SMAW, GTAW
WELDER	G034449	WELDER-LINCOLN 300	SMAW, GTAW
WELDER	G0304450	WELDER-LINCOLN 300	SMAW, GTAW
WELDER	396294	WELDER-MILLER TRAILBLAZER 44E	GTAW, SMAW
WELDER	396295	WELDER-MILLER TRAILBLAZER 44E	GTAW, SMAW
WELDER	1224852	WELDER-MILLER TRAILBLAZER 44D	GTAW, SMAW
WELDER	1224853	WELDER-MILLER TRAILBLAZER 440	GTAW, SMAW
WELDER	1540798	WELDER-MILLER TRAILBLAZER 440	GTAW, SMAW
WELDER	1324019	WELDER-MILLER TRAILBLAZER 440	GTAW, SMAW
WELDER	1541600	WELDER-MILLER TRAILBLAZER 440	GTAW, SMAW

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WELDER	1541601	WELDER-MILLER TRAILBLAZER 440	GTAW, SMAW
WELDER	1542052	WELDER-LINCOLN E. 36132 TIG 255	GTAW
WELDER	1542053	WELDER-LINCOLN E. 36132 TIG 255	GTAW
WELDER	590420	WELDER-LINCOLN E. 63672	SMAW, GTAW
WELDER	819153	WELDER-MILLER AIRCRAFTER 330ST	SMAW, GTAW
WELDER	819154	WELDER-MILLER E. PAC 111	STICK AND GTAW
The following tools and equipment are located at Building 4301:			
POWER SUPPLY	H033022	POWER SUPPLY	
FORK LIFT	H033512	FORK LIFT	
CUT-OFF SAW	H034332	CUT OFF SAW	
DRILL	14580	DYMO DRILL	
MAN LIFT	144843	GENIE LIFT	
POWER SUPPLY	145037	WELDING POWER SUPPLY	
POWER SUPPLY	145037	WELDING POWER SUPPLY	
POWER SUPPLY	145039	WELDING POWER SUPPLY	
WELDING MACHINE	145042	WELDING MACHINE	
WELDING MACHINE	145043	WELDING MACHINE	
WELDING MACHINE	396993	WELDING MACHINE	
WELDING MACHINE	752427	WELDING MACHINE	

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SPECIAL OPERATIONS AND MAINTENANCE TEST COMPLEX

WELDING MACHINE	752466	WELDING MACHINE	
TABLE SAW	752727	TABLE SAW	
DRILL PRESS	752868	DRILL PRESS	
SAW	753286	RADIAL ARM SAW	
WELDING MACHINE	819151	WELDING MACHINE	
DRILL	1223611	DRILL PRESS	
MAN LIFT	1223677	80 FOOT MAN LIFT	
WELDING MACHINE	1224231	WELDING MACHINE	
BENDER	132884	ELECTRIC BENDER	
TORCH	1323951	PLASMA ARC TORCH	
THREADING MACHINE	1324634	THREADING MACHINE	
PRESSURE WASHER	1324637	PRESSURE WASHER	
PRESSURE WASHER	13246638	PRESSURE WASHER	
WELDING MACHINE	1539612	WELDING MACHINE	
WELDING MACHINE	1539643	WELDING MACHINE	
WELDING MACHINE	1539644	WELDING MACHINE	
WELDING MACHINE	1539645	WELDING MACHINE	
WELDING MACHINE	1539646	WELDING MACHINE	
BENDER	1539669	CONDUIT BENDER	
SPIDER	1540018	CLIMBING SPIDER	
WELDING MACHINE	1540906	WELDING MACHINE	
WELDING MACHINE	15411213	WELDING MACHINE	
HYDRAULIC PRESS	1541254	HYDRAULIC PRESS	
BAND SAW	1911499	BAND SAW	
DRILL SHARPENER	15414554	DRILL SHARPENER	

