

UNITED STATES  
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
LANGLEY RESEARCH CENTER  
HAMPTON, VIRGINIA

SPECIFICATIONS

TO

COMPONENT VERIFICATION LAB,  
RELOCATION TO

BUILDING 1267

LOCATED IN

WEST AREA

LANGLEY RESEARCH CENTER, HAMPTON, VIRGINIA

SPECIFICATION NO. AE02435

DATE: 5-10-2010

**PROJECT TABLE OF CONTENTS****DIVISION 01 - GENERAL REQUIREMENTS**

01 11 00.00 41	SUMMARY OF WORK
01 30 00.00 41	ADMINISTRATIVE REQUIREMENTS
01 31 19.00 40	PROJECT MEETINGS
01 33 00	SUBMITTAL PROCEDURES
01 35 23.00 41	LANGLEY SAFETY AND ENVIRONMENTAL REQUIREMENTS
01 42 00	SOURCES FOR REFERENCE PUBLICATIONS

**DIVISION 26 - ELECTRICAL**

26 00 00.00 20	BASIC ELECTRICAL MATERIALS AND METHODS
26 05 00.00 40	COMMON WORK RESULTS FOR ELECTRICAL
26 05 71.00 40	LOW VOLTAGE OVERCURRENT PROTECTIVE DEVICES

-- End of Project Table of Contents --

## SECTION TABLE OF CONTENTS

## DIVISION 01 - GENERAL REQUIREMENTS

## SECTION 01 11 00.00 41

## SUMMARY OF WORK

## PART 1 GENERAL

- 1.1 SUMMARY
- 1.2 EXISTING WORK
- 1.3 SUBMITTALS
- 1.4 DRAWINGS
  - 1.4.1 Contract Drawings
- 1.5 SCHEDULE
  - 1.5.1 General Schedule Requirements
  - 1.5.2 Work Rescheduling
  - 1.5.3 Special Scheduling
- 1.6 OCCUPANCY OF PREMISES
- 1.7 GOVERNMENT FURNISHED PROPERTY
- 1.8 ON-SITE PERMITS
  - 1.8.1 Utility Outage Requests and Utility Connection Requests
  - 1.8.2 Borrow, Excavation, Welding, and Burning Permits
- 1.9 EPA DESIGNATED ITEMS INCORPORATED IN THE WORK

## PART 2 PRODUCTS (NOT USED)

## PART 3 EXECUTION (NOT USED)

-- End of Section Table of Contents --

## SECTION 01 11 00.00 41

## SUMMARY OF WORK

## PART 1 GENERAL

## 1.1 SUMMARY

The Contractor shall furnish all services and materials for the Modification of Building 1267, as indicated on the drawings and as specified herein. The Contractor shall furnish all plant, equipment, tools, materials, labor and services necessary for the complete and finished effort.

The work is located at Building 1267, East Reid Street, West Area, of the Langley Research Center, Hampton, Virginia.

The work consists of earthwork, sitework, concrete, masonry, steel, metals, painting, plumbing, mechanical, electrical, fire alarm, and other items defined in the Contract Documents.

The work includes Building Modifications to Building 1267, to accommodate the relocation of the CVL, relocation of equipment from Building 1284B to Building 1267 and incidental related work.

All references to the Contracting Officer contained in this specification, or any severable part thereof, shall be determined to mean the Contracting Officer or the Contracting Officer's Technical Representative. If any question arises concerning the "authorization" status of a Contracting Officer Technical Representative, the Contractor shall immediately refer the question, in writing, to the Contracting Officer. Any references to "as directed", "approved by", "witnessed by", or "submitted to", shall be determined to mean the Contracting Officer.

## 1.2 EXISTING WORK

Protect existing vegetation, structures, equipment, utilities, pavement and improvements.

Remove or alter existing work in such a manner as to prevent injury or damage to any portions of the existing work which remain.

Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as approved by the Contracting Officer. At the completion of operations, existing work shall be in a condition equal to or better than that which existed before new work started.

## 1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

**SD-01 Preconstruction Submittals**

Upon receipt of Government Furnished Equipment, the Contractor

shall submit records in accordance with paragraph entitled, "Government Furnished Property," of this section.

Submit the following items to the Contracting Officer:

Utility Outage Requests  
 Utility Connection Requests  
 Borrow Permits  
 Excavation Permits  
 Welding Permits  
 Burning Permits

#### SD-03 Product Data

Form LF491 LaRC Computerized Maintenance Management System (CMMS)  
 Equipment Change Request

The Contractor is responsible for providing the required information on NASA Form LF491 (refer to Attachment) for each piece of removed or installed equipment and submitting the forms to the Contracting Officer. The Contracting Officer's authorized representative will be responsible for final submittal of LF491 forms for modification of the MAXIMO equipment database.

#### 1.4 DRAWINGS

The drawings listed below accompany this specification and are a part thereof.

Five sets of full size contract drawings, maps, and specifications will be furnished to the Contractor without charge. Reference publications will not be furnished.

Contractor shall immediately check furnished drawings and notify the Government of any discrepancies.

##### 1.4.1 Contract Drawings

The work shall conform to these specifications and the drawings listed below:

<u>DRAWING NO.</u>	<u>SHEET NO.</u>	<u>TITLE</u>
GENERAL		
1263266	G-001	TITLE SHEET
STRUCTURAL		
1263267	S-101	STRUCTURAL NOTES AND PLAN
1271604	S-102	STRUCTURAL SECTIONS AND DETAILS
MECHANICAL		
1263268	M-001	MECHANICAL GENERAL NOTES AND LEGEND
1263269	M-101	MECHANICAL REMOVAL PLAN-ROOM 127
1263270	M-102	MECHANICAL FLOOR PLAN-NEW WORK
1263271	M-601	MECHANICAL DETAILS
1263272	M-602	MECHANICAL SCHEDULES
ELECTRICAL		
1263273	E-101	FLOOR PLAN-DEMOLITION
1263274	E-102	FLOOR PLAN-NEW WORK

<u>DRAWING NO.</u>	<u>SHEET NO.</u>	<u>TITLE</u>
1263275	E-601	ELECTRICAL SCHEDULES AND DETAILS

1.5 SCHEDULE

1.5.1 General Schedule Requirements

The Contractor shall commence work within 20 calendar days after receipt of Notice to Proceed. All work as required by these specifications shall be completed within 75 consecutive calendar days after receipt of Notice to Proceed.

1.5.2 Work Rescheduling

Contractor shall allow for a maximum of 10 calendar days where construction activity is prohibitive. Further allowance for 4 calendar days of excavation and subsurface activity abeyance shall be imposed where other construction activities are permitted. Government will provide 24 hour notification each time the restrictions are invoked.

Normal duty hours for work shall be from 7:00 a.m. to 4:00 p.m., Monday through Friday. Requests for additional work shall require written approval from the Contracting Officer 7 days in advance of the proposed work period.

1.5.3 Special Scheduling

Contractor shall delay moving 1800 psi air compressor until the end of the project to minimize CVL down time. This shall be scheduled and coordinated with the Contracting Officer.

1.6 OCCUPANCY OF PREMISES

Building(s) will be occupied during performance of work under this Contract.

Before work is started, the Contractor shall arrange with the Contracting Officer a sequence of procedure, means of access, space for storage of materials and equipment, and use of approaches, corridors, and stairways.

1.7 GOVERNMENT FURNISHED PROPERTY

Government will furnish to the Contractor the following property to be incorporated or installed in the work, or used in its performance. Such property will be relocated from Building 1284B, to Building 1267, to location shown on drawings.

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>QUANTITY</u>	<u>DATE AVAILABLE</u>	<u>SALVAGE RECEIVING POINT</u>
Salv-1	HABCO PPT 1050	1	End of Project	B1284B
Salv-2	1800 PSI AC TS	1	End of Project	B1284B
Salv-3	60000 PSI TS	1	End of Project	B1284B
Salv-4	Gage Cabinet	1	End of Project	B1284B
Salv-5	Super Tube Valve	1	End of Project	B1284B
Salv-6	1800 PSI Compressor	1	End of Project	B1284B

1.8 ON-SITE PERMITS

1.8.1 Utility Outage Requests and Utility Connection Requests

Notify the Contracting Officer at least 72 hours prior to starting excavation work. Contractor is responsible for marking and verifying all utilities not marked.

The Contractor shall verify the elevations of existing piping, utilities, and any type of underground obstruction not indicated or specified to be removed, but indicated in locations to be transversed by piping, ducts, and other work to be installed. Verify elevations before installing new work closer than nearest manhole or other structure at which an adjustment in grade can be made.

Work shall be scheduled to hold outages to a minimum.

Utility outages and connections required during the execution of work that affect existing systems shall be arranged at the convenience of the Government and shall be scheduled outside the regular working hours or on weekends.

Contracting Officer may permit utility outages at his discretion.

Contractor shall not be entitled to additional payment for utility outages and connections required to be performed outside the regular work hours.

Requests for utility outages and connections shall be made in writing to the Contracting Officer at least 7 calendar days in advance of the time required. Each request shall state the system involved, area involved, approximate duration of outage, and the nature of work involved.

1.8.2 Borrow, Excavation, Welding, and Burning Permits

<u>ACTIVITY</u>	<u>SUBMISSION DATE</u>	<u>SUBMISSION FORM</u>
Excavation Permits	7 calendar days prior to work	
Welding Permits	7 calendar days prior to work	

Permits shall be posted at a conspicuous location in the construction area.

Burning of trash or rubbish is not permitted on project site.

1.9 EPA DESIGNATED ITEMS INCORPORATED IN THE WORK

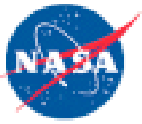
Various sections of the specifications contain requirements for materials that have been designated by EPA as being products which are or can be made with recovered or recycled materials. These items, when incorporated into the work under this contract, shall contain at least the specified percentage of recycled or recovered material.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

-- End of Section --





**LaRC Computerized Maintenance Management System (CMMS)  
Software/Equipment Change Request**



*Software Change Requests: Submit to Mail Stop 224*

**Change Request Number:** \_\_\_\_\_  
*(Will be generated by the CCB Analyst.)*

**DATE OF REQUEST:** \_\_\_\_\_

**NAME:** \_\_\_\_\_ **EXT.:** \_\_\_\_\_

**EMAIL:** \_\_\_\_\_

**TRACKING #:** \_\_\_\_\_

Acronym/Term List
CCB = Change Control Board
FMO = Facility Maintenance On-line
MAXIMO = Desktop Commercial Off the Shelf Product

**CHANGE REQUEST TYPE:**

- SOFTWARE**     
  **SECURITY**     
  **DOCUMENTATION**     
  **HARDWARE - CMMS Architecture**  
 FMO  
 MAXIMO  
 CMMS Database

*Provide sample, if available, of change requested.*

**DESCRIPTION OF CHANGE REQUEST:**

**JUSTIFICATION FOR CHANGE REQUEST:**

**CRITICALITY OF CHANGE REQUEST:**

<p><b>CCB REQUIRED?</b>    <input type="checkbox"/> <b>YES</b>    <input type="checkbox"/> <b>NO</b></p> <p>IMPLEMENTED BY:</p> <p>_____ <i>Printed Name</i>      _____ <i>Signature</i></p> <p>DATE IMPLEMENTED: _____</p>	<p><b>IF "YES": CHANGE REQUEST APPROVED</b></p> <p>APPROVED BY:                      <input type="checkbox"/> <b>YES</b>    <input type="checkbox"/> <b>NO</b></p> <p>_____ <i>Printed Name</i>      _____ <i>Signature</i></p> <p>DATE APPROVED: _____</p>
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## SECTION TABLE OF CONTENTS

## DIVISION 01 - GENERAL REQUIREMENTS

## SECTION 01 30 00.00 41.00 41

## ADMINISTRATIVE REQUIREMENTS

## PART 1 GENERAL

- 1.1 SUBMITTALS
- 1.2 BULLETIN BOARD
- 1.3 PROGRESS AND COMPLETION PICTURES
- 1.4 SECURITY REQUIREMENTS AND REGULATION OBSERVANCE
  - 1.4.1 References
- 1.5 CONTRACTOR PERSONNEL REQUIREMENTS
  - 1.5.1 Contractor, Subcontractors and Personnel
  - 1.5.2 Identification Badges
  - 1.5.3 Subcontractor Special Requirements
    - 1.5.3.1 Plumbing Workers' Qualifications
    - 1.5.3.2 Mechanical Workers' Qualifications
    - 1.5.3.3 Electrical Workers' Qualifications
  - 1.5.4 Contractor Personnel Requirements
- 1.6 PRECONSTRUCTION CONFERENCE
- 1.7 SCHEDULING OF WORK
- 1.8 CORRESPONDENCE, SUBMITTALS AND INVOICES
- 1.9 ELECTRONIC MAIL (E-MAIL) ADDRESS
- 1.10 AS-BUILT CONTRACT DRAWINGS
- 1.11 HANDLING/PROTECTION OF CONTRACTOR MATERIAL AND EQUIPMENT
- 1.12 UTILITY OUTAGES AND POWER CONNECTIONS
  - 1.12.1 Utility Outages
  - 1.12.2 Application for Connecting to Government Electrical Utilities
- 1.13 ON-SITE GOVERNMENT/CONTRACTOR/SUBCONTRACTOR COORDINATION

## PART 2 PRODUCTS (NOT USED)

## PART 3 EXECUTION (NOT USED)

-- End of Section Table of Contents --

## SECTION 01 30 00.00 41.00 41

## ADMINISTRATIVE REQUIREMENTS

## PART 1 GENERAL

## 1.1 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00  
SUBMITTAL PROCEDURES:

## SD-01 Preconstruction Submittals

Progress and completion pictures

List of contact personnel

Plumbing Workers' Qualifications

Mechanical Workers' Qualifications

Electrical Workers' Qualifications

## SD-11 Closeout Submittals

As-Built Contract Drawings

## 1.2 BULLETIN BOARD

Immediately upon beginning site work, the Contractor shall provide at the job site a weatherproof bulletin board for displaying the fair employment poster, wage rates, and safety bulletins and posters. The bulletin board shall be located in a conspicuous place, easily accessible to all employees. Legible copies of the aforementioned data shall be displayed until on-site work is complete.

## 1.3 PROGRESS AND COMPLETION PICTURES

Photographically document site conditions prior to start of construction operations. Provide monthly and within one month of the completion of work, digital photographs, 1600x1200x24 bit true color file format showing the sequence and progress of work. Take a minimum of 20 digital photographs each week throughout the entire project from a minimum of ten views from points located by the Contracting Officer.

## 1.4 SECURITY REQUIREMENTS AND REGULATION OBSERVANCE

## 1.4.1 References

The publications listed below form a part of these specifications to the extent referenced. The publications are referred to in the text by the basic designation only.

LAPD 1600.4 (January 2005) Firearms and Dangerous Weapons  
Policy

LAPD 1600.5	(May 2005) Workplace Violence and Threatening Behavior
LAPD 1700.7	(October 2008) Traffic Management
LAPD 1700.8	(January 2008) Parking Regulations
NPD 1600.2D	(February 2006) NASA Security Policy
NPR 1371.2A	(March 2004) Procedural Requirements for Processing Requests for Access to NASA Installations or Facilities by Foreign Nationals or U.S. Citizens Who Are Reps of Foreign Entities
NFPA 70E	Standard for Electrical Safety in the Workplace

## 1.5 CONTRACTOR PERSONNEL REQUIREMENTS

### 1.5.1 Contractor, Subcontractors and Personnel

Furnish a [list of contact personnel](#) of the Contractor and subcontractors including addresses and telephone numbers to the Contracting Officer for use in the event of an emergency. As changes occur and additional information becomes available, correct and change the information contained in previous lists.

### 1.5.2 Identification Badges

Identification badges will be furnished without charge. Application for and use of badges will be as directed. Immediately report instances of lost or stolen badges to the Contracting Officer.

At all times while on LaRC property, the Contractor shall require its employees, subcontractor(s) and agents to wear badges which will be issued by the NASA Contract Badge and Pass Office, located at 1 Langley Boulevard (Building No. 1308). Badges shall be issued only between the hours of 6:30 a.m. and 3:30 p.m., Monday through Friday. Temporary ID badges will be issued upon submission of a completed Langley Form 227, "Construction/Contractor Badge and/or Vehicle Permit Request". The Contractor will be held accountable for these badges and may be required to validate outstanding badges with the NASA LaRC Security Office. Immediately after employee termination or contract completion, badges shall be returned to the NASA Contract Badge and Pass Office.

### 1.5.3 Subcontractor Special Requirements

#### 1.5.3.1 [Plumbing Workers' Qualifications](#)

All plumbing work shall be performed by plumbing tradesmen who have in their possession a current Apprentice, Journeyman, or Master's plumbing license card, as issued by the Commonwealth of Virginia.

#### 1.5.3.2 [Mechanical Workers' Qualifications](#)

All mechanical work shall be performed by mechanical tradesmen who have in their possession a current Apprentice, Journeyman, or Master's mechanical license card, as issued by the Commonwealth of Virginia.

#### 1.5.3.3 Electrical Workers' Qualifications

All electrical work shall be performed by electrical tradesmen who have in their possession a current Apprentice, Journeyman, or Master's Electrical License Card, as issued by the Commonwealth of Virginia.

#### 1.5.4 Contractor Personnel Requirements

Failure to obtain entry approval will not affect the contract price or time of completion.

#### 1.6 PRECONSTRUCTION CONFERENCE

After award of the contract but prior to commencement of any work at the site, meet with the Contracting Officer to discuss and develop a mutual understanding relative to the administration of the value engineering and safety program, preparation of the schedule prices, shop drawings, and other submittals, scheduling programming, and prosecution of the work. Major subcontractors who will engage in the work shall also attend.

#### 1.7 SCHEDULING OF WORK

The established hours of work at Langley Research Center are 7:00 a.m. to 4:30 p.m. Monday through Friday, excluding U.S. Government holidays and closings declared by Administrative or Executive Order.

In order that the necessary and proper inspection of the Contractor's work may be effectively accomplished, and to assure the availability of required Government facilities, the Contractor shall schedule work performance to be compatible with the established work week, hours of work and legal holidays observed by the Government organization having cognizance over the work performed at the particular work site. No work shall be performed during other hours without prior authorization of the Contracting Officer.

All requests for overtime work shall be submitted to the Contracting Officer or the Contracting Officer's authorized representative for approval two calendar days prior to the proposed overtime.

The Contractor shall give at least three calendar days notice to the Contracting Officer and the Safety and Facility Assurance Branch of the date when the contract work will begin at the site.

If the Contractor suspends work at any time, it shall notify the Construction Inspection Service (CIS) and shall not again resume work without notifying the CIS in advance.

#### 1.8 CORRESPONDENCE, SUBMITTALS AND INVOICES

All correspondence, submittals and invoices shall be clearly marked with the assigned contract number. Unless otherwise specified herein, the Contractor shall submit an original and five copies of all correspondence and submittals.

The Contractor shall submit Technical Submittals required by these specifications for all shop drawings, test reports, equipment data sheets, and any other technical data under an original cover letter and with copies as required by these specifications. Samples shall be accompanied by a cover letter and appropriate copies.

All correspondence to the Contracting Officer or Contract Administrator shall be addressed as follows:

Contracting Officer/Contract Administrator, Mail Stop 126  
Contract NNL \_\_\_\_\_  
NASA, Langley Research Center  
Hampton, Virginia 23681-2199

All correspondence to the Contracting Officer Technical Representative (COTR) shall be addressed as follows:

COTR, Mail Stop 219  
Contract NNL \_\_\_\_\_  
NASA, Langley Research Center  
Hampton, Virginia 23681-2199

Progress payment, final payment invoices, and Contractor's release form (NASA Form 778) shall be addressed as follows:

Accounts Payable and Employee Services Branch, Mail Stop 175  
Contract NNL \_\_\_\_\_  
NASA, Langley Research Center  
Hampton, Virginia 23681-2199

Certified payrolls shall be addressed as follows:

Construction Services Unit, Mail Stop 306  
Contract NNL \_\_\_\_\_  
NASA, Langley Research Center  
Hampton, Virginia 23681-2199

Submittals to the Safety and Facility Assurance Branch shall be addressed as follows:

Safety and Facility Assurance Branch, Mail Stop 305  
Contract NNL \_\_\_\_\_  
NASA, Langley Research Center  
Hampton, Virginia 23681-2199

Submittals to the Environmental Management Branch shall be addressed as follows:

Environmental Management Branch, Mail Stop 213  
Contract NNL \_\_\_\_\_  
NASA, Langley Research Center  
Hampton, Virginia 23681-2199

#### 1.9 ELECTRONIC MAIL (E-MAIL) ADDRESS

The Contractor shall establish and maintain electronic mail (e-mail) capability along with the capability to open various electronic attachments in Microsoft, Adobe Acrobat, and other similar formats. Within 10 days after contract award, the Contractor shall provide the Contracting Officer a single (only one) e-mail address for electronic communications from the Contracting Officer related to this contract including, but not limited to contract documents, invoice information, request for proposals, and other correspondence. The Contracting Officer may also use e-mail to notify the Contractor of base access conditions when emergency conditions warrant, such as hurricanes, terrorist threats, etc. Multiple e-mail addresses will

not be allowed.

It is the Contractor's responsibility to make timely distribution of all Contracting Officer initiated e-mail within its own organization including field office(s). The Contractor shall promptly notify the Contracting Officer, in writing, of any changes to this e-mail address.

#### 1.10 AS-BUILT CONTRACT DRAWINGS

The Contractor shall maintain a red-lined set of contract construction drawings that reflect current "As-Built" conditions in accordance with specification Section 01 33 00 SUBMITTAL PROCEDURES.

#### 1.11 HANDLING/PROTECTION OF CONTRACTOR MATERIAL AND EQUIPMENT

All shipments shall be addressed to the Contractor and the Contractor shall be responsible for their receipt, unloading, handling, and storage at the site. The Government will not accept deliveries on behalf of the Contractor or its subcontractors, nor assume any responsibility for security of materials, equipment or supplies delivered to the site.

The Contractor shall at all times protect and preserve all contractually required materials, supplies and equipment of every description (including property which may be Government-furnished or owned) and all work performed. If, as determined by the Contracting Officer, material, equipment, supplies and work performed are not adequately protected by the Contractor, such property may be protected by the Government and the cost thereof will be charged to the Contractor.

When Government-owned equipment is to be utilized by the Contractor at the construction site, the Contractor shall jointly inventory such equipment with the assigned Inspector, mutually agreeing as to condition and quantities. Upon completion of the inventory, the Contractor shall accept the equipment and give the Government a signed receipt. The Contractor shall be responsible for the equipment, its protection from damage, and availability for installation. Even in the absence of such a joint inventory, the Contractor assumes full responsibility for such Government-owned equipment when it comes into its possession. The Contractor shall submit a record of existing conditions prior to use of Government-owned equipment.

#### 1.12 UTILITY OUTAGES AND POWER CONNECTIONS

##### 1.12.1 Utility Outages

Work shall be scheduled to hold outages to a minimum.

Utility outages required during the execution of work that affect existing systems shall be scheduled at the convenience of the Government. Any interruption of utilities or services that would interfere with the operation of a facility will be permitted only on week-ends between the hours of 12:00 midnight Friday and 10:00 p.m. on the following Sunday. The Contracting Officer may permit interruptions at other times. Any utilities or service connections made at other than normal working hours shall be at no additional cost to the Government. Permission to make such an interruption shall be requested in writing to the Contracting Officer at least seven calendar days prior to the day of interruption.

The Contractor shall schedule all work necessitating power shutdowns or

outages with the Contracting Officer by submitting a written request for utility outage stating the date and time the desired interruption will commence, the anticipated period of interruption, and feeders and circuits to be interrupted. No interruption shall be made without authorization from the Contracting Officer. If a scheduled power interruption is to extend into the regular working hours, the Contractor shall notify the Contracting Officer 24 hours in advance.

#### 1.12.2 Application for Connecting to Government Electrical Utilities

Prior to making connection to any part of the Government's electrical power distribution system, the Contractor shall make application to the Contracting Officer stating the date, time, location, and the service required. The Contractor shall also state when such connection is desired.

Before granting the Contractor permission for such connection, the Government will make the necessary checks of the Contractor's system to assure its adequacy and safety and that the Government's supply is adequate at that point for such connection.

The Contractor shall perform the initial energizing of all new electrical equipment in the presence of an authorized representative of the Contracting Officer.

Prior to connecting into any existing Government electrical utility, the Contractor shall conform to the requirements of Section 01 35 23.00 41 LANGLEY SAFETY AND ENVIRONMENTAL REQUIREMENTS.

#### 1.13 ON-SITE GOVERNMENT/CONTRACTOR/SUBCONTRACTOR COORDINATION

The existing facility will be occupied by the Government during construction. The Contractor shall coordinate its work with the Contracting Officer to ensure minimum interference with Government activities during construction.

Other contractors will not be working at the site of the work during the performance of this contract.

The Contractor shall be responsible for familiarizing each of its subcontractors with all requirements (this includes administrative as well as technical) of the contract affecting each subcontractor, respectively. The Contractor shall be responsible for coordinating the work of its subcontractors or suppliers to prevent any interference or omission whatsoever. The divisions or sections of the specifications shall not be interpreted as limiting or defining the work for purposes of dividing the work among subcontractors, or to limit the work performed by any trade.

The Contractor shall be responsible to the Contracting Officer for acts and omissions of its own employees and of subcontractors and their employees. The Contracting Officer will not undertake to settle any differences between the Contractor and its subcontractors, or between subcontractors. All business pertaining to the contract shall be conducted through the Contracting Officer. If the Contractor specifically authorizes in writing a subcontractor to act as its agent, it shall state the specific authority conferred. The Contractor shall also be bound by any agreement made between the agent acting within the scope of its authority and the Contracting Officer.

The Contractor shall afford other contractor(s) reasonable opportunity for

the introduction and storage of their materials and equipment and the execution of their work. The Contractor shall conduct its work so as not to impede or interfere with the work of such other contractors or persons engaged in or about the site. Whenever any work performed by the Contractor adjoins or affects any work by any other contractor(s), the Contracting Officer will decide any disputes between the Contractor and such other contractor. The Contracting Officer's decision, in writing, shall be final and conclusive upon both parties.

If the Contractor causes damage to the work or property of any other contractor on the project, the Contractor shall, upon due notice, repair such damage or pay for such repair as directed by the Contracting Officer.

The Contractor shall not endanger any work of any other contractors by cutting, excavating or otherwise altering any work of any other contractor, except with the written consent of the Contracting Officer.

If a dispute arises between the various on-site contractors as to their responsibility for cleaning up as required, the Contracting Officer may clean up and charge the cost thereof to the several contractors as the Contracting Officer shall determine to be just.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01 31 19.00 40

PROJECT MEETINGS

PART 1 GENERAL

- 1.1 SUMMARY
- 1.2 SUBMITTALS
- 1.3 PRECONSTRUCTION CONFERENCE
- 1.4 PROJECT MEETINGS

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

-- End of Section Table of Contents --

## SECTION 01 31 19.00 40

## PROJECT MEETINGS

## PART 1 GENERAL

## 1.1 SUMMARY

The requirements of this Section apply to, and are a component part of, each section of the specifications.

## 1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

[SD-01 Preconstruction Submittals](#)

A [Project Submittal Schedule](#) shall be submitted in accordance with paragraph entitled, "Project Meetings," of this section.

The Contractor shall submit a [Monthly Progress Report](#) at the first meeting of each month.

## 1.3 PRECONSTRUCTION CONFERENCE

The Contractor shall attend a preconstruction conference scheduled by the Contracting Officer. Work shall not commence prior to the conference. Subcontractor representatives shall attend.

The Contractor shall address project orientation, personnel contact, safety issues, permits, deficiencies, and the location of the Contractor's office.

## 1.4 PROJECT MEETINGS

The Contractor shall attend monthly project meetings scheduled by the Government.

A [Monthly Progress Report](#) shall be submitted with the progress schedule, and shall address potential factors of delay, deficiencies, material delivery schedules, submittals, and safety issues.

A [Project Submittal Schedule](#) shall be submitted showing full coordination with the project schedule. All products and tests under each submittal number shall be prioritized and linked to the progress schedule.

## PART 2 PRODUCTS (NOT USED)

## PART 3 EXECUTION (NOT USED)

-- End of Section --

## SECTION TABLE OF CONTENTS

## DIVISION 01 - GENERAL REQUIREMENTS

## SECTION 01 33 00

## SUBMITTAL PROCEDURES

## PART 1 GENERAL

- 1.1 DEFINITIONS
  - 1.1.1 Submittal
  - 1.1.2 Submittal Descriptions (SD)
  - 1.1.3 Approving Authority
  - 1.1.4 Work
- 1.2 SUBMITTALS
- 1.3 USE OF SUBMITTAL REGISTER
  - 1.3.1 Contractor Action Code and Action Code
- 1.4 PROCEDURES FOR SUBMITTALS
  - 1.4.1 Reviewing, Certifying, Approving Authority
  - 1.4.2 Constraints
  - 1.4.3 Scheduling
  - 1.4.4 Variations
    - 1.4.4.1 Considering Variations
    - 1.4.4.2 Proposing Variations
    - 1.4.4.3 Warranting That Variations Are Compatible
    - 1.4.4.4 Review Schedule Is Modified
  - 1.4.5 Contractor's Responsibilities
  - 1.4.6 QC Organization Responsibilities
  - 1.4.7 Government's Responsibilities
  - 1.4.8 Actions Possible
- 1.5 FORMAT OF SUBMITTALS
  - 1.5.1 Transmittal Form
  - 1.5.2 Identifying Submittals
  - 1.5.3 Format for SD-02 Shop Drawings
  - 1.5.4 Format of SD-03 Product Data and SD-08 Manufacturer's Instruction
  - 1.5.5 Format of SD-05 Design Data and SD-07 Certificates
  - 1.5.6 Format of SD-06 Test Reports and SD-09 Manufacturer's Field Reports
  - 1.5.7 Format of SD-10 Operation and Maintenance Data (O&M)
  - 1.5.8 Format of SD-01 Preconstruction Submittals and SD-11 Closeout Submittals
- 1.6 QUANTITY OF SUBMITTALS
  - 1.6.1 Number of Copies of SD-02 Shop Drawings
  - 1.6.2 Number of Copies of SD-03 Product Data and SD-08 Manufacturer's Instructions
  - 1.6.3 Number of Copies SD-05 Design Data and SD-07 Certificates
  - 1.6.4 Number of Copies SD-06 Test Reports and SD-09 Manufacturer's Field Reports
  - 1.6.5 Number of Copies of SD-10 Operation and Maintenance Data
  - 1.6.6 Number of Copies of SD-01 Preconstruction Submittals and SD-11 Closeout Submittals
- 1.7 SUBMITTAL CLASSIFICATION

- 1.7.1 Government Approved
  - 1.7.2 Information Only
  - 1.8 APPROVED SUBMITTALS
  - 1.9 DISAPPROVED SUBMITTALS
  - 1.10 WITHHOLDING OF PAYMENT
  - 1.11 GENERAL
  - 1.12 SUBMITTAL REGISTER
  - 1.13 SCHEDULING
  - 1.14 TRANSMITTAL FORM
  - 1.15 SUBMITTAL PROCEDURES
    - 1.15.1 Procedures
    - 1.15.2 Deviations
  - 1.16 CONTROL OF SUBMITTALS
  - 1.17 GOVERNMENT APPROVED SUBMITTALS
  - 1.18 INFORMATION ONLY SUBMITTALS
  - 1.19 PREPARATION
    - 1.19.1 Marking
    - 1.19.2 Drawing Format
    - 1.19.3 Data Format
  - 1.20 SUBMISSION REQUIREMENTS
    - 1.20.1 Schedules
  - 1.21 PROGRESS SCHEDULE
    - 1.21.1 Bar Chart
  - 1.22 STATUS REPORT ON MATERIALS ORDERS
- PART 2 PRODUCTS
- PART 3 EXECUTION

-- End of Section Table of Contents --

## SECTION 01 33 00

## SUBMITTAL PROCEDURES

## PART 1 GENERAL

## 1.1 DEFINITIONS

## 1.1.1 Submittal

Contract Clauses "FAR 52.236-5, Material and Workmanship," paragraph (b) and "FAR 52.236-21, Specifications and Drawings for Construction," paragraphs (d), (e), and (f) apply to all "submittals."

## 1.1.2 Submittal Descriptions (SD)

Submittals requirements are specified in the technical sections. Submittals are identified by SD numbers and titles as follows.

**SD-01 Preconstruction Submittals**

Submittals which are required prior to a notice to proceed on a new contract. Submittals required prior to the start of the next major phase of the construction on a multi-phase contract. Schedules or tabular list of data or tabular list including location, features, or other pertinent information regarding products, materials, equipment, or components to be used in the work, submitted prior to contract notice to proceed or next major phase of construction.

Certificates of insurance.  
Surety bonds.  
List of proposed subcontractors.  
List of proposed products.  
Construction Progress Schedule.  
Submittal register.  
Schedule of prices.  
Health and safety plan.  
Work plan.  
Quality control plan.  
Environmental protection plan.

**SD-03 Product Data**

Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions and brochures illustrating size, physical appearance and other characteristics of materials, systems or equipment for some portion of the work.

Samples of warranty language when the contract requires extended product warranties.

**SD-06 Test Reports**

Report signed by authorized official of testing laboratory that a material, product or system identical to the material, product or system to be provided has been tested in accord with specified

requirements. (Testing must have been within three years of date of contract award for the project.)

Report which includes findings of a test required to be performed by the Contractor on an actual portion of the work or prototype prepared for the project before shipment to job site.

Report which includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.

Investigation reports.

Daily logs and checklists.

Final acceptance test and operational test procedure.

#### SD-08 Manufacturer's Instructions

Preprinted material describing installation of a product, system or material, including special notices and Material Safety Data sheets concerning impedances, hazards and safety precautions.

#### SD-10 Operation and Maintenance Data

Data that is furnished by the manufacturer, or the system provider, to the equipment operating and maintenance personnel. This data is needed by operating and maintenance personnel for the safe and efficient operation, maintenance and repair of the item.

This Data is intended to be incorporated in an operations and maintenance manual or control system.

#### SD-11 Closeout Submittals

Documentation to record compliance with technical or administrative requirements or to establish an administrative mechanism.

Special requirements necessary to properly close out a construction contract. For example, Record Drawings, manufacturer's help and product lines necessary to maintain and install equipment. Also, submittal requirements necessary to properly close out a major phase of construction on a multi-phase contract.

##### 1.1.3 Approving Authority

Office or designated person authorized to approve submittal.

##### 1.1.4 Work

As used in this section, on- and off-site construction required by contract documents, including labor necessary to produce submittals, construction, materials, products, equipment, and systems incorporated or to be incorporated in such construction.

##### 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as

otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

**SD-01 Preconstruction Submittals**

**Submittal register; G**

**1.3 USE OF SUBMITTAL REGISTER**

Submittal register will be delivered to the Contractor, by Contracting Officer. Register will have the following fields completed, to the extent that will be required by the Government during subsequent usage.

Column (c): Lists specification section in which submittal is required.

Column (d): Lists each submittal description (SD No. and type, e.g. SD-02 Shop Drawings) required in each specification section.

Column (e): Lists one principal paragraph in specification section where a material or product is specified. This listing is only to facilitate locating submitted requirements. Do not consider entries in column (e) as limiting project requirements.

Column (f): Indicate approving authority for each submittal. A "G" indicates approval by Contracting Officer; a blank indicates approval by Design Engineer.

Prepare and maintain **submittal register**, as the work progresses. Do not change data which is output in columns (c), (d), (e), and (f) as delivered by Government; retain data which is output in columns (a), (g), (h), and (i) as approved.