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SPECIAL OPERATIONS AND MAINTENANCE TEST COMPLEX

**TABLE 5.6-2  
MACHINE SHOP TOOLING**

NAME	EQUIPMENT NUMBER	DESCRIPTION	CAPACITY
VERT. MILL	591451	VERTICAL MILL	120 INCHES
VERT. MILL	594305	VERTICAL MILL	62 INCHES
DRILL PRESS	1323235	RADIAL ARM DRILL PRESS	5 FEET
LATHE	G32881	CLAUSING 15" LATHE	15" X 4'
LATHE	398291	CLAUSING 15" LATHE	15" X 4'
LATHE	594325	MONARCH LATHE	40" X 6'
LATHE	1541419	MONARCH LATHE	20" X 36"
LATHE	594319	MONARCH LATHE	30" X 48"
LATHE	594342	MONARCH LATHE	16-1/2" X 54"
LATHE	594341	AMERICAL PALL MAKER	16 X 30
LATHE	1011932	COLECHESTER	21" X 6'
LATHE	594328	MONARCH LATHE	12-1/2" X 20
GRINDER		PEDISTAL GRINDER	6"
GRINDER	591444	PEDISTAL GRINDER	6"
DRILL PRESS	591361	DRILL PRESS	3" X 18" STROKE
PRESS	594313	BENCH TOP PRESS	1" X 4"
LATHE	594338	JEWEL LATHE	
PRESS DRILL	594333	CHEERMAN JIG BORE	16" X 36"
PRESS DRILL	818996	RONGFU	8" X 24"
OPTICAL COMP.	818995	STARRET OPTICAL	

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		COMPARITOR	
LATHE	594329	MONARCH LATHE	12-1/2" X 20"
LATHE	1225132	VICTOR LATHE	11" X 16"
ENGRAVER	1322751	VANGUARD	11" X 19"
PRESS	1539479	HYDRAULIC PRESS	55 TONS
GRINDER	591353	DRILL BIT GRINDER	#30 - 3/4"
GRINDER	591352	CARBIDE TOOL GRINDER	14"
MILL	1172896	UNIVERSAL KEARNEY TUECKER MILL	24" X 40"
GRINDER	5941625	SURFACE GRINDER	16" X 40"
GRINDER	591355	CINCINNATI TOOL GRINDER	
GRINDER	591358	END MILL GRINDER	
GRINDER	1010702	LARGE TOOL BIT GRINDER	3/4" X 3"
MILL, INDEX	591448	INDEX MILLING MACHINE	18" X 30"
MILL	125415	BRIDGEPORT MILLING MACHINE	18" X 30"
MILL	591343	BRIDGEPORT MILLING MACHINE	18" X 30"
MILL	591364	SMALL HORIZONTAL MILL	6" X 16"
MILL	1541418	KEARNEY & TRECKER MILL	24" X 48"
MILL	G33900	C & C HERCO UNIVERSAL MILL	27" X 54"
METAL SAW	591394	DO ALL BAND SAW	32"
MILL	133049	C & C HURCO KNEE MILL	17" X 27"

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SAW, CUT OFF	819145	MARVEL CUT OFF SAW	16''
HORIZ. BORE MILL	591347	G & L	74'' X 48''
HORIZ. BORE MILL	594382	LUCAS HORIZONTAL BORING MILL	60'' X 40''
OVEN, HEAT TREAT	1172845	THERMCRAFT HEAT TREATING OVEN 2500 ° F	24'' X 18'' C 40''
GRINDER	591348	PEDESTAL GRINDER	12''
TOOLING, INCLUDING: BITS, TOOLING, END MILLS, REAMERS, TAPS, DIES, CARBIDE INSERTS, CUTTING BLADES, SAWS, ETC. APPROXIMATE VALUE IN FY97 DOLLARS = \$100,000.00 (OR GREATER)			

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**TABLE 5.6.-3  
COMPONENTS PROCESSED FY98**