**1.3.1 Contractor Action Code and Action Code**

Entries used shall be as follows (others may be prescribed by Transmittal Form):

AC - Approved with corrections

A - Approved

R - Disapproved, Revise, and Resubmit

RE - Reviewed

RC - Reviewed with corrections

**1.4 PROCEDURES FOR SUBMITTALS**

**1.4.1 Reviewing, Certifying, Approving Authority**

Contracting Officer shall be responsible for reviewing and certifying that submittals are in compliance with contract requirements. Approving authority on submittals is Contracting Officer unless otherwise specified for specific submittal. At each "Submittal" paragraph in individual specification sections, a notation "G," following a submittal item,

indicates Contracting Officer is approving authority for that submittal item.

#### 1.4.2 Constraints

- a. Submittals listed or specified in this contract shall conform to provisions of this section, unless explicitly stated otherwise.
- b. Submittals shall be complete for each definable feature of work; components of definable feature interrelated as a system shall be submitted at same time.
- c. When acceptability of a submittal is dependent on conditions, items, or materials included in separate subsequent submittals, submittal will be returned without review.
- d. Approval of a separate material, product, or component does not imply approval of assembly in which item functions.

#### 1.4.3 Scheduling

- a. Coordinate scheduling, sequencing, preparing and processing of submittals with performance of work so that work will not be delayed by submittal processing. Allow for potential requirements to resubmit.
- b. Except as specified otherwise, allow review period, beginning with receipt by approving authority, that includes at least 15 working days for submittals for QC Manager approval and 20 working days for submittals for Contracting Officer approval. Period of review for submittals with Contracting Officer approval begins when Government receives submittal from QC organization. Period of review for each resubmittal is the same as for initial submittal.
- c. For submittals requiring review by fire protection engineer, allow review period, beginning when Government receives submittal from QC organization, of 30 working days for return of submittal to the Contractor. Period of review for each resubmittal is the same as for initial submittal.

#### 1.4.4 Variations

Variations from contract requirements require Government approval pursuant to contract Clause entitled "FAR 52.236-21, Specifications and Drawings for Construction" and will be considered where advantageous to Government.

##### 1.4.4.1 Considering Variations

Discussion with Contracting Officer prior to submission, will help ensure functional and quality requirements are met and minimize rejections and resubmittals. When contemplating a variation which results in lower cost, consider submission of the variation as a Value Engineering Change Proposal (VECP).

##### 1.4.4.2 Proposing Variations

When proposing variation, deliver written request to the Contracting Officer, with documentation of the nature and features of the variation and why the variation is desirable and beneficial to Government. If lower cost

is a benefit, also include an estimate of the cost saving. In addition to documentation required for variation, include the submittals required for the item. Clearly mark the proposed variation in all documentation.

#### 1.4.4.3 Warranting That Variations Are Compatible

When delivering a variation for approval, Contractor warrants that this contract has been reviewed to establish that the variation, if incorporated, will be compatible with other elements of work.

#### 1.4.4.4 Review Schedule Is Modified

In addition to normal submittal review period, a period of 10 working days will be allowed for consideration by the Government of submittals with variations.

#### 1.4.5 Contractor's Responsibilities

- a. Determine and verify field measurements, materials, field construction criteria; review each submittal; and check and coordinate each submittal with requirements of the work and contract documents.
- b. Transmit submittals to Contracting Officer in accordance with schedule on approved Submittal Register, and to prevent delays in the work, delays to Government, or delays to separate Contractors.
- c. Advise Contracting Officer of variation, as required by paragraph entitled "Variations."
- d. Correct and resubmit submittal as directed by approving authority. When resubmitting disapproved transmittals or transmittals noted for resubmittal, the Contractor shall provide copy of that previously submitted transmittal including all reviewer comments for use by approving authority. Direct specific attention in writing or on resubmitted submittal, to revisions not requested by approving authority on previous submissions.
- e. Furnish additional copies of submittal when requested by Contracting Officer, to a limit of 20 copies per submittal.
- f. Complete work which must be accomplished as basis of a submittal in time to allow submittal to occur as scheduled.
- g. Ensure no work has begun until submittals for that work have been returned as "approved," or "approved as noted", except to the extent that a portion of work must be accomplished as basis of submittal.

#### 1.4.6 QC Organization Responsibilities

- a. Note date on which submittal was received from Contractor on each submittal.
- b. Review each submittal; and check and coordinate each submittal with requirements of work and contract documents.
- c. Review submittals for conformance with project design concepts and compliance with contract documents.

- d. Act on submittals, determining appropriate action based on QC organization's review of submittal.
- e. Ensure that material is clearly legible.
- f. Stamp each sheet of each submittal with QC certifying statement or approving statement, except that data submitted in bound volume or on one sheet printed on two sides may be stamped on the front of the first sheet only.

(1) When approving authority is Contracting Officer, QC organization will certify submittals forwarded to Contracting Officer with the following certifying statement:

"I hereby certify that the (equipment) (material) (article) shown and marked in this submittal is that proposed to be incorporated with contract Number, is in compliance with the contract drawings and specification, can be installed in the allocated spaces, and is submitted for Government approval.

Certified by Submittal Reviewer \_\_\_\_\_, Date \_\_\_\_\_  
(Signature when applicable)

Certified by QC Manager \_\_\_\_\_, Date \_\_\_\_\_"  
(Signature)

(2) When approving authority is QC Manager, QC Manager will use the following approval statement when returning submittals to Contractor as "Approved" or "Approved as Noted."

"I hereby certify that the (material) (equipment) (article) shown and marked in this submittal and proposed to be incorporated with contract Number, is in compliance with the contract drawings and specification, can be installed in the allocated spaces, and is approved for use.

Certified by Submittal Reviewer \_\_\_\_\_, Date \_\_\_\_\_  
(Signature when applicable)

Approved by QC Manager \_\_\_\_\_, Date \_\_\_\_\_"  
(Signature)

- g. Sign certifying statement or approval statement. The person signing certifying statements shall be QC organization member designated in the approved QC plan. The signatures shall be in original ink. Stamped signatures are not acceptable.
- h. Update submittal register as submittal actions occur and maintain the submittal register at project site until final acceptance of all work by Contracting Officer.
- i. Retain a copy of approved submittals at project site, including Contractor's copy of approved samples.

1.4.7 Government's Responsibilities

When approving authority is Contracting Officer, the Government will:

- a. Note date on which submittal was received from QC Manager, on each submittal for which the Contracting Officer is approving authority.
- b. Review submittals for approval within scheduling period specified and only for conformance with project design concepts and compliance with contract documents.
- c. Identify returned submittals with one of the actions defined in paragraph entitled "Actions Possible" and with markings appropriate for action indicated.

#### 1.4.8 Actions Possible

Submittals will be returned with one of the following notations:

- a. Submittals marked "not reviewed" will indicate submittal has been previously reviewed and approved, is not required, does not have evidence of being reviewed and approved by Contractor, or is not complete. A submittal marked "not reviewed" will be returned with an explanation of the reason it is not reviewed. Resubmit submittals returned for lack of review by Contractor or for being incomplete, with appropriate action, coordination, or change.
- b. Submittals marked "approved" "approved as submitted" authorize Contractor to proceed with work covered.
- c. Submittals marked "approved as noted" or "approval except as noted; resubmission not required" authorize Contractor to proceed with work as noted provided Contractor takes no exception to the notations.
- d. Submittals marked "revise and resubmit" or "disapproved" indicate submittal is incomplete or does not comply with design concept or requirements of the contract documents and shall be resubmitted with appropriate changes. No work shall proceed for this item until resubmittal is approved.

### 1.5 FORMAT OF SUBMITTALS

#### 1.5.1 Transmittal Form

Transmit each submittal, except sample installations and sample panels, to office of approving authority. Transmit submittals with transmittal form prescribed by Contracting Officer and standard for project. The transmittal form shall identify Contractor, indicate date of submittal, and include information prescribed by transmittal form and required in paragraph entitled "Identifying Submittals." Process transmittal forms to record actions regarding sample panels and sample installations.

#### 1.5.2 Identifying Submittals

Identify submittals, except sample panel and sample installation, with the following information permanently adhered to or noted on each separate component of each submittal and noted on transmittal form. Mark each copy of each submittal identically, with the following:

- a. Project title and location.
- b. Construction contract number.

- c. Section number of the specification section by which submittal is required.
- d. Submittal description (SD) number of each component of submittal.
- e. When a resubmission, add alphabetic suffix on submittal description, for example, SD-10A, to indicate resubmission.
- f. Name, address, and telephone number of subcontractor, supplier, manufacturer and any other second tier Contractor associated with submittal.
- g. Product identification and location in project.

#### 1.5.3 Format for SD-02 Shop Drawings

- a. Shop drawings shall not be less than 8-1/2 by 11 inches nor more than 30 by 42 inches.
- b. Present 8-1/2 by 11 inches sized shop drawings as part of the bound volume for submittals required by section. Present larger drawings in sets.
- c. Include on each drawing the drawing title, number, date, and revision numbers and dates, in addition to information required in paragraph entitled "Identifying Submittals."
- d. Dimension drawings, except diagrams and schematic drawings; prepare drawings demonstrating interface with other trades to scale. Shop drawing dimensions shall be the same unit of measure as indicated on the contract drawings. Identify materials and products for work shown.
- e. Drawings shall include the nameplate data, size and capacity. Also include applicable federal, military, industry and technical society publication references.

#### 1.5.4 Format of SD-03 Product Data and SD-08 Manufacturer's Instruction

- a. Present product data submittals for each section as a complete, bound volume. Include table of contents, listing page and catalog item numbers for product data.
- b. Indicate, by prominent notation, each product which is being submitted; indicate specification section number and paragraph number to which it pertains.
- c. Supplement product data with material prepared for project to satisfy submittal requirements for which product data does not exist. Identify this material as developed specifically for project, with information and format as required for submission of SD-07 Certificates.
- d. Product data shall include the manufacturer's name, trade name, place of manufacture, and catalog model or number. Submittals shall also include applicable federal, military, industry and technical society publication references. Should manufacturer's data require supplemental information for clarification, the

supplemental information shall be submitted as specified for SD-07 Certificates.

- e. Where equipment or materials are specified to conform to industry and technical society reference standards of the organizations such as American National Standards Institute (ANSI), ASTM International (ASTM), National Electrical Manufacturer's Association (NEMA), Underwriters Laboratories (UL), and Association of Edison Illuminating Companies (AEIC), submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance. In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Contracting Officer. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.
- f. Submit manufacturer's instruction prior to installation.

#### 1.5.5 Format of SD-05 Design Data and SD-07 Certificates

- a. Provide design data and certificates on 8-1/2 by 11 inches paper. Provide a bound volume for submittals containing numerous pages.

#### 1.5.6 Format of SD-06 Test Reports and SD-09 Manufacturer's Field Reports

- a. Provide reports on 8-1/2 by 11 inches paper in a complete bound volume.
- b. Indicate by prominent notation, each report in the submittal. Indicate specification number and paragraph number to which it pertains.

#### 1.5.7 Format of SD-10 Operation and Maintenance Data (O&M)

- a. O&M Data format shall be standard documents provided by Material Manufacturer's.

#### 1.5.8 Format of SD-01 Preconstruction Submittals and SD-11 Closeout Submittals

- a. When submittal includes a document which is to be used in project or become part of project record, other than as a submittal, do not apply Contractor's approval stamp to document, but to a separate sheet accompanying document.

### 1.6 QUANTITY OF SUBMITTALS

#### 1.6.1 Number of Copies of SD-02 Shop Drawings

- a. Submit six copies of submittals of shop drawings requiring review and approval only by QC organization and seven copies of shop drawings requiring review and approval by Contracting Officer.

#### 1.6.2 Number of Copies of SD-03 Product Data and SD-08 Manufacturer's Instructions

- a. Submit in compliance with quantity requirements specified for shop

drawings.

1.6.3 Number of Copies SD-05 Design Data and SD-07 Certificates

- a. Submit in compliance with quantity requirements specified for shop drawings.

1.6.4 Number of Copies SD-06 Test Reports and SD-09 Manufacturer's Field Reports

- a. Submit in compliance with quantity and quality requirements specified for shop drawings.

1.6.5 Number of Copies of SD-10 Operation and Maintenance Data

Submit three copies of O&M Data to the Contracting Officer for review and approval.

1.6.6 Number of Copies of SD-01 Preconstruction Submittals and SD-11 Closeout Submittals

- a. Unless otherwise specified, submit administrative submittals compliance with quantity requirements specified for shop drawings.

1.7 SUBMITTAL CLASSIFICATION

Submittals are classified as follows:

1.7.1 Government Approved

Government approval is required for extensions of design, critical materials, deviations, equipment whose compatibility with the entire system must be checked, and other items as designated by the Contracting Officer. Government approval is required for any deviations from the Solicitation or Accepted Proposal and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction," they are considered to be "shop drawings."

1.7.2 Information Only

All submittals not requiring Government approval will be for information only. All submittals not requiring Designer of Record or Government approval will be for information only. They are not considered to be "shop drawings" within the terms of the Contract Clause referred to above.

All submittals not requiring Government approval will be for information only. They are not considered to be "shop drawings" within the terms of the Contract Clause referred to above.

1.8 APPROVED SUBMITTALS

The Contracting Officer's approval of submittals shall not be construed as a complete check, but will indicate only that the general method of construction, materials, detailing and other information are satisfactory design, general method of construction, materials, detailing and other information appear to meet the Solicitation and Accepted Proposal. After submittals have been approved by the Contracting Officer, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

### 1.9 DISAPPROVED SUBMITTALS

The Contractor shall make all corrections required by the Contracting Officer and promptly furnish a corrected submittal in the form and number of copies specified for the initial submittal. The Contractor shall make all corrections required by the Contracting Officer, obtain the Designer of Record's approval when applicable, and promptly furnish a corrected submittal in the form and number of copies specified for the initial submittal. Any "information only" submittal found to contain errors or unapproved deviations from the Solicitation or Accepted Proposal shall be resubmitted as one requiring "approval" action, requiring both Designer of Record and Government approval. If the Contractor considers any correction indicated on the submittals to constitute a change to the contract, a notice in accordance with the Contract Clause "Changes" shall be given promptly to the Contracting Officer.

### 1.10 WITHHOLDING OF PAYMENT

Payment for materials incorporated in the work will not be made if required approvals have not been obtained. No payment for materials incorporated in the work will be made if all required Designer of Record or required Government approvals have not been obtained. No payment will be made for any materials incorporated into the work for any conformance review submittals or information only submittals found to contain errors or deviations from the Solicitation or Accepted Proposal.

### 1.11 GENERAL

The Contractor shall make submittals as required by the specifications. The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections. Units of weights and measures used on all submittals shall be the same as those used in the contract drawings. Each submittal shall be complete and in sufficient detail to allow ready determination of compliance with contract requirements. Prior to submittal, all items shall be checked and approved by the Contractor's Quality Control (CQC) System Manager. Proposed deviations from the contract requirements shall be clearly identified. Submittals shall include items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals. Submittals requiring Government approval shall be scheduled and made prior to the acquisition of the material or equipment covered thereby. Samples remaining upon completion of the work shall be picked up and disposed of in accordance with manufacturer's Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations.

### 1.12 SUBMITTAL REGISTER

At the end of this section is a submittal register showing items of equipment and materials for which submittals are required by the specifications; this list may not be all inclusive and additional submittals may be required.

### 1.13 SCHEDULING

Submittals covering component items forming a system or items that are

interrelated shall be scheduled to be coordinated and submitted concurrently. Certifications to be submitted with the pertinent drawings shall be so scheduled. Adequate time (a minimum of 21 calendar days exclusive of mailing time) shall be allowed and shown on the register for review and approval. No delay damages or time extensions will be allowed for time lost in late submittals.

#### 1.14 TRANSMITTAL FORM

The sample transmittal form provided at the pre-construction conference shall be used for submitting both Government approved and information only submittals. These forms will be furnished to the Contractor. This form shall be properly completed by filling out all the heading blank spaces and identifying each item submitted. Special care shall be exercised to ensure proper listing of the specification paragraph and/or sheet number of the contract drawings pertinent to the data submitted for each item.

#### 1.15 SUBMITTAL PROCEDURES

Submittals shall be made as follows:

##### 1.15.1 Procedures

The Contracting Officer will further discuss detailed submittal procedures with the Contractor at the Preconstruction Conference.

##### 1.15.2 Deviations

For submittals which include proposed deviations requested by the Contractor, the column "variation" of the transmittal form shall be checked. The Contractor shall set forth in writing the reason for any deviations and annotate such deviations on the submittal. The Government reserves the right to rescind inadvertent approval of submittals containing unnoted deviations.

#### 1.16 CONTROL OF SUBMITTALS

The Contractor shall carefully control his procurement operations to ensure that each individual submittal is made on or before the Contractor scheduled submittal date shown on the approved "Submittal Register."

#### 1.17 GOVERNMENT APPROVED SUBMITTALS

Upon completion of review of submittals requiring Government approval, the submittals will be identified as having received approval by being so stamped and dated. Three copies of the submittal will be retained by the Contracting Officer and three copies of the submittal will be returned to the Contractor. If the Government performs a conformance review of other Designer of Record approved submittals, the submittals will be so identified and returned, as described above.

#### 1.18 INFORMATION ONLY SUBMITTALS

Normally submittals for information only will not be returned. Approval of the Contracting Officer is not required on information only submittals. The Government reserves the right to require the Contractor to resubmit any item found not to comply with the contract. This does not relieve the Contractor from the obligation to furnish material conforming to the plans and specifications, will not prevent the Contracting Officer from requiring

removal and replacement of nonconforming material incorporated in the work, and does not relieve the Contractor of the requirement to furnish samples for testing by the Government laboratory or for check testing by the Government in those instances where the technical specifications so prescribe.

#### 1.19 PREPARATION

##### 1.19.1 Marking

Prepare, review and stamp with Contractor's approval all specified submittals.

Permanently mark each submittal to identify it by contract number; transmittal date; Contractor's, Subcontractor's, and supplier's name, address(es) and telephone number(s); submittal name; specification or drawing reference; and similar information to distinguish it from other submittals. Submittal identification shall include space to receive the review action by the Contracting Officer.

##### 1.19.2 Drawing Format

Drawing submittals shall be prepared using AUTO-CAD 2002 or better.

Copies of each drawing shall have the following information clearly marked thereon:

- a. Job name, which shall be the general title of the contract drawings.
- b. Date of the drawings and revisions.
- c. Name of Contractor.
- d. Name of Subcontractor.
- e. Name of the item, material, or equipment detailed thereon.
- f. Submittal number (e.g., first submittal to last submittal) in a uniform location adjacent to the title block.
- g. Specification section to which submittal applies.
- h. Government contract number shall appear in the margin, immediately below the title block.

Drawings shall be numbered in logical sequence. Contractor may use his own number system. Each drawing shall bear the number of the submittal in a uniform location adjacent to the title block. Government contract number shall appear in the margin, immediately below the title block, for each drawing.

A blank space, no smaller than **3x5 inches** shall be reserved on the right hand side of each sheet for the Government disposition stamp.

##### 1.19.3 Data Format

Required data submittals for each specific material, product, unit of work, or system shall be collected into a single submittal and marked for

choices, options, and portions applicable to the submittal. Marking of each copy of product data submitted shall be identical. Partial submittals will not be accepted for expedition of construction effort.

## 1.20 SUBMISSION REQUIREMENTS

### 1.20.1 Schedules

Within 30 calendar days of notice to proceed, provide, for approval by the Contracting Officer, the following schedule of submittals:

- a. A schedule of shop drawings and technical submittals required by the specifications and drawings. Indicate the specification or drawing reference requiring the submittal; the material, item, or process for which the submittal is required; the "SD" number and identifying title of the submittal; the Contractor's anticipated submission date and the approval need date.
- b. A separate schedule of other submittals required under the contract but not listed in the specifications or drawings. Schedule will indicate the contract requirement reference; the type or title of the submittal; the Contractor's anticipated submission date and the approved need date (if approval is required).
- c. Submittals called for by the contract documents will be listed on one of the above schedules. If a submittal is called for but does not pertain to the contract work, the Contractor shall include the submittal in the applicable schedule and annotate it "N/A" with a brief explanation. Approval of the schedules by the Contracting Officer does not relieve the Contractor of supplying submittals required by the contract documents but which have been omitted from the schedules or marked "N/A".
- d. Re-submit copies of both schedules and annotate monthly by the Contractor with actual submission and approval dates. When all items on a schedule have been fully approved, no further re-submittal of the schedule is required.

## 1.21 PROGRESS SCHEDULE

### 1.21.1 Bar Chart

- a. Submit the progress chart, for approval by the Contracting Officer, at the Preconstruction Conference in one reproducible and 4 copies.
- b. Prepare the progress chart in the form of a bar chart utilizing form "Construction Progress Chart" or comparable format acceptable to the Contracting Officer.
- c. Include no less than the following information on the progress chart:
  - (1) Break out by major headings for primary work activity.
  - (2) A line item break out under each major heading sufficient to track the progress of the work.

- (3) A line item showing contract finalization task which includes punch list, clean-up and demolition, and final construction drawings.
  - (4) A materials bar and a separate labor bar for each line item. Both bars will show the scheduled percentage complete for any given date within the contract performance period. Labor bar will also show the number of men (man-load) expected to be working on any given date within the contract performance period.
  - (5) The estimated cost and percentage weight of total contract cost for each materials and labor bar on the chart.
  - (6) Separate line items for mobilization and drawing submittal and approval. (These items are to show no associated costs.)
- d. Update the progress schedule in one reproduction and 4 copies every 30 calendar days throughout the contract performance period.

#### 1.22 STATUS REPORT ON MATERIALS ORDERS

Within 30 calendar days after notice to proceed, submit, for approval by the Contracting Officer, an initial material status report on all materials orders. This report will be updated and re-submitted every 30 calendar days as the status on material orders changes.

Report shall list, in chronological order by need date, materials orders necessary for completion of the contract. The following information will be required for each material order listed:

- a. Material name, supplier, and invoice number.
- b. Bar chart line item or CPM activity number affected by the order.
- c. Delivery date needed to allow directly and indirectly related work to be completed within the contract performance period.
- d. Current delivery date agreed on by supplier.
- e. When item d exceeds item c, the effect that delayed delivery date will have on contract completion date.
- f. When item d exceeds item c, a summary of efforts made by the Contractor to expedite the delayed delivery date to bring it in line with the needed delivery date, including efforts made to place the order (or subcontract) with other suppliers.

#### PART 2 PRODUCTS

Not Used

#### PART 3 EXECUTION

Not Used

-- End of Section --

# SUBMITTAL REGISTER

CONTRACT NO.  
AE02435

TITLE AND LOCATION  
COMPONENT VERIFICATION LAB, RELOCATION TO BUILDING 1267

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		APPROVING AUTHORITY					REMARKS	
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION		MAILED TO CONTR/ DATE RCD FRM APPR AUTH
	01 11 00.00 41		SD-01 Preconstruction Submittals														
			Utility Outage Requests	1.8.1													
			Utility Connection Requests	1.8.1													
			Borrow Permits														
			Excavation Permits	1.8.2													
			Welding Permits	1.8.2													
			Burning Permits														
			SD-03 Product Data														
			Form LF491 LaRC Computerized Maintenance Management System (CMMS) Equipment Change Request														
	01 30 00.00 41		SD-01 Preconstruction Submittals														
			Progress and completion pictures	1.3													
			List of contact personnel	1.5.1													
			Plumbing Workers' Qualifications	1.5.3.1													
			Mechanical Workers' Qualifications	1.5.3.2													
			Electrical Workers' Qualifications	1.5.3.3													
			SD-11 Closeout Submittals														
			As-Built Contract Drawings	1.10													
	01 31 19.00 40		SD-01 Preconstruction Submittals														
			Project Submittal Schedule	1.4													
			Monthly Progress Report	1.4													
	01 33 00		SD-01 Preconstruction Submittals														
			Submittal register	1.3	G												

# SUBMITTAL REGISTER

CONTRACT NO.  
AE02435

TITLE AND LOCATION  
COMPONENT VERIFICATION LAB, RELOCATION TO BUILDING 1267

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		APPROVING AUTHORITY				REMARKS		
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE		DATE OF ACTION	MAILED TO CONTR/ DATE RCD FRM APPR AUTH
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		01 33 00	Submittal register	1.12	G												
		01 35 23.00 41	SD-01 Preconstruction Submittals														
			Safety Plan	1.5.1													
			Material Safety Data Sheet (MSDS) of hazardous material(s)	1.5.9													
			Application for Work on Energized Electrical Circuits Below 600 Volts														
			Electrical Safety Workers' Qualifications	1.7.16.1													
			Application for Making Connection to Government Electrical Utilities														
			Energized Substations Work Plan														
			Power Utility Outage Request														
			LaRC Energized Electrical Work Permit Form LF 416														
			Asbestos Operational Procedure	1.18.3													
			Asbestos Operational Procedure	1.18.7													
			List of Riggers														
			PCB Operational Procedures														
			PCB Disposal Facility Identification and Qualifications														
			PCB-Drained Equipment														
			Certification Compliance														
			List of PCB Items														

# SUBMITTAL REGISTER

CONTRACT NO.  
AE02435

TITLE AND LOCATION  
COMPONENT VERIFICATION LAB, RELOCATION TO BUILDING 1267

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT OR CLASSIFICATION REVIEW	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		APPROVING AUTHORITY				REMARKS		
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE		DATE OF ACTION	MAILED TO CONTR/ DATE RCD FRM APPR AUTH
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		01 35 23.00 41	Emergency Spill Plan	1.7.16.3													
			Shipping Document	1.7.16.3													
			Shipping Document	1.7.16.3													
			List of PCB Operators and Qualifications														
			Hazardous Waste Disposal Plan														
			Sewer Disposal Permit	1.23													
		26 05 00.00 40	SD-03 Product Data														
			Conduits, Raceway and Fittings	3.1													
			Wire and Cable	2.2													
			Splices and Connectors	2.3													
			Switches	2.4													
			Receptacles	2.1.6													
			Receptacles	2.5													
			Receptacles	3.4.1													
			Outlets, Outlet Boxes, and Pull Boxes	2.6													
			Circuit Breakers	2.7													
			Lamps and Lighting Fixtures	2.8													
			Lamps and Lighting Fixtures	3.6													
			Camera Equipment and Accessories														
			SD-06 Test Reports														
			Continuity Test	3.8													
			Phase-Rotation Tests	3.8													
			Insulation Resistance Test	3.8													

# SUBMITTAL REGISTER

CONTRACT NO.  
AE02435

TITLE AND LOCATION  
COMPONENT VERIFICATION LAB, RELOCATION TO BUILDING 1267

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH #	GOVT CLASSIFICATION REVIEW	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		APPROVING AUTHORITY				REMARKS			
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE		DATE OF ACTION	MAILED TO CONTR/ DATE RCD FRM APPR AUTH	
																		(a)
		26 05 00.00 40	SD-08 Manufacturer's Instructions															
			Material, Equipment, and Fixture Lists	1.4														
			Manufacturer's Instructions	1.4														
			Camera Equipment and Accessories															
		26 05 71.00 40	SD-03 Product Data															
			Motor Control	2.1														
			Instrument Transformers															
			Enclosures	2.2														
			Circuit Breakers	2.3														
			Control Devices	3.1														
			Indicating Lights	2.7														
			SD-10 Operation and Maintenance Data															
			Manual Motor Controllers	2.1.1														

## SECTION TABLE OF CONTENTS

## DIVISION 01 - GENERAL REQUIREMENTS

## SECTION 01 35 23.00 41

## LANGLEY SAFETY AND ENVIRONMENTAL REQUIREMENTS

## PART 1 GENERAL

- 1.1 LARC SAFETY INFORMATION
  - 1.1.1 Safety and Health Information
    - 1.1.1.1 Commitment to Safety and Health
    - 1.1.1.2 Safety and Health Culture
    - 1.1.1.3 Construction Safety and Health Goals
    - 1.1.1.4 Construction Safety Strategy
    - 1.1.1.5 Compliance
    - 1.1.1.6 LaRC Definition of Construction Work
- 1.2 SUMMARY
- 1.3 REFERENCES
- 1.4 SUBMITTALS
- 1.5 GENERAL SAFETY REQUIREMENTS
  - 1.5.1 Safety Plan
  - 1.5.2 Recordkeeping
  - 1.5.3 Safety Briefing
  - 1.5.4 Inspections
  - 1.5.5 Housekeeping
  - 1.5.6 Illumination
  - 1.5.7 Ladders
  - 1.5.8 Motor Vehicles and Mechanized Equipment
  - 1.5.9 Hazardous Materials
  - 1.5.10 Inclement Weather Conditions
- 1.6 SAFETY CLEARANCE PROCEDURES/LOCKOUT/TAGOUT
- 1.7 ELECTRICAL SAFETY
  - 1.7.1 Electrical Definitions
  - 1.7.2 General Requirements
  - 1.7.3 Specific Requirements
    - 1.7.3.1 Live Work Requirements
    - 1.7.3.2 Personal Protective Equipment (PPE)
    - 1.7.3.3 Hard Hat Area
    - 1.7.3.4 Welding Near Electrical Equipment
    - 1.7.3.5 Lockout/Tagout
    - 1.7.3.6 Portable Equipment Grounding
    - 1.7.3.7 Temporary Wiring
    - 1.7.3.8 Extension Cords
  - 1.7.4 Training Requirements
    - 1.7.4.1 Technical Training
    - 1.7.4.2 Safety Training
    - 1.7.4.3 Additional Training
  - 1.7.5 Working Space Around Equipment
  - 1.7.6 Approach Distances to Exposed Energized Parts - Shock Protection
  - 1.7.7 Approach Distances to Exposed Energized Parts - Arc Flash Protection
  - 1.7.8 Cranes and Lifting Equipment Adjacent to Exposed Electrical

## Energized Parts

- 1.7.9 Installation or Repair of Transformers
- 1.7.10 Removal of Obsolete Equipment
- 1.7.11 Contractor Connections into Government Electrical Utilities
- 1.7.12 Work in Energized Substations
  - 1.7.12.1 General Requirements
  - 1.7.12.2 Contractors Other Than NPS Contractors
- 1.7.13 Substation Access
  - 1.7.13.1 Standard Substation Access Procedures
  - 1.7.13.2 Substation Access for Non-Electrical Work
- 1.7.14 Special Electrical Equipment Handling Procedures
  - 1.7.14.1 Batteries
  - 1.7.14.2 Fuses
- 1.7.15 HAZARDS OF ELECTRICITY
  - 1.7.15.1 Hazards of Electric Arcs
  - 1.7.15.2 Effects of Electric Shocks
  - 1.7.15.3 Body Current Levels at 120 Volts AC
- 1.7.16 Special Electrical Safety Requirements
  - 1.7.16.1 Electrical Safety Workers' Qualifications and Duties
  - 1.7.16.2 Protective System Checks
  - 1.7.16.3 PCB Operations
- 1.8 UNDERGROUND UTILITIES AND OPERATIONS
  - 1.8.1 General
  - 1.8.2 Water Connections
- 1.9 RADIATION SAFETY PRECAUTIONS
- 1.10 PRESSURE VESSELS
- 1.11 DEMOLITION OPERATIONS
  - 1.11.1 Air - Fugitive Dust/Emissions Control
  - 1.11.2 Recycling/Diversion
  - 1.11.3 EPCRA Waste Requirements
- 1.12 EXCAVATION OPERATIONS
  - 1.12.1 Soil Excavation
- 1.13 DIGGING PERMITS
- 1.14 GAS PROTECTION
- 1.15 PAINTING AND COATING OPERATIONS
- 1.16 ROOFING AND COATING OPERATIONS
- 1.17 FIRE PREVENTION AND PROTECTION
  - 1.17.1 General Requirements
  - 1.17.2 Welding, Flame Cutting and Melting
  - 1.17.3 Prohibitions
  - 1.17.4 Safeguards
  - 1.17.5 Firewatch
  - 1.17.6 Means of Egress
  - 1.17.7 Fire Protection and Detection Systems
  - 1.17.8 Portable Fire Extinguishers
  - 1.17.9 Temporary Heaters
  - 1.17.10 Removal of Combustible Waste Material
  - 1.17.11 Disposal of Rubbish
  - 1.17.12 Flammable and Combustible Liquids
  - 1.17.13 Smoking
  - 1.17.14 Non-Emergency Use of Fire Hydrants
  - 1.17.15 Fire Department Access
- 1.18 ASBESTOS ABATEMENT
  - 1.18.1 General Requirements
  - 1.18.2 Notification Requirements
  - 1.18.3 Operational Procedure
  - 1.18.4 Additional Requirements for Removal of Friable Asbestos
  - 1.18.5 Removal and/or Reinstallation of Transite Panels
  - 1.18.6 Disposal of Asbestos Waste

- 1.18.7 Submittals
  - 1.18.8 Monitoring Requirements
    - 1.18.8.1 Licensed Asbestos Project Monitor (LAPM)
    - 1.18.8.2 Duties of the Project Monitor
    - 1.18.8.3 Air Sampling
  - 1.18.9 Final Clearance
  - 1.19 USE OF EXPLOSIVES
  - 1.20 FALL PROTECTION (OSHA 29 CFR 1926.501 THROUGH 1926.503)
  - 1.21 LIFTING OPERATIONS
    - 1.21.1 General
    - 1.21.2 Lifting Devices
    - 1.21.3 Guidelines for Proper Use of A-Frame Type Lifting Devices
    - 1.21.4 Certification of Qualified Operators of Government Owned Lifting
  - 1.22 ACCIDENTS AND SAFETY RELATED INCIDENTS
    - 1.22.1 Emergency Response and First Aid Facilities
    - 1.22.2 Accident Reporting
    - 1.22.3 Hazard Identification and Tracking
  - 1.23 DISPOSAL OF HAZARDOUS WASTE MATERIAL
  - 1.24 PERSONAL PROTECTIVE EQUIPMENT
  - 1.25 SIGNS, SIGNALS AND BARRICADES
    - 1.25.1 Accident Prevention Signs
    - 1.25.2 Signaling
    - 1.25.3 Barricades
  - 1.26 HAND AND POWER TOOLS
  - 1.27 SCAFFOLDING
    - 1.27.1 Aerial Lifts
  - 1.28 STEEL ERECTION
  - 1.29 CONCRETE AND MASONRY CONSTRUCTION
- PART 2 PRODUCTS (NOT APPLICABLE)
- PART 3 EXECUTION (NOT APPLICABLE)

-- End of Section Table of Contents --

## SECTION 01 35 23.00 41

## LANGLEY SAFETY AND ENVIRONMENTAL REQUIREMENTS

## PART 1 GENERAL

## 1.1 LARC SAFETY INFORMATION

## 1.1.1 Safety and Health Information

## 1.1.1.1 Commitment to Safety and Health

The LaRC safety policy is to ensure each employee a safe and healthful working environment that is free from unacceptable hazard, which could result in property damage, injury, or loss of life. We permeate safety and health in everything we do at LaRC and are committed to protecting the safety and health of the general public, astronauts, the workforce, and our high-value assets. The culture of this Center is one of safety and health in the accomplishment of our goals and missions, including construction activities.

No activity is too important to compromise the safety and health of any individual or property. If it's not safe, SAY SO. Trust your instincts and job experience. If you feel something about your project or assigned task is not right, contact your supervisor, inspector, Contracting Officer, or other government/contractor interface to discuss your concerns and resolve them.

LaRC was the first federal worksite to become a certified OSHA Voluntary Protection Program (VPP) STAR site in 1998, and was recertified as a STAR site in 2007. As a VPP worksite, OSHA feels our safety and health program exceeds the minimum OSHA requirements and that we continually strive to improve our program. Because we are an OSHA VPP worksite, what may be acceptable at other work places may not be acceptable at LaRC, and we request you comply with all rules and regulations we have established for individuals working on Center.

## 1.1.1.2 Safety and Health Culture

Safety at LaRC is of paramount concern. We assure a commitment to safety by employing systems and processes that ensure the safety of the public, the employees, and assets. We ensure safety in all aspects of personal endeavors and we are committed to ensuring the safety of others. We take ownership for safety. We know every accident is preventable.