COMPONENT	NUMBER OF COMPONENTS PROCESSED (FY 98 ACTUAL)
HAND VALVES < 1.5"	519
HAND VALVES > 1.5"	20
MOTOR VALVE	75
LOX PUMP	0
RELIEF VALVE PILOT	1
RELIEF VALVE NON-PILOT	311
REGULATOR	241
SOLENOID VALVE	125
CHECK VALVE	117
BALL VALVE	32
SHUTTLE VALVE	1
PCV VALVE	6
FLEX FLOW VALVE	5
FILTER	67
EXPANSION JOINT	11
Z-BAFFLE	3
GATE VALVE	4
OTHER COMPONENTS	54
TOTAL	1,592
OTHER ITEMS (QUANTITY)	
FLEX-HOXES	231
PIPE	144
TUBING	2,076
MISC.	24,833

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Notes:

- Flex hoses ranged in diameter from 0.25" to 2" with an average length of 12' (equivalent of 876 feet for FY97)
- Pipe ranged in diameter from 1.5" to 12" with an average length of 10' (equivalent to 300 feet in FY97)
- Tubing ranged in diameter from 0.25" to 2" with an average length of 6' (equivalent to 9,786 feet for FY97)

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SPECIAL OPERATIONS AND MAINTENANCE TEST COMPLEX

**TABLE 5.6-4  
FCPF EQUIPMENT**

<u>ECN</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Use</u>	<b>Cost</b>
G032554	Sealing Machine	Emplex	Protective bag sealing	\$2,225
G032555	Sealing Machine	Emplex	Protective bag sealing	\$2,225
G033760	Data Plate Marker	Dayton Electric	Component ID tag manufacture	\$8,755
G033834	Impact Wrench	Ingersol-Rand	Misc. component rework	\$1,450
0014989	Bench Oven	Dayton Electric	Parts Drying	\$1,999
0014991	Flow Bench	Laminar Flow	Clean Room Support	\$4,754
0015726	Fork Lift Truck	Caterpillar	Misc. Component Lifting	\$16,613
0015735	Solvent Recovery Still	Corpane	Freon Recovery	\$14,549
0016186	Strip Chart Recorder	Gultin Ind.	Clean Room Support	\$1,000
0016187	Laser Particle Recorder	TSI Inc.	Clean Room Support	\$2,290
0016188	Laser Particle Recorder	TSI Inc.	Clean Room Support	\$2,290
0016189	Laser Particle Recorder	TSI Inc.	Clean Room Support	\$2,290
0016190	Laser Particle Recorder	TSI Inc.	Clean Room Support	\$2,290
0016191	Remote Processor	TSI Inc.	Clean Room Support	\$1,900
0016194	Remote Processor	TSI Inc.	Clean Room Support	\$1,900
0034316	Ph Meter	Omega Eng. Inc.	Chem/Solvent sampling	\$2,277

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**TABLE 5.6-4  
FCPF EQUIPMENT**

0034317	Ph Meter	Omega Eng. Inc.	Chem/Solvent sampling	\$2,277
0034318	Ph Meter	Omega Eng. Inc.	Chem/Solvent sampling	\$2,277
0034434	Electronic Balance	Denver Inst.	Chem/Solvent sampling	\$1,097
0036771	Hydraulic Torque Wrench	Florida Pneumatic	Misc. component rework	\$2,469
0036976	Fluid Pump	Haskel Inc.	Water/Freon transport w/in shop	\$1,225
0036977	Fluid Pump	Haskel Inc.	Water/Freon transport w/in shop	\$1,225
0036979	Gas Booster Pump	Haskel Inc.	Test cell support	\$3,795
0036981	Gas Booster Pump	Haskel Inc.	Test cell support	\$3,795
0133681	Sealing Machine	Vertrod Corp	Protective bag sealing	\$6,075
0289633	Flaring Machine	Conrac corp.	Tubing manufacture	\$14,275
0397214	Air flow oven	WWR Scientific	Component drying	\$4,250
0590326	Hydrostatic Test Stand	Crane Risistoflex	Hydro pressure test	\$15,819
0590328	Swaging Machine	Crane Risistoflex	Tubing manufacture	\$11,792
0590331	DriveUnit	Allenaircorp.	Flex hose manufacture	\$2,600
0590332	Swager	Allenaircorp.	Tubing manufacture	\$1,395
0590338	Solvent Reclamation unit	Copane Ind.	Freon Recovery	\$9,950
0590341	Sealing machine	Vertrod Corp	Protective bag sealing	\$1,275
0590349	Hoist	ARO Corp.	Misc. component lifting	\$1,879