As the prime construction contractor, you shall instruct all primary and subcontractor employees of the hazards and the precautions to be taken in the performance of this construction contract. You shall provide and maintain work environments and procedures, which will safeguard your employees, subcontractor employees, the public, Government personnel, and Government property, materials, supplies, and equipment exposed to Contractor operations and activities.

## 1.1.1.3 Construction Safety and Health Goals

The provisions of this section shall be implemented by the Contractor to

ensure:

- a. Everyone involved in this project goes home as healthy as they arrived.
- b. The construction worksite is free of recognizable hazards.
- c. No lost-time or other recordable injuries or illnesses occur on the worksite.

#### 1.1.1.4 Construction Safety Strategy

In order to meet the goals stated above, every individual working at the worksite, including primary contractor and subcontractor personnel and vendors, shall:

- a. Be involved in making this project a safe one.
- b. Know how to identify hazards and the steps to take to have them corrected.
- c. Know their safety and health training needs, obtain the training, and put the concepts of what they have learned to work while working on this project.

#### 1.1.1.5 Compliance

The Contractor shall comply with all applicable state, federal (including OSHA 29 CFR 1910 and 29 CFR 1926), Agency, and LaRC occupational safety and health rules, regulations, and standards to ensure the safety and health of all persons in or near the worksite, and to prevent damage to property, materials, supplies, and equipment.

#### 1.1.1.6 LaRC Definition of Construction Work

- o Chemical, paint or solvent usage
- o Pressure/vacuum systems/vessels and compressed air
- o Cryogenic, nitrogen, oxygen systems, and other gas distribution systems
- o Exhaust or ventilation systems, spray booths, fire/smoke dampers, and fume hoods
- o Eyewash stations
- o Walls/ceilings, partitions, stairs or doors
- o Pipe/duct insulation, HVAC systems or galvanized steel
- o Tile and carpet
- o Elevators, cranes or other lifting devices
- o Plumbing
- o Electrical wiring/systems, transformers, and switchgear equipment, and power transmission lines/systems
- o Sanding, cutting, or welding, including hot work
- o Roofing work
- o Confined spaces
- o Exit signs, emergency lighting, gas monitoring systems, smoke detection, fire suppression, fire hydrants, water mains or other piping that supplies fire
- o Roadways, sidewalks, curbs, airfields, and gutters/sewers
- o Irrigation or drainage systems
- o Dirt (earth) digging, shoring, and trenching
- o Pyrotechnics/explosives
- o Any aero or space flight labs/assembly, test facility associated equipment (e.g., simulators, clean rooms, lasers, anechoic chambers)

- o Surveying
- o Clearing of land by cutting, removing, burning or other disposition of trees/shrubbery
- o Environmental, waste profiling, and/or air and water permit testing via sample collections.

Any individual involved in any of the activities listed above shall be considered a construction worker and shall attend the Safety Briefing prior to beginning work on LaRC. This includes employees of all prime contracts and their subcontractors.

This does not apply to individuals performing the following:

- o Office work
- o Maintenance to office equipment, such as copiers, fax machines, computers, etc.
- o Aircraft and vehicle repairs
- o Job estimates/bid proposals
- o Off-site assembly/manufacturer of structures/systems for delivery to LaRC
- o Maintenance personnel currently working on-site under a support service contract requiring them to perform daily work on the Center.
- o The quick delivery or pickup of machinery and equipment whereas the driver will not be tasked to perform the duties of an equipment operator on the jobsite.

Any scheduled work not falling into either of the above classifications shall be brought to the attention of the LaRC Safety Manager for a decision on classification.

## 1.2 SUMMARY

The requirements of this Section apply to, and are a component part of, each section of the specifications.

## 1.3 REFERENCES

The publications listed below form a part of these specifications to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS  
(AASHTO)

AASHTO MUTCD-1 (2003) Manual on Uniform Traffic Control Devices

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A14.1 (2000) Safety Requirements for Ladders - Portable Wood

ANSI A14.2 (2000) Safety Requirements for Portable Metal Ladders

ANSI A14.5 (2000) Safety Requirements for Fiberglass Ladders

ANSI/SIA A92.2 (2002) For Vehicle Mounted Elevating and

## Rotating Aerial Devices

ANSI Z358.1

(2004) Emergency Eyewash and Shower Equipment

## ASME INTERNATIONAL (ASME)

ASME B15.1

(2000) Safety Standard for Mechanical Power Transmission Apparatus

## ASTM INTERNATIONAL (ASTM)

ASTM E 1368

(2005e1) Visual Inspection of Asbestos Abatement Projects

## INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE Std 95

(2002) Recommended Practice for Insulation Testing of AC Electric Machinery (2300 V and Above) With High Direct Voltage

IEEE C2

(2007; Errata 2006; Errata 2007; INT 44-56 2007; INT 47, 49, 50, 52-56 2008; INT 57, 58, 51, 48 2009) National Electrical Safety Code

## LANGLEY RESEARCH CENTER (LaRC)

LAPD 1700.7

(October 2008) Traffic Management

LPR 1710.5

(January 2009) Ionizing Radiation

LPR 1710.10

(February 2010) Langley Research Center Energy Control Program (Lockout/Tagout)

LPR 1710.11

(October 2004) Fire Protection Program

LPR 1710.40

(February 2005) Langley Research Center Pressure Systems Handbook

LPR 1740.2

(February 2008) Facility Safety Requirements

LPR 1740.6

(November 2005) Personnel Safety Certification

LPR 8800.1

(November 2007) Environmental Program Manual

## NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

NASA-STD-8719.11

(2008) NASA Safety Standard for Fire Protection

NASA-STD-8719.9

(2002; R 2007) Standard for Lifting Devices and Equipment

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 10	(2010) Standard for Portable Fire Extinguishers
NFPA 30	(2007; Errata 2008) Flammable and Combustible Liquids Code
NFPA 31	(2006; Errata 2006; Errata 2007) Installation of Oil Burning Equipment
NFPA 51	(2007) Design and Installation of Oxygen-Fuel Gas Systems for Welding, Cutting, and Allied Processes
NFPA 51B	(2009) Fire Prevention During Welding, Cutting, and Other Hot Work
NFPA 54	(2008) National Fuel Gas Code
NFPA 58	(2007; Amendment 1 2007; Amendment 2 2007; Amendment 3 2007; Amendment 4 2008) Liquefied Petroleum Gas Code
NFPA 70	(2008; AMD 1 2008) National Electrical Code - 2008 Edition
NFPA 70B	(2006; Errata 2007) Electrical Equipment Maintenance
NFPA 70E	(2009; Errata 2009) Standard for Electrical Safety in the Workplace
NFPA 101	(2009; Amd 1 & 2 2009) Life Safety Code
NFPA 211	(2010) Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances

## STATE OF VIRGINIA ADMINISTRATIVE CODE (VAC)

9 VAC 5-40-90	Standard for Fugitive Dust/Emissions
9 VAC 20-60	Title 9, Agency 20, Chapter 60: Hazardous Waste Management Regulations
13 VAC-5-51	Virginia Statewide Fire Prevention Code

## U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

10 CFR Parts 0-199	Nuclear Regulatory Commission
10 CFR 20	Standards for Protection Against Radiation
29 CFR 1904	Recording and Reporting Occupational Injuries and Illnesses
29 CFR 1910	Occupational Safety and Health Standards
29 CFR 1926	Safety and Health Regulations for

	Construction
29 CFR Subpart P	Appendixes A through F
40 CFR Part 173.1090	Department of Transportation Regulations
40 CFR 279	Standards for the Management of Used Oil
40 CFR 61	National Emission Standards for Hazardous Air Pollutants
40 CFR 761	Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions
40 CFR 763	Asbestos

#### 1.4 SUBMITTALS

The Contractor shall submit the following to the Contracting Officer in accordance with the requirements of Section 01 33 00 SUBMITTAL PROCEDURES:

##### SD-01 Preconstruction Submittals

Safety Plan

Material Safety Data Sheet (MSDS) of hazardous material(s)

Application for Work on Energized Electrical Circuits Below 600 Volts

Electrical Safety Workers' Qualifications

Application for Making Connection to Government Electrical Utilities

Energized Substations Work Plan

Power Utility Outage Request

LaRC Energized Electrical Work Permit Form LF 416 (Submit only if work will be performed on energized electrical systems)

Asbestos Operational Procedure

List of Riggers

PCB Operational Procedures

PCB Disposal Facility Identification and Qualifications

PCB-Drained Equipment Certification Compliance

List of PCB Items

Emergency Spill Plan

Shipping Document

## List of PCB Operators and Qualifications

### Hazardous Waste Disposal Plan

### Sewer Disposal Permit

## 1.5 GENERAL SAFETY REQUIREMENTS

### 1.5.1 Safety Plan

On-site work shall not commence prior to the Contracting Officer's and Safety approval of the [Safety Plan](#).

The Contractor safety plan is a written plan prepared by the Contractor summarizing the overall safety program that will cover the employees and equipment used to fulfill the contract. The safety plan shall address all aspects of the contract performance to include manufacturing, construction, transportation, and testing. It is not intended that the Contractor's normal industrial home-plant safety rules and directives be subject to NASA approval; however, it is intended to ensure that the Contractor has an adequate safety program for on-site work. Attachment 1, Safety Program Guide, to this section provides a list of items required to be addressed in the safety plan; however, additional safety procedures may be required, depending on the scope of work, environmental conditions or area of operation.

The safety plan shall contain a brief summary and scope of the work to be performed.

The Contractor's safety representative, responsible for ensuring compliance with all applicable rules and regulations, shall be identified in the safety plan.

### 1.5.2 Recordkeeping

The Contractor shall have a log and summary of all recordable occupational injuries and illnesses for their company, on an OSHA 300, "Log of Work-Related Injuries and Illnesses," and OSHA 300A, "Summary of Work-Related Injuries and Illnesses," or their equivalent at a central place. The on-site Contractor shall have the address and telephone number of the central place where the OSHA 300 and 300A logs are maintained and shall have personnel available at the central place during normal business hours to provide information from the records maintained there, by telephone or mail. (OSHA 29 CFR 1904)

The Contractor shall maintain a Contractor Safety and Health Log. Attachment 3, Contractor Safety and Health Log, to this section shall be used to submit the required information. The Contractor Safety and Health Log shall be submitted 30 calendar days after notice to proceed and monthly thereafter in accordance with Section 01 33 00.

### 1.5.3 Safety Briefing

All Contractor and Subcontractor employees shall attend a Safety Briefing conducted by the Safety and Facility Assurance Branch (SFAB) in Building 1308 or other area designated by the SFAB, Langley Research Center (LaRC), prior to any on-site activity. Briefings are conducted daily at 7:30 a.m. This effort will be coordinated with the required badging activity. The prime contractor shall provide a list of all prime and subcontracted

personnel to the LaRC Badge and Pass Office to acquire badges.

#### 1.5.4 Inspections

In accordance with Section 107 of the Contract Work Hours and Safety Standards Act, a representative of the NASA Langley Research Center shall have the right of entry to any on-site area of contract performance to ensure compliance with all applicable rules and regulations (OSHA 29 CFR 1926.3).

Any condition that threatens the safety or security of: (1) personnel, (2) Government property or equipment, or (3) information, or any conditions that affect LaRC's environmental compliance may be subject to immediate work stoppage by the Contracting Officer(CO), the Contracting Officer(CO)'s Technical Representative (COTR), or the CO's designated inspection representative, and shall not resume until directed by the Contracting Officer.

#### 1.5.5 Housekeeping

During the course of construction, alteration, or repairs, the Contractor shall keep form and scrap lumber with protruding nails, and all other debris cleared from work areas, passageways, and stairs, in and around buildings or other structures.

Combustible scrap and debris shall be removed at regular intervals during the course of construction. Safe means shall be provided to facilitate such removal.

Containers shall be provided for the collection and separation of waste, trash, oily and used rags, and other refuse. Containers used for garbage and other oily, flammable, or hazardous wastes, such as caustics, acids, harmful dusts, etc., shall be equipped with covers. Garbage and other waste shall be disposed of at frequent and regular intervals.

#### 1.5.6 Illumination

The Contractor shall light construction areas, aisles, stairs, ramps, runways, corridors, offices, shops, and storage areas where work is in progress with either natural or artificial illumination (OSHA 29 CFR 1926.26).

#### 1.5.7 Ladders

All ladders shall comply with ANSI A14: wood ladders (ANSI A14.1), metal ladders (ANSI A14.2), fiberglass ladders (ANSI A14.5), and OSHA 29 CFR 1926.1050, 29 CFR 1926.1051, and 29 CFR 1926.1053.

#### 1.5.8 Motor Vehicles and Mechanized Equipment

All contractor-owned vehicles shall abide by LaRC traffic regulations in accordance with LAPD 1700.7, "Traffic Management," and OSHA regulations in accordance with OSHA 29 CFR 1926.600 through 1926.606.

#### 1.5.9 Hazardous Materials

In accordance with OSHA 29 CFR 1910.1200, the Contractor shall have a hazardous communications program, when applicable, available for each chemical, oil, lubricant, or solvent used on the job-site. The Contractor/Subcontractor must submit the current [Material Safety Data Sheet](#)

(MSDS) of hazardous material(s) along with information on the storage, quantity, locations, and use location to **LaRC Environmental Management Branch (EMB)** at least 10 working days before it is needed. This information shall be made available at an on-site location or by other LaRC approved methods.

#### 1.5.10 Inclement Weather Conditions

In the event of a severe storm warning, or indications of impending severe weather (e.g., damaging wind, heavy rains, floods, tornados, hail, lightning or snow), the Contractor shall monitor weather conditions and take appropriate precautions including but not limited to:

- a. Secure outside equipment and materials that should not be exposed to or contaminated with dirt, water, etc., including mechanical, electrical, and electronic equipment.
- b. Check the worksite, including roofs, if applicable, for loose material, equipment, debris, and other objects that could be blown away or against existing facilities or structures.

No construction activities shall be conducted if the Center has been closed to on-site employees. The Contractor shall call the LaRC Emergency Announcement System at 757-864-2111 or 1-888-664-2111 (toll free number) to check on Center status during inclement weather conditions.

#### 1.6 SAFETY CLEARANCE PROCEDURES/LOCKOUT/TAGOUT

All contractors performing work at Langley Research Center (LaRC) shall comply with the safety clearance procedures described in **LPR 1710.10**, "Langley Research Center Energy Control Program (Lockout/Tagout)." Failure to comply with **LPR 1710.10** will result in the exclusion of the individual responsible for violating **LPR 1710.10** from LaRC. The LaRC Lockout/Tagout procedures involve the use of red tags, red locks, associated locking hardware, LaRC issued personal locks, and LaRC issued lock boxes.

##### Lockout/Tagout Overview

(Terminology: "Protected Person" refers to any person who after placing a personal lock on the lockout/tagout where required becomes protected by a lockout/tagout; "Responsible Person" refers to a person who has lockout/tagout responsibility for a group of protected persons; and "Requester" refers to the individual who requests the lockout/tagout. The requester may be an individual who only has lockout/tagout responsibility for him/herself or may be the responsible person who has lockout/tagout responsibility for a group of workers.)

When lockout/tagout is required, the requester contacts the Facility Coordinator who is responsible for the system/item requiring lockout/tagout. The Facility Coordinator then contacts a qualified Safety Operator who performs the required lockout/tagout. At LaRC, the only persons authorized to perform lockout/tagout are Safety Operators who have in their possession a current NASA Langley Form 453, "NASA Langley Safety Operator Permit." Once the lockout/tagout has been completed, the Safety Operator contacts the requester, communicates the limits of the lockout/tagout, demonstrates the effectiveness of the lockout/tagout, and delivers red tag stub(s), lock box when required, and personal lock(s) to the requester. When the requester no longer requires the protection of the lockout/tagout, he/she signs the red tag stub(s) and delivers the

signed red tag stub(s), the lock box if used, and personal lock(s) to the Facility Coordinator. The Facility Coordinator contacts the Safety Operator who clears the lockout/tagout.

## 1.7 ELECTRICAL SAFETY

### 1.7.1 Electrical Definitions

Buddy System: The practice of employing a second qualified person to directly observe the electrical work of a qualified electrical person working on or near unguarded energized electrical equipment. System voltage and work location will determine the qualifications of the second person.

Cardiopulmonary Resuscitation (CPR): A procedure designed to restore normal breathing after cardiac arrest that includes the clearance of air passages to the lungs and heart massage by the exertion of pressure on the chest.

De-energized: Free from any electrical connection to a source of potential difference and from electrical charge; not having a potential different from that of the earth. (NFPA 70E)

Electrically Safe Work Condition: Energized at less than 50 volts or de-energized, locked and tagged, tested to ensure the absence of voltage, and grounded if deemed necessary. (NFPA 70E)

Energized: Electrically connected to a source of potential difference.

Energized Electrical Work Permit: A management approved, written permit required by NFPA 70E to work on energized equipment that cannot be placed in an electrically safe work condition.

Exposed (as applied to energized parts): Capable of being inadvertently touched or approached nearer than a safe distance by a person, especially parts that are not suitably guarded, isolated, or insulated. (NFPA 70E)

Fail-Safe: The capability to go to a predetermined safe state (i.e. minimum energy or minimized hazard condition) in the event of a specific malfunction.

Field Verified (as applied to electrical configuration controlled drawings): Verification that the drawing accurately depicts the configuration of installed systems or equipment by visual comparison and by point-to-point wire checks prior to placing the system into service. Point-to-point wire checks require ringing out or talking down the wiring between points of termination and are usually done during installation.

Functionally Verified (as applied to electrical configuration controlled drawings): Verification that the drawing accurately depicts the configuration of a functional system or equipment by visual comparison.

Grounded: Connected to earth or to some conducting body that serves in place of the earth. (NFPA 70E)

Guarded: Covered, shielded, fenced, enclosed, or otherwise protected

by means of suitable covers, casings, barriers, rails, screens, mats, or platforms to remove the likelihood of approach or contact by persons or objects to a point of danger. (NFPA 70E)

High Voltage: Voltage class designation for electric power systems and equipment operating above 600 volts.

Live Part: Energized conductive component. (NFPA 70E)

Lockout/Tagout (LOTO): The full procedure of determining what is required to make a system safe; the action of making the system safe; and the placing of locks, locking devices, and red tags to preclude changing from the safe condition.

Low Voltage: Voltage class designation for electric power systems and equipment operating at 600 volts or less.

Qualified Electrical Person: One who has been trained in and demonstrates adequate knowledge of the installation, construction, and operation of electrical equipment and has received safety training on the hazards involved. One who is undergoing on-the-job training and, who in the course of such training, has demonstrated an ability to perform duties safely at that level of training, and who under the direct supervision of a qualified electrical person, is considered to be a qualified electrical person for the performance of those duties.

Qualified Industrial Person: One who has been trained in and demonstrates adequate knowledge of the installation, construction, and operation of industrial equipment and has received safety training on the hazards involved, and is a non-electrical Safety Operator with an electrical designation of 600 volts. The 600 volt designation permits operation of switches, circuit breakers, or disconnects to isolate electrically driven equipment for non-electrical maintenance but does not permit the use of electrical test equipment on exposed energized parts.

Safety Operator (SO): Individual who has been qualified and certified to perform Red Tag Lockout/Tagout on electrical systems for which the Red Tag LOTO is requested and possesses a current NASA Langley Form 453, "NASA Langley Safety Operators Permit." LaRC SO's are the only persons authorized to hang or remove red locks, red tags, and associated locking hardware.

Service Point: The point of connection between the facilities of the serving utility and the premises wiring. (National Electrical Code-NEC) (NFPA 70) Service points for the facilities at LaRC are identified on Effort Code (EC) 300 Switching Diagrams.

Unqualified Person: A person who is not qualified. (NFPA 70E)

Voltage (of a circuit): The greatest root-mean-square (rms) (effective) difference of electrical potential between any two conductors of the circuit concerned. (NFPA 70E)

#### 1.7.2 General Requirements

Consider all electrical circuits and equipment energized until properly tested by a qualified electrical person and witnessed by a second qualified person.

Equipment operating at or above 50 volts shall be de-energized and have lockout/tagout performed prior to performing maintenance, service, and troubleshooting if there is a possibility that an employee may work on or near exposed energized parts in accordance with NFPA 70E, Art. 130.1. Energized parts that operate at less than 50 volts to ground need not be de-energized if there will be no increased exposure to electrical shock or other injuries resulting from direct or indirect electrical contact.

The buddy system, a second qualified person directly observing the operation, is mandatory whenever electrical work (including measurements) is to be performed on exposed energized parts exceeding 250 volts to ground or is conducted in a high risk area with exposed parts exceeding 600 volts. For voltages up to 600 volts, the second person may be a qualified electrical person or a qualified industrial person. For voltages exceeding 600 volts, the second person must be a qualified electrical person. Table 1.7.2 provides specific buddy system requirements based on type of work and voltage.

**Table 1.7.2 - Buddy System Requirements**

<u>Type of Work</u>	<u>Voltage</u>			
	<u>Less Than 50 V</u>	<u>50 - 250 V</u>	<u>251 - 600 V</u>	<u>Greater Than 600 V</u>
De-energized & Checked	NBR	NBR	NBR (1)	NBR (2)
Diagnostics & Testing	NBR	NBR	QEP or QIP	QEP
Energized (3)	NBR	NBR + LF 416	QEP or QIP + LF 416	QEP + LF 416

NBR = No Buddy Required  
 QEP = Qualified Electrical Person  
 QIP = Qualified Industrial Person

- (1) QEP or QIP required until system is de-energized and checked.
- (2) QEP required until system is de-energized and checked.
- (3) No energized work is permitted without an Approved LF 416, LaRC Energized Electrical Work Permit.

Before commencing work on any mechanical equipment or systems which have electrical connections or contain explosive, combustible, or other dangerous gases or fluids, the equipment or systems shall be properly grounded and/or made safe in accordance with other LaRC safety regulations concerning these materials.

Disconnecting means shall be legibly marked to indicate its purpose, unless located and arranged so the purpose is evident. Labeling shall indicate the source of power for the disconnecting means.

Up-to-date circuit directories shall be provided on all panelboards to clearly identify the purpose or load of each circuit. Circuit identification shall be in sufficient detail to distinguish each circuit from all others.

Switchboards, panelboards, and motor control centers shall be clearly labeled to warn qualified persons of potential arc flash hazards when working on energized equipment. Labeling shall meet the requirements of the NEC (NFPA 70).

Electrical wall outlets shall be labeled to indicate the source electrical panel number and circuit number.

Identification markings on building light and power distribution panels, circuits, and components shall not be relied on for establishing safe work conditions.

Ground wires or connections to frames or cases are not to be removed from any energized equipment.

Earth return shall not be used in the wiring of any power circuit.

Non-conductive fish tape shall be used when pulling wires through a conduit into energized equipment.

Commutating-type tools shall not be operated in close proximity to volatile materials.

Portable ladders shall have non-conductive side rails, if they are used where the employee or ladder could contact exposed live parts operating at 50 volts or more or where an electrical hazard exists. Nonconductive ladders shall meet the requirements of ANSI standards for ladders in NFPA 70E, Table 130.7(F). Metal ladders shall be marked with signs or decals reading: **CAUTION - DO NOT USE NEAR ELECTRICAL EQUIPMENT.**

When possible, stand to the side away from the door/cover when operating (opening or closing) disconnect switches.

Only devices designed for voltage testing and rated for the nominal voltage of the circuit under test shall be used to make voltage checks. Test voltage indicators shall be verified immediately before and after use by application to an energized circuit or by using an appropriate test unit.

### 1.7.3 Specific Requirements

#### 1.7.3.1 Live Work Requirements

Live parts to which an employee might be exposed shall be put into an electrically safe work condition and locked/tagged out before an employee works on or near them, unless the employer can demonstrate that de-energization introduces additional or increased hazards or is infeasible due to equipment design or operational limitations. (NFPA 70E, Art. 130.1) Equipment normally energized above 600 volts shall always be considered energized unless protective grounds and/or other appropriate safety measures, in accordance with LPR 1710.10, "Langley Research Center Energy Control Program (Lockout/Tagout)," are confirmed to be in place.

If de-energizing equipment introduces additional or increased hazards or is infeasible due to equipment design or operational limitations, a detailed procedure shall be developed for the energized work and documented on NASA Langley Form 416, "Energized Electrical Work Permit." The detailed procedure may be a separate document referenced by the Energized Electrical Work Permit. Work authorized by the Energized Electrical Work Permit shall be performed only by electrically-qualified personnel.

No work (other than performing routine testing, troubleshooting, and voltage measurements) shall be performed on energized power circuits of 600 volts or less without a NASA Langley Form 416.

Removal of switchgear panels or panel door barriers from energized circuits above 600 volts for inspection, data gathering or infrared testing of the exposed energized bus shall not be performed without a NASA Langley Form 416.

Workers shall not work alone on equipment with exposed energized parts operating at greater than 250 volts to ground.

#### 1.7.3.2 Personal Protective Equipment (PPE)

Personal Protective Equipment (PPE) shall be used to mitigate the hazards of electrical shock and electrical burns from arc-flash when work is to be performed on energized equipment and personnel are within the approach boundaries for shock protection as defined in NFPA 70E, Art. 130.2, and within the flash protection boundary for arc flash as defined in NFPA 70E, Art. 130.3(A).

PPE shall be selected based on the requirements of NFPA 70E, Art. 130, Table 130.7(c)(9)(a) defining hazard/risk category for electrical tasks and Table 130.7(c)(10) defining required PPE based on hazard/risk categories.

Conductive articles of jewelry and clothing (such as watchbands, bracelets, rings, key chains, necklaces, metalized aprons, cloth with conductive thread, metal headgear, or metal frame glasses) shall not be worn without appropriate PPE where they present an electrical contact hazard with exposed live parts.

Rubber gloves alone shall not be relied upon for protection from energized circuits of more than 3500 volts to ground.

#### 1.7.3.3 Hard Hat Area

Electrical substations with exposed bus are designated as "hard hat" areas. Personnel within the confines of these substations shall wear Class E, Type 1, or Type 2 hard hats.

#### 1.7.3.4 Welding Near Electrical Equipment

Welding or burning shall not be permitted in the immediate vicinity of electrical equipment. This requirement shall not restrict the work associated with the splicing or termination of lead-sheathed cable. Any deviations to this paragraph shall have the concurrence of the Facility Coordinator and the Electrical Standard Practice Engineer.

#### 1.7.3.5 Lockout/Tagout

The application of lockout/tagout devices shall be in accordance with LPR 1710.10, "Langley Research Center Energy Control Program (Lockout/Tagout)" and Paragraph 1.6 of this document.

#### 1.7.3.6 Portable Equipment Grounding

The cases of all portable electrical motor-driven hand tools are to be grounded by use of standard three-prong plugs and receptacles and all other

electrical equipment supplied with 50 volts or above are to have their cases or frames connected to ground, except:

- a) Devices operated solely from self-contained batteries
- b) Devices which have cases and all exposed parts protected by insulating material
- c) "Double insulated" tools

#### 1.7.3.7 Temporary Wiring

Temporary electrical wiring shall not be run directly on ungrounded conductive surfaces but shall be supported by suitable wood or other insulating materials.

Temporary electrical wiring and portable electrical cords shall be kept out of water at all times unless the cable is approved by the NEC (NFPA 70) for that purpose.

#### 1.7.3.8 Extension Cords

Extension cords usage shall abide by the restrictions for temporary wiring as delineated in Paragraph 1.7.3.7 of this document.

Extension cords shall not be used for more than 90 consecutive days without LaRC Safety Manager Approval.

Where extension cords are utilized, they shall not be:

- a) Used as a substitute for the fixed wiring of a structure
- b) Routed through holes in walls, ceiling, or floors
- c) Run through doorways, windows, or similar openings
- d) Attached to building surfaces
- e) Concealed behind building walls, ceilings, or floors

Extension cords shall be Underwriter's Laboratory (UL) listed.

Extension cords shall have adequate current carrying capacity to handle the maximum current draw of the connected electrical device. Extension cords shall be sized in accordance with NFPA 70B, Table 20.5 based on cord length and load current.

High current equipment (i.e., microwave ovens, space heaters, and coffee pots) shall be plugged directly into wall receptacles.

Extension cords shall be of the three-pronged grounded type, and suitable for the conditions of use and location.

A surge protector power strip is a special type of extension cord intended to protect computers and related equipment from damaging power fluctuations. Surge power strips shall not be used with electrical equipment other than computers and related equipment.

Extension cords used in outdoor or wet locations shall utilize integral or

separate Ground Fault Circuit Interrupters (GFCI's) for shock protection.

1.7.4 Training Requirements

1.7.4.1 Technical Training

Qualified electrical persons shall be technically trained and experienced in the work methods required by their electrical work assignments and shall have safety training on the operation of the equipment and the use of safe work practices.

Technical training commensurate with the assignments of the qualified electrical person shall be documented and shall meet the requirements of the person's job description. Refresher technical training shall be taken as required by the qualified electrical person's job assignments and certification requirements.

An individual that is undergoing on-the-job electrical training and that has demonstrated competence in performing work safely shall be considered "qualified" if the individual is under the direct supervision of a qualified electrical person. This individual shall have completed safety training on the hazards involved prior to performing the work.

1.7.4.2 Safety Training

The direct supervisor of any person who works with electrical equipment shall ensure that the person has completed the minimum safety training defined below. The level of electrical safety training shall be based on the level of electrical risk and hazard to which the person will be exposed.

	<u>Required Training</u>	<u>Type and Frequency</u>	
		<u>Initial</u>	<u>Every 3 Years</u>
Qualified Workers, Less Than 600 V	<ul style="list-style-type: none"> <li>o NFPA 70E</li> <li>o Low Voltage Safety</li> </ul>	Comprehensive	Refresher
Qualified Workers, Over 600 V	<ul style="list-style-type: none"> <li>o NFPA 70E</li> <li>o Low Voltage Safety</li> <li>o High Voltage Safety</li> </ul>	Comprehensive	Refresher
Unqualified Workers	<ul style="list-style-type: none"> <li>o NFPA 70E</li> </ul>	Comprehensive	Refresher

Safety training for qualified electrical persons shall include as a minimum:

- a) Training in the skills and techniques to distinguish exposed energized parts from other parts of the electrical equipment
- b) Training in the skills and techniques necessary to determine the nominal system voltage of the exposed energized part
- c) Training to determine the minimum approach distances to exposed energized parts as specified in NFPA 70E, Table 130.2(C) and Paragraphs 1.7.8 and 1.7.9 of this document
- d) Training to determine the degree and extent of an electrical hazard and in the proper use of PPE required to perform the task safely

1.7.4.3 Additional Training

Electrical Safety Operators shall meet the training and qualification requirements for Safety Operator Certification as required by LPR 1710.10, Chapter 6, "Safety Operators".

Non-Electrical Safety Operators performing electrical lockout/tagout for mechanical equipment operating at less than 600 volts shall complete the safety training for qualified electrical persons as defined in Paragraph 1.7.6.2.

1.7.5 Working Space Around Equipment

Sufficient access and working space shall be provided and maintained around all electrical equipment to permit ready and safe operation and maintenance of such equipment.

Working space around electrical equipment shall be based on providing sufficient clearance to avoid body contact with grounded parts while performing maintenance on energized equipment.

Minimum working space around equipment operating at 600 volts or less and working space entrance requirements shall be as required by the NEC (NFPA 70), Art. 110.32 through 110.34.

Except for substations, the minimum working space around equipment operating over 600 volts shall be as required by the NEC (NFPA 70), Art. 110.32. For substation locations, the minimum working space shall be as required by IEEE C2, Rule 125.B.

1.7.6 Approach Distances to Exposed Energized Parts - Shock Protection

NFPA 70E defines three shock protection boundaries (Limited Approach Boundary, Restricted Approach Boundary, and Prohibited Approach Boundary) for workers approaching exposed energized parts. The distances for these boundaries, (based on system voltage) are listed in NFPA 70E, Table 130.2(C). The requirements for crossing the shock protection boundaries by qualified and unqualified persons are defined in NFPA 70E, Art. 130.2, summarized in the table below, and illustrated in Attachment 5.

<b>Shock Protection Boundary</b>	<b>Boundary Crossing Requirement based on Worker Qualifications</b>	
	<b>Unqualified Worker</b>	<b>Qualified Worker</b>
Limited Approach Boundary	Prohibited from crossing unless escorted by qualified worker	Permitted to cross
Restricted Approach Boundary	Prohibited from crossing	Prohibited from crossing except as permitted by NFPA 70E, Art. 130.2 (C) and paragraph below
Prohibited Approach Boundary	Prohibited from crossing	Crossing this distance treated the same as making contact with energized parts

See Figure - Boundaries for Shock Hazard Protection Based on System Voltage

**Levels** (Attachment 5).

Qualified electrical persons shall not approach or take any conductive object closer to exposed energized parts than the "Restricted Approach Boundary" defined in **NFPA 70E**, Table 130.2(C) and listed below, for any reason unless such parts are adequately guarded as required by **NFPA 70E**, Art. 130.2(C). Voltage ranges shown are those applicable to systems at LaRC.

<u>Nominal System Voltage Range - Phase-to-Phase</u>	<u>Distance from Energized Parts to Restricted Approach Boundary</u>
50 - 300 volts	Avoid contact
301 - 750 volts	1 ft
751 - 15,000 volts	2 ft 2 in
15,100 - 36,000 volts	2 ft 7 in
36,100 - 46,000 volts	2 ft 9 in
72,600 - 121,000 volts	3 ft 3 in

1.7.7 Approach Distances to Exposed Energized Parts - Arc Flash Protection

If work on or near exposed energized parts is required, as permitted by Paragraph 1.7.3.1, flash protection PPE shall be utilized as required by **NFPA 70E**, Art. 130.3(B).

The need for and level of flash protection PPE is determined by whether or not the worker is closer than the Flash Protection Boundary (FPB) and what the available Incident Energy (IE) level is at the Working Distance (WD) from the exposed energized part resulting from an arc flash. FPB and WD are illustrated in Attachment 6.

See **Figure - Boundaries for Arc - Flash Protection Based on Arc Flash Incident Energy Levels** (Attachment 6).

The FPB is the distance that the incident energy is no greater than 1.2 cal/cm<sup>2</sup>, which is the energy that will result in a second degree burn when not using arc flash PPE. For systems that are 600 volts or less, the FPB is 4 ft. (assuming a maximum available bolted fault current of 50 kA and a 6 cycle clearing time) unless marked on the equipment by an arc flash hazard label. Alternatively, and for equipment operating above 600 volts, **NFPA 70E**, Art. 130.3(A) may be used to calculate the FPB or contact the Electrical Standard Practice Engineer to obtain this distance.

The WD is the distance between the worker's head or body and the exposed energized part for the specific task. The WD for electrical tasks is 18", unless specifically marked on the equipment as 24".

Incident energy levels for the selection of PPE shall be based on the calculated energy level at the working distance for the task. If not marked on the equipment by an arc flash hazard label, the incident energy level can be obtained from the Electrical Standard Practice Engineer. The Hazard/Risk categories based on incident energy levels are listed in **NFPA 70E**, Table 130.7(C)(11). Alternatively, **NFPA 70E**, Table 130.7(C)(9)(A) may be used to select PPE for various electrical tasks in lieu of calculating incident energy levels at the WD.

Note 1: Flash Protection PPE does not prevent injury resulting from an arc flash. It is designed only to limit the injury resulting from an arc flash to a second degree burn, which has been determined to be a survivable burn.

### 1.7.8 Cranes and Lifting Equipment Adjacent to Exposed Electrical Energized Parts

Where cranes or other lifting equipment are used in or around high-voltage substations, overhead lines, or exposed energized parts, the operations and equipment shall be in conformance with OSHA 29 CFR 1926.550. See Paragraph 1.7.16.1 for additional requirements on crane usage.