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**TABLE 5.6-4  
FCPF EQUIPMENT**

0590431	Utility Truck	Textron	Misc. transportation	\$2,590
				\$920
0590457	Hydraulic Press	Dake	Component rework 50 ton	
0753659	Mass Spectrometer	Varian Assoc.	Vacuum leak checks	\$13,560
0753704	Parts Dryer	Randall Mfg.	Sample bottle cleaning	\$2,313
0753705	Pares Washer	Randall Mfg.	Sample bottle cleaning	\$9,905
0753706	Parts Rinser	Randall Mfg.	Sample bottle cleaning	\$3,096
	Microscope	Cambridge Inst.	Clean room support	\$2,758
	Tube End Finishing Machine	Phi/Conrac	Tubing manufacture	\$6,985
	Pedestal Buffing Machine	Baldor	Misc. component rework	\$11,323
	Engine Lathe	Emco Maier Corp.	Misc. component rework	\$1,311
	Utility Truck	Textron Corp	Misc. transportation	\$3,500
	Drilling Machine	Wilton Corp.	Misc. component rework	\$1,708
	Horizontal Flow Console	Laminar Flow Inc.	Clean room support	\$2,610
	Gas Booster Pump	Haskel Inc.	Test cell support	\$4,332
	Gas Booster Pump	Haskel Inc.	Test cell support	\$4,332
	Portable Power Pack	Hytork	Misc. component rework	\$3,711
	Bench Micrometer	Starrett	Misc. component rework	\$1,311
	Data PlateMarker	Defiance Machine	Component ID marking	\$8,740

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**TABLE 5.6-4  
FCPF EQUIPMENT**

	Relief Valve Tester	Duns valve	Relief valve testing	\$56,435
	Chain Hoist	Columbus	Misc. component lifting	\$1,425
	Tube Bender	Parker-Hannifin	Tubing Manufacture	\$2,444
	Chain Hoist	Columbus	Misc. component lifting	\$3,394
	Pressure Washer	Landa Mfg.	Field Cleaning	\$3,394
	Parts Washer	ADF Systems	Aqueous component cleaning	\$19,895
	Crimp Machine	Aeroquip Corp.	Flex hose manufacture	\$3,175
	Torque Calibrator	Snap-on Tools	FCPF torque tool support	\$1,100
	Ultrasonic Liquid Processor	Misonix Inc.	Misc. component cleaning	\$3,826
	Wet Cut Saw	Keller Machine	Tubing cutting	\$3,665
	Moisture Analyzer	Meeco	Tubing/Flex hose support	\$7,920
	Moisture Analyzer	Meeco	Tubing/Flex hose support	\$7,920
	Original Purchase Cost of Equipment Listed -- \$358,186			
	Note: This list of equipment represents only those items considered "significant".			

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**TABLE 5.6-5  
FCPF BENCHSTOCK VALUE**

Note: The values for the various benchstock materials are for historical value only and should not be considered specific to the requirements for each type of benchstock at the time of contract award.

<b>Item</b>	<b>Estimated Value</b>
Lox compatible softgoods (certified lox compatible)	\$150,000
Miscellaneous softgoods	\$30,000
Component repair kits	\$25,000
Teflon bags, tape, grease	\$8,500
Miscellaneous nuts, bolts, washers	\$7,500
Miscellaneous fittings	\$6,500
Miscellaneous cleaning supplies	\$110,000
<b>Total Benchstock Estimate</b>	<b>\$337,000</b>