All lifting equipment shall be effectively grounded when being moved or operated in close proximity to energized lines or equipment. Consideration shall also be given to grounding the load, particularly if insulated lifting straps are in use.

Lifting equipment shall be operated with a dedicated observer to warn the equipment operator of potentially hazardous situations and/or movements.

Exposed energized conductors of up to 115kV are in use in high-voltage substations at LaRC. The following clearances shall be maintained between cranes and lifting equipment and exposed energized conductors as required by OSHA 29 CFR 1926.550(a) (15) :

<u>Conductor Voltage</u>	<u>Minimum Distance Between Conductors and Equipment</u>
50 kV and below	10 ft
115 kV	12 ft, 2 in (Note 1)

Note 1: Distance calculated for 115 kV based on requirements from OSHA 29 CFR 1926.550(a) (15). See this standard for distance requirements for voltages other than those shown here.

### 1.7.9 Installation or Repair of Transformers

Whenever work is to be performed on connected transformers, protective grounds shall be applied as required by Paragraph 1.7.4.3 of this document.

When transformers are installed or replaced, the secondaries shall be checked for correct voltage and phase rotation.

When transformers are installed and before they are energized, the ground connection shall be made to the case, and where applicable, to the neutral.

Transformer covers or hand hole plates shall not be removed from energized transformers.

All transformers shall be considered energized at full voltage unless they are disconnected from the primary and secondary power source, or unless they are disconnected from the primary power source and protective grounds have been applied to the transformer secondary. The opening of a fused primary cutout or switch shall not be considered as a primary disconnection unless the de-energized side of the cutout or switch is grounded.

When removing transformers, the case and neutral ground shall be disconnected last.

Because it is possible to have up to full phase-to-ground voltage on the transformer neutral, transformer neutrals shall always be treated as phase conductors, unless established as grounded.

#### 1.7.10 Removal of Obsolete Equipment

Unless otherwise specified in a contract or requested by the Facility Coordinator, when removing old or obsolete equipment, the electrical wiring, conduit, and control boxes shall be removed from the equipment to the power source. The power source shall be de-energized and disconnected prior to disconnecting the load or cutting the cables.

#### 1.7.11 Contractor Connections into Government Electrical Utilities

Prior to permitting the contractor to make connection into any part of the Government electrical power distribution system, the contractor shall:

- a) Make written application to the Government Contracting Officer stating the date, time, location, and the service desired.
- b) Jointly with the Government representative, make the necessary checks of the contractor's system and the Government's supply to ensure their compatibility and safety.

#### 1.7.12 Work in Energized Substations

##### 1.7.12.1 General Requirements

In addition to the other industry electrical safety codes, rules, and regulations specified elsewhere in this document, work in energized substations shall comply with the requirements of **IEEE C2**, all applicable OSHA standards for substations, and Paragraph 1.7.4 of this document.

Work areas shall be clearly defined by the installation of barriers and rope guards. Barriers and rope guards shall be sufficient to restrain the workers from inadvertently moving out of the work area.

Use physical barriers whenever practicable. When adequate barriers cannot be installed around all energized parts adjacent to the work area, action shall be taken to provide the continuous safeguarding of each worker.

Establish a safe zone area between the work area and the energized parts of the substation so that all live circuits and parts clear the designated work area by at least five feet.

Electric power outages required to execute work in the substation shall be requested at least twenty one days in advance of the need.

Refrain from using any crane in or near an energized substation with exposed conductors where movement of the crane might cause objects to fall into or strike energized parts of the substation. If crane usage is required to support the work, a power outage shall be requested for the work area. See Paragraph 1.7.11 for clearance requirements for cranes working around exposed energized conductors.

When work involves handling of lengths of conduit, bus, steel, or large equipment in substations with exposed energized bus, a full-time employee knowledgeable of the safety required and without other duties shall be assigned to assure the safety of the work area.

After execution of a power outage by an LaRC certified Safety Operator (as evidenced by receipt of the red tag stubs), the lockout/tagout responsible

person shall check to ensure the designated circuits have been de-energized and properly grounded and verify that the immediate work area and a zone beyond the work area have been made safe before permitting employees to work in the substations.

Additional safety supervisors shall be assigned as needed for the protection of the workers when the work is so divided and extensive that one safety supervisor cannot effectively maintain safety surveillance over the workers and their operations.

#### 1.7.12.2 Contractors Other Than NPS Contractors

Except for Non-Personal Service (NPS) Contractors that provide on-site operational and maintenance support for electrical systems at LaRC, contractors who are required to enter and/or work in energized substations shall comply with the following requirements in addition to the requirements of Paragraph 1.7.16.1 above.

Submit a work plan, at least twenty one days prior to initiating work in the substation, outlining the work to be done and identifying the circuits required to be de-energized to safely conduct operations. The plan shall include a detailed step-by-step work procedure for each phase of the work. All changes to this work plan shall be reviewed with the responsible LaRC personnel prior to initiation.

Appoint an individual responsible for the electrical safety of each work team. The safety supervisor(s) shall attend the Construction Safety Briefing. Before the work begins, the responsible individual shall provide a document to the Government establishing that the appointed safety supervisor(s) is (are) qualified and knowledgeable in OSHA and LaRC safety regulations and requirements.

Contact the Government representative at the beginning of work each day for admittance to the substation. Maintain surveillance of the substation gates to only permit authorized personnel to enter. No entrance shall be made while work is being conducted unless the contractor safety supervisor has been first contacted to verify conditions are safe.

#### 1.7.13 Substation Access

##### 1.7.13.1 Standard Substation Access Procedures

Doors and gates that control access to high voltage substations are secured with locks. Keys for these locks are assigned to qualified "key" holders who are electrically qualified personnel who have a need to enter the substations on a regular basis.

The issuance of substation keys shall be approved by the power distribution system Facility Safety Head and Facility Coordinator, and the Electrical Standard Practice Engineer.

Temporary keys may be assigned to other electrically qualified personnel at the discretion of the power distribution system Facility Safety Head and Facility Coordinator, and the Electrical Standard Practice Engineer.

Personnel who require access to the substations but are not a qualified "key" holder shall contact a qualified "key" holder who shall escort anyone they permit into the substation.

General requirements for substation entries are as follows:

- a) At least two people shall be involved in all entries into the substation when work is to be performed.
- b) Entry gates/doors shall be closed but shall remain unlocked while personnel are working in the substations.
- c) Entry gates/doors shall be locked when the last person exits the substation.

#### 1.7.13.2 Substation Access for Non-Electrical Work

Unqualified personnel performing non-electrical work such as grounds keeping and painting in energized substations shall obtain substation access from a qualified "key" holder.

When the non-electrical work is performed around electrical hazards, the qualified "key" holder or another electrically qualified person shall act as a safety watch. If the electrical hazard can be eliminated by de-energizing circuits, or securing access to circuits by padlocks or barriers, then the work can be performed with no electrically qualified person present.

#### 1.7.14 Special Electrical Equipment Handling Procedures

##### 1.7.14.1 Batteries

Vented batteries and battery cells, regardless of electrode type, contain dangerous electrolytes, which are subject to spillage. Overcharging or too rapid charging can cause electrolyte boiling and spewing, and the production of explosive gases. The following requirements shall be followed in these devices:

- a) Face shields and goggles, rubber gloves, and protective rubber aprons shall be worn whenever batteries or cells are being handled, filled, or charged.
- b) Ample neutralizing agent shall be present to fully neutralize any electrolyte spill, which may occur in battery operations.
- c) Battery charging shall take place in a well ventilated area.
- d) No smoking shall be permitted in the area where batteries are handled, filled, or charged.
- e) Battery charging shall comply with all of the manufacturer's recommendations.
- f) An eyewash station shall be in an accessible location that requires no more than 10 seconds to reach. This eyewash station can be in each facility or on the battery technician's truck. Eyewash devices shall comply with [ANSI Z358.1-2004](#).

##### 1.7.14.2 Fuses

Fuses shall not be removed on energized circuits above 23,000 volts. Fuses shall not be removed from loaded energized circuits with voltage ranges from 50 volts to 23,000 volts. In addition to the PPE requirements of

**NFPA 70E** when removing or replacing fuses on unloaded energized circuits, the following shall be required:

- a) Rated 50 to 600 volts, insulated fuse tongs, extractors, or other approved methods shall be used.
- b) Rated 601 to 1000 volts, lineman's type rubber gloves in addition to either insulated fuse tongs or extractors shall be used.
- c) Rated 1001 to 23,000 volts, lineman's type rubber gloves in addition to insulated high-voltage sticks or tongs shall be used.

#### 1.7.15 HAZARDS OF ELECTRICITY

##### 1.7.15.1 Hazards of Electric Arcs

###### **Arc Flash:**

While the phenomena of electric arcs and their destructive forces is nothing new, their threat to the safety of exposed electrical workers has only recently come under close scrutiny. Because of the availability of high fault current levels in industrial systems, arcs from electric faults are more powerful and dangerous. An uncontrolled electric arc results in arc flash and arc blast. The severity of the hazard to the worker is determined by the amount of available energy at the fault and proximity of the worker to the fault. A dropped tool, deteriorating insulation on aging conductors, or animals are examples of situations that can create electric arc faults.

During a fault, conductive plasma is created that produces an arc flash at temperatures up to 35,000 degrees F. The resulting radiated heat energy can create fatal burns or burns severe enough to result in long lost time recovery periods. Depending on the available short circuit current at the fault and the duration of the fault, the resulting incident energy (radiated heat energy) can exceed 40 cal/cm<sup>2</sup>. An incident energy level of 1.2 cal/cm<sup>2</sup> will create a second degree burn causing very painful blistering of the skin, which has been deemed to be a survivable burn. A third degree burn results in complete destruction of the skin, cooking of the deeper tissues, and permanent damage and disfigurement.

Working on de-energized equipment will eliminate the arc hazard. If this is not possible, exposure to high incident energy levels while working on energized equipment can be mitigated by the use of flash rated PPE and increasing exposure distance. Flash protective PPE is designed to limit incident energy levels during an arc flash to 1.2 cal/cm<sup>2</sup>. Requirements for arc flash hazard mitigation are found in the latest edition of the NEC (**NFPA 70**) and **NFPA 70E**, Art. 130.

###### **Arc Blast:**

Arc blast is a second consequence of electric arcs. The arc blast is produced by the rapid expansion of super-heated air surrounding the arc and vaporization of conductive metal by the arc resulting in an explosive air pressure wave. The blast energy or pressure resulting from an electric arc blast can be significant enough to cause falls or impact injuries that are more severe than burn injuries. Water turning into steam expands to 1670 times its original volume. By comparison when copper vaporizes, it expands to 67,000 times its original volume. This is the same expansion rate that is produced when dynamite explodes. Protective clothing will not protect

against impact forces resulting from this blast pressure.

1.7.15.2 Effects of Electric Shocks

Some individuals who handle electrical equipment mistakenly believe their tolerance to electric shock is related to their ability to withstand the pain of the shock. Actually, the lethal incidence is a function of current passage (duration and level) through the heart region. Additionally, the onset of possibly lethal currents is only marginally higher than those ranked just painful and well within the range of industrial low-voltage power systems. While asphyxiation is the physiological result of the first zone of over-painful shock, the second zone results in heart ventricular fibrillation, or heart dysfunction. Not only is the latter not self-curing on cessation of the current, but it is generally lethal within about 3 minutes. Just as it is current, not voltage, which heats a wire, it is current which causes the physiological damage.

The values of 60 Hz current and its effects (typically) on an average man are listed in Attachment 7.

See **Figure - Effects of Current on Average Human** (Attachment 7).

NOTE: Most GFCI's operate at 0.005 Amps.

Note that as shock current values are increased they are statistically more dangerous from burn-type damage than heart failure. This is most likely because of the shorter exposure times. When very high voltages (above 2300 V) are involved, burns may not be severe as the victim initiates an arc that retracts (by reflex) the victim's attempted grasp. In summary, humans are affected in major proportion by the duration, as well as the level of shock. When contact is made in such a manner as to retract the contracting part (such as a light finger touch when the strong muscular contractions of the arm pull the fingers away) the shock is much less dangerous than one of the same current level incurred by "freezing" to the contact with a full hand grasp.

1.7.15.3 Body Current Levels at 120 Volts AC

Typical body current paths are listed in the table below.

<u>Path</u>	<u>Current</u>
Dry Skin	Less than 1 mA
Wet Skin	110 mA
Hand to Foot	220 mA
Ear to Ear	1.1 A

1.7.16 Special Electrical Safety Requirements

1.7.16.1 [Electrical Safety Workers' Qualifications](#) and Duties

All appointed safety workers shall be electrical tradesmen.

- o The Contractor shall appoint a Safety Supervisor knowledgeable of contract safety requirements specified herein. The Safety Supervisor shall be available at the worksite during all work and shall be responsible for the safety of each of the Contractor's work teams.
- o The Contractor shall appoint an Assistant Safety Supervisor who shall

take over the responsibilities and perform all duties of the Safety Supervisor if the Safety Supervisor is not present.

- o The Contractor shall furnish to the Contracting Officer, in writing, the names and qualifications of the Safety Supervisor and Assistant Safety Supervisor prior to commencement of work. This submittal is in addition to the Safety Plan required above.
- o When working in energized substations, manholes, and cable tunnels, the Contractor shall:
  - o Assign an employee knowledgeable of the safety required, and without other duties, to assist the Safety Supervisor to assure the safety of the work area whenever the work involves the handling of lengths of conduit, bus, steel or large equipment.
  - o Assign additional employees, knowledgeable of the safety required and without other duties, for the protection of the workers when the work is so divided and extensive that one safety employee cannot effectively maintain the safety surveillance over the workers and their operations.
  - o Ensure no work is performed without a minimum of two (2) employees present in any one-work team, one of which shall be a safety team leader.

#### 1.7.16.2 Protective System Checks

Protected relay settings shall be coordinated to provide selective tripping. The Contractor shall coordinate this effort through the Contracting Officer.

All circuit interruption devices shall be rated to interrupt the maximum short circuit current of the power system at the point of application of the device.

Circuit breakers shall be immediately inspected and checked to assure suitability for reuse after any operation in which the circuit breaker opens under short circuit or fault conditions. When a trip occurs on breakers above 600 volts, the troubleshooting process shall verify the settings of all breakers between the fault and the breaker when tripped. Molded case circuit breakers without solid state trip devices are excluded from these requirements.

These tests shall be in accordance with Section 6, [IEEE Std 95](#).

#### 1.7.16.3 PCB Operations

Electrical equipment, such as transformers, capacitors, light ballasts and other items may be filled with insulating fluid that contains Polychlorinated Biphenyls (PCB). PCB fluids have been sold under various trade names, such as "Askeral," "Inerteen," "Chlorexol," "Noflama" and "Pyranol." Any spills or leaks of fluid containing any Parts Per Million of PCB's shall be reported immediately to the Inspector and LaRC Environmental Management Branch (EMB) Spill Coordinator at 864-2073.

#### A. REQUIREMENTS FOR POLYCHLORINATED BIPHENYL (PCB) REMOVAL

All PCB operations shall be conducted in accordance with applicable provisions of 40 CFR 761, Polychlorinated Biphenyls (PCB's) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions, Subparts A through K, other Federal and Local application regulations applicable to PCB removal, and Section 6 of LPR 8800.1, "LaRC Environmental Program Manual," and Section 6 of LPR 8800.1, "PCB Management." All fluids and equipment containing any percentage of PCB's shall be carefully controlled and monitored. The Contractor shall notify LaRC, Environmental Management Branch (EMB) prior to work involving the removal or disposal of any Parts Per Million (PPM) concentration of PCB's or PCB items. All storage and disposal practices shall be reviewed by the LaRC EMB.

#### B. OPERATIONAL PROCEDURE FOR PCB REMOVAL

The Contractor shall submit an operational procedure to the Contracting Officer for approval a minimum of twenty one days prior to the start of the removal process. The procedure shall specify the means by which the Contractor will assure compliance with all applicable regulations. The procedure shall include attention to the following elements, as appropriate to the specific job:

- o Emergency Plan (approved by the EMB Spill Coordinator)
- o A work schedule to include start and anticipated finish dates
- o Work area control procedures
- o Personal protective equipment and clothing to be worn
- o Work practices to be observed
- o Personnel hygiene procedures
- o Labeling and proper packaging of PCB items and related waste
- o PCB handling procedures, including a description of the waste and estimated volume to be generated
- o Disposal practices
- o Proof of training qualifications of PCB workers

#### C. TEMPORARY STORAGE FOR DISPOSAL

The Contractor may temporarily store, on LaRC, PCB items (i.e., transformers, capacitors), for a period of time, not to exceed 30 calendar days, from the date of removal from service. Storage shall be in accordance with EPA regulations 40 CFR 761.65 and coordinated with EMB to assure proper storage practices. A notation shall be attached to the PCB item or PCB container housing which indicates the date of removal from service, its weight, and PCB PPM content (Environmental Branch provides or if unknown, Contractor provides analysis). The Contractor shall package all PCB items for transportation in accordance with Department of Transportation (DOT) regulations.

The Contractor may request the use of LaRC Storage Facility, Building 1167, as a temporary storage site. In this case, the Contractor shall notify EMB, seven calendar days prior to storage, of the amount of PCB waste to be stored.

#### D. RESPONSIBILITIES FOR STORAGE

The Contractor shall adhere to the following requirements for items placed in storage:

- o Follow EPA Regulations 40 CFR 761.65, (a) through (c) (9).
- o Request/Coordinate storage of PCB with LaRC EMB.
- o Package PCB items for disposal in accordance with DOT regulations.
- o Survey the storage location every week for evidence of PCB contamination and leaks.
- o Make a written report stating the results of the survey and cleanup actions required or taken. Forward a copy of the original survey to EMB within seven calendar days of survey.

#### E. PCB DISPOSAL

Disposal of any concentration of PCB's and PCB items shall comply with applicable regulations of 40 CFR 761, Subparts A through K, other Federal and Local regulations and Section 6 of LPR 8800.1, Chapter 6, "LaRC Environmental Program Manual," "PCB Management." All transformers and PCB electrical equipment too large to be contained in drums and that contain any PPM PCB fluids, shall be drained before removing the transformers or other electrical equipment off the Center for disposal. Small transformers or capacitors that can be contained without modification in a drum or other leakproof container are not required to be drained. Items and fluids that contain less than 50 PPM PCB are considered non-PCB and are excluded from federal regulation with the exception of disposal practices provided in 40 CFR 279 and 40 CFR 761.20 (d) and (e). Also, oil containing any quantifiable level of PCB's (greater than 2 PPM) shall be marketed to incinerators or burners defined in 40 CFR 761.20 (e)(1) or an EPA approved chemical treatment facility. The disposal of drained transformer carcasses and other electrical equipment is regulated in accordance with 40 CFR 761.60 (b) through (c). The Contractor shall notify LaRC EMB, prior to draining any equipment and ensure that proper accumulation containers are used. All PCB items shall be packaged in accordance with DOT regulations. A shipping document or state manifest shall accompany the oil in transportation for disposal.

#### F. RESPONSIBILITIES FOR DISPOSAL ARE AS FOLLOWS:

Thirty calendar days after date of Receipt of Notice to Proceed:

- o Submit to the Contracting Officer for approval the name and location of the ultimate disposal facility. Only NASA LaRC audited/approved facilities may be used for the disposal of PCB items.
- o Submit to the Contracting Officer for approval a one-time written and signed notice certifying that the burner (Disposal Company) has complied with requirements applicable to incinerators or burners defined in 40 CFR 761.20 (e)(1) and identify the class of burner he qualifies for as defined in 40 CFR 761.20 (e)(3).
- o Submit to the Contracting Officer certification that electrical

equipment drained of oil containing any PPM of PCB's complies with 40 CFR 761.60 (b) and (c).

- o Submit to the Contracting Officer a list of all PCB items for disposal, to EMB for review.
- o Submit to the Contracting Officer an [Emergency Spill Plan](#) that defines the procedures and materials that will be provided by the Contractor in the event of a spill or leak of any amount of PCBs.

Five calendar days prior to removal from LaRC the Contractor shall:

Submit to the Contracting Officer a completed [shipping document](#) or, if required, a state manifest that fulfills all requirements of 40 CFR 761.207 and 40 CFR 761.208. The EMB will review the manifest prior to approval and signature.

#### G. SPILL CLEANUP

The Contractor is responsible for spill cleanup as required under 40 CFR 761, Subpart G. In the event of a spill, the Contractor shall take immediate action to contain the spill and notify the Inspector. During non-working hours, the Contractor shall notify the Duty Office at 864-4927.

#### H. RESPONSIBILITIES

All Contractor and subcontractor PCB removal personnel, including supervisors involved with prevention and cleanup, shall be trained in accordance with applicable EPA, Federal, State, and Local regulations. Proof of training shall be submitted 30 calendar days prior to PCB operation removal.

No PCB site operations shall be performed if spill materials and qualified personnel defined under the Emergency Spill Plan are not at the site prior to starting any PCB operations.

### 1.8 UNDERGROUND UTILITIES AND OPERATIONS

#### 1.8.1 General

Mylar detectable tape or its equivalent shall be used in all installations and maintenance tasks for buried underground utilities at LaRC; this includes the laying of detectable tape approximately 6 inches below the surface of the ground directly above the buried utility line.

#### 1.8.2 Water Connections

Contamination of potable water supply is prohibited. LaRC utilizes the necessary safeguards to protect against possible contamination of the fresh water supply caused by backflow or back siphonage. These safeguards are:

- o Where the possibility of cross-connection may exist, backflow prevention devices, or the equivalent, shall be installed and tested periodically.
- o Any suspect cross-connection or suspect contamination of fresh water shall be immediately reported to the Contracting Officer.

## 1.9 RADIATION SAFETY PRECAUTIONS

Contractors performing tasks involving the use of sources of ionizing radiation, the pertinent provisions of the Nuclear Regulatory Commission Standards for Protection Against Radiation (10 CFR 20), relating to protection against occupational radiation exposure, shall apply.

Any activity, which involves the use of radioactive materials or X-rays, whether or not under license from the Nuclear Regulatory Commission (10 CFR Parts 0-199), shall be performed by competent persons specially trained in the proper and safe operation of such equipment. In the case of materials used under Commission license, only persons actually licensed, or competent persons under direction and supervision of the licensee, shall perform such work.

Contractors shall comply with the requirements of LPR 1710.5, "Ionizing Radiation."

## 1.10 PRESSURE VESSELS

The design, fabrication, inspection, testing, installation, and use of pressure vessels, piping, and associated equipment covered by these specifications shall conform to LPR 1710.40, Safety Regulations Covering Pressurized Systems.

## 1.11 DEMOLITION OPERATIONS

Demolition operations shall be conducted to ensure the safe passage of persons to and from facilities occupied and used by the Government and to prevent damage to adjacent buildings, structures, and other facilities. Demolition operations shall be in accordance with OSHA 29 CFR 1926.850 through 1926.859.

### 1.11.1 Air - Fugitive Dust/Emissions Control

The Contractor shall control fugitive dust/emissions from demolition activities in accordance with Virginia Regulation 9 VAC 5-40-90 (Standard for Fugitive Dust/Emissions). The Contractor shall take reasonable precautions to prevent particulate matter from becoming airborne during demolition activities. Examples of such reasonable precautions are included in the above referenced regulation.

### 1.11.2 Recycling/Diversion

The Contractor is responsible for tracking and submitting the disposition of waste from demolition of facilities. Tracking shall include total weight of all materials disposed in a landfill and the weight of concrete or other materials diverted from a landfill. Diversion to include, but limited to incinerated for energy, recovery, recycled, composted or reused. It is requested that the Contractor/Subcontractor submit a document identifying the diversion method and weight of each material. Potential materials for recycling and processes will be identified in the Waste Management Plan provided by the Contractor. Weight tickets, shipping documents and manifest can be used to confirm diversion/recycling.

### 1.11.3 EPCRA Waste Requirements

The Contractor will provide the EMB with the following information in compliance with LaRC's Toxic Release Inventory Report requirements. Any

waste that is contaminated with lead or chromium and generated from demolition activities (blasting, scraping, cutting, washing, or other treatments) prior to or during deconstruction of LaRC wind tunnels shall be recorded and provided to the government. Records shall include the amounts the amount in pounds of waste generated, the amount of lead and/or chromium in the waste, a copy of the analysis or testing report, the name and complete address of the facility the waste is sent to and what that facility plans to do with the waste (i.e., treatment or disposal).

#### 1.12 EXCAVATION OPERATIONS

All excavation, trench-work, bedding, testing and backfilling shall be done in the presence of the Contracting Officer or designated representative, who shall be notified by the Contractor two working days in advance of the work.

The methods of excavation, the means of earth support, and the manner of backfill shall be conducted with primary consideration for the safety of the personnel and the work. Minimum requirements for excavations/trenching/shoring/bracing activities shall be in accordance with OSHA 29 CFR 1926.650 through 1926.652 and OSHA 29 CFR Subpart P, Appendixes A through F. Excavation shall be performed in a manner to prevent surface water and subsurface or groundwater from flowing into the excavations and to prevent water from flooding the conduit trench and any adjacent or surrounding area.

##### 1.12.1 Soil Excavation

The Contractor will be responsible for the disposal of any excavated soil that is to be removed from LaRC. Soil that is to be removed shall be disposed at a permitted landfill. The name, address, and permit number of the permitted landfill shall be identified in the Contractor's proposal. Contractor will be responsible for the sampling and analysis of the soil to be removed from LaRC for TCLP (for metals), BTEX, TPH (DRO and GRO ranges), TOX and PCB and any additional test the permitted landfill requires for disposal. EMB request to be notified of soil removal so they can inform the Project Manager of any prior or known soil conditions at the proposed site that would need to be provided to the landfill or to be investigated by EMB. The Contractor is responsible to notify EMB of the test results prior to removal from the Center and to ensure that removal and disposal of excavated soils complies with all applicable Federal, State, local environmental laws and regulations, and LaRC requirements. The Contractor shall be responsible for any disposal permits and fees if off-site disposal is necessary. The Contractor will be permitted to store soil on the job-site for the purpose of reusing for fill or grading or for waiting for soil analysis and be held responsible for securing and controlling the area. Soil sampling done before site work begins is the preferred method and this practice allows the Contractor to remove the soil from the site as it is generated without storing the soil for five to ten days waiting for sampling results. It will be the Contractors responsibility to remove and dispose all unused soil generated from the project site at a permitted landfill upon job completion.

#### 1.13 DIGGING PERMITS

For personnel safety and to prevent the possible interruption of major utility services encountered during excavation, the following procedures and practices shall be followed:

Prior to the Contractor performing any excavation or making any penetrations into the ground 6 inches or deeper (such as driving stakes or probes) in either the East or West Area of Langley Research Center, the Contractor shall first notify the cognizant Inspector of its intentions two working days in advance of starting the work.

The Inspector will initiate the work for staking out the subsurface utilities known to exist within 10 feet of the designated work area.

Any delays brought about because of late notification by the Contractor shall be the responsibility of the Contractor.

No work shall start until the Contractor receives a digging permit and sign to be posted at the work site and the facility coordinator has made up-to-date subsurface drawings available and discussed specific details of the work with the Contractor and Inspector at the work site. The sign and permit shall be displayed at the site during the excavation or penetration operations.

The Contractor shall not proceed with any machine excavation within 10 feet of the staked out area until it has exposed the utility or utilities in question by hand excavation. After such exposure the Contractor shall obtain approval from the Inspector for any additional machine excavation within the ten-foot area.

No excavations will be allowed for any purpose other than those for which the original digging permit was issued, nor will any excavations outside the original planned and marked areas be allowed until a new or revised digging permit has been issued by the Government. In marked areas where sufficient time has elapsed such that ground markings have disappeared or deteriorated, they shall be remarked and the digging permit reissued by the Government prior to any excavations.

Warning tape, color-coded with the words "CAUTION ELECTRIC LINE BELOW", "CAUTION WATER LINE BELOW", "CAUTION SEWER LINE BELOW", shall be installed six inches below grade over the direct buried line. Tape shall be detectable when used over PVC water or sewer lines. Non-detectable tape shall be used over power or communication cables, duct banks, and metal piping.

The Contractor shall notify the Inspector after installation of each segment of underground utilities and before any backfilling has started. The Inspector will notify the cognizant NASA personnel and arrange to have a survey performed to determine the "as-built" location and elevation of each utility line. This survey will be performed within one working day after the Inspector is notified. Immediately after the survey is performed, the Contractor, with the Inspector's concurrence, may proceed with the backfilling operation.

#### 1.14 GAS PROTECTION

The applicable rules of OSHA 29 CFR 1926.800, shall be observed for all pier excavation and work in soils known or suspected to be gaseous.

The Contractor shall assign one or more competent persons, properly trained in the operation of gas testing equipment, who shall be on duty during all times and whose primary functions shall be to test for gas and be responsible for operation of the testing equipment. Unless equipment of constant supervisory type with automatic alarm is employed, tests for gas

shall be made at least every hour and more often when character of ground or experience indicates that gas may be encountered. A test for gas shall be made before any workers are permitted to enter the excavation after an idle period exceeding one-half hour.

Readings shall be taken with instrumentation designed to indicate the concentration of gas, number and location, point of test, date and time of test. The instrumentation shall be maintained and calibrated in accordance with the manufacturers specifications. Readings shall be entered into a permanent record.

#### 1.15 PAINTING AND COATING OPERATIONS

The Contractor shall protect all adjacent materials and equipment against damage from spillage, dripping and spatter of coating materials. All building materials and equipment shall be left clean, with all damaged surfaces corrected. Provide "WET PAINT" signs to indicate newly painted surfaces.

The Contractor shall provide adequate ventilation for all interior spaces during application and drying of coatings, to prevent the build-up of toxic or explosive concentrations of solvent vapors.

#### 1.16 ROOFING AND COATING OPERATIONS

At the beginning of each workday, Contractors performing roof repairs, modifications or fire suppression tasks shall check with the Contracting Officer to assure safe work conditions before proceeding to work on the roof, if required by the Contracting Officer.

All accesses to hazardous roof areas shall be identified by the appropriate warning signs.

Access to roof areas requires approval by the Contracting Officer prior to performing any roof activity.

Where structural integrity or permanent safety devices do not provide sufficient protection, special security, safety equipment and/or procedures, and temporary structural requirements shall be implemented.

Where access to roof-located equipment can be anticipated (for example, heating, ventilation, and air-condition (HVAC), aircraft warning lights, pressure systems, instrumentation stations, and so forth), the following apply:

- o The Contractor shall provide permanent working platforms, associated walkways or ladders, and appropriate rails and guards in accordance with OSHA regulations.
- o The Contractor shall identify and certify those workers requiring access shall be identified and certified as "high workers."
- o Code compliant safety equipment and procedures shall be established for these operations.

For buildings with adequate structural integrity, the same requirements described above apply to roof repair or modification. Roof activities on surfaces that are structurally inadequate, or which are not permanently

configured for such work, may have additional requirements.

Routes clear of obstructions shall be provided for all persons carrying hot substances.

The carrying of hot substances up and down ladders is prohibited.

Hoisting gear used in handling hot substances shall be adequate for the loads imposed and shall be securely and substantially braced and anchored.

#### 1.17 FIRE PREVENTION AND PROTECTION

##### 1.17.1 General Requirements

Fire prevention and protection shall be in accordance with [NASA-STD-8719.11](#), "NASA Safety Standard for Fire Protection".

All hot work, as defined in [LPR 1710.11](#), shall have a "Hot Work Permit" issued by the Fire Department. Hot Work shall not be permitted until a Hot Work Permit has been issued and posted. Deviations or waivers from this and the following requirements shall be presented to the LaRC Fire Chief, in writing, for review and consideration. Only the LaRC Fire Chief can grant deviation or waiver approval.

##### 1.17.2 Welding, Flame Cutting and Melting

All welding and cutting operations including, but not limited to, the use of acetylene and propane torches, propane heat guns, grinders, electric arc welders, and activities such as brazing, shall be done in accordance with the publications of the American Welding Society, the National Fire Protection Association [NFPA 51](#) and [NFPA 51B](#), and Chapter 22 of the "Virginia Statewide Fire Prevention Code" ([13 VAC-5-51](#)).

##### 1.17.3 Prohibitions

Hot work activities shall not be performed on the following:

- o Combustible walls or ceilings or those containing combustible insulation.
- o Tanks or pipes that have held flammable liquids, (unless they have been thoroughly purged and tested for residual vapors).
- o Pipes or other metal in contact with combustible materials if ignition of material is possible due to conduction.
- o Items that have coatings of paint that contain lead/chromium until coatings have been removed and contained.
- o Metal partitions, walls, ceilings, or roofs having a combustible covering.
- o Walls or partitions of combustible sandwich-type panel construction.
- o Automatic sprinkler systems after initial installation of systems have been completed.

#### 1.17.4 Safeguards

- o Contractor shall remove flammable liquids, oily deposits, and combustible materials within 35-feet of the hot work area.
- o Contractor shall cover or shield combustible materials that cannot be removed with flameproof covers, fire resistant guards, or fire resistant curtains.
- o Contractor shall cover cracks in walls, floors, ducts, or other concealed spaces within 35-feet of the hot work area to prevent the passage of sparks or slag to adjacent areas.
- o Prior to beginning hot work, Contractor shall remove combustible materials from the opposite side of walls, partitions, ceilings or roofs.
- o Nearby personnel shall be protected from heat, sparks, and/or slag, through the use of fire resistive screens or shields.

Special precautions, as recommended by the LaRC Fire Chief and approved by the Contracting Officer, shall be taken to avoid unwanted activation of automatic detection or suppression systems due to the use of hot work equipment.

#### 1.17.5 Firewatch

The Contractor shall assign a firewatch for every job involving hot work. The firewatch personnel shall not have any other collateral duties to distract or occupy them.

The firewatch personnel shall know the location of fire alarm pull stations in the work area and shall have two fully charged, 10-pound, ABC multi-purpose, dry chemical fire extinguishers available at all times. Facility fire extinguishers shall not be used to satisfy this requirement. The firewatch personnel shall be qualified in the proper use of fire extinguishers for controlling or extinguishing incipient fires.

The firewatch personnel shall continuously monitor the work area for any smoldering fires or hot spots during the period the hot work is being conducted, and for a period of 30 minutes following the termination of the hot work operation. The firewatch personnel shall immediately notify other workers if any dangerous conditions develop, and call the LaRC Fire Department, at 911 from any Center telephones or 864-2222 on cellular telephones.

#### 1.17.6 Means of Egress

An unobstructed means of egress in accordance with [NFPA 101](#), "Life Safety Code," shall be maintained at all times, for use by construction workers and LaRC employees.

#### 1.17.7 Fire Protection and Detection Systems

During building alterations and modifications, where the building is protected by fire detection and/or protection systems, such systems shall be maintained in an operable condition at all times. Shut down for any reason shall be pre-approved and coordinated with the LaRC Fire Chief or designee.

If it is necessary to place any existing fire detection or protection system out of service, temporary protection measures such as the termination of all hazardous operations, or frequent inspections of the area involved with a 24-hour per day firewatch may be required by the LaRC Fire Chief or designee.

The Contractor shall make regular checks on the fire sprinkler, and standpipe control valves shall be regularly checked at the end of each work period to ascertain that such systems are in service.

If fire sprinkler heads are located within a demolition area, all heads subject to physical damage shall be fitted with guards.

If smoke detectors are located such that dust and/or gases resulting from the construction may adversely affect them, the following procedures shall be adhered to:

- o Place sequentially numbered plastic bags around each smoke detector in the affected area each day before renovation begins.
- o Post manual instructions and inform all Contractor personnel on how to manually signal a fire condition.
- o If the area in question contains a special hazard, an employee of the Contractor shall be dedicated as a firewatch for the period that detectors are bagged.
- o Remove all bags at the end of each work day until renovation work is completed. Bags shall be removed sequentially and recorded, to ensure that every bag is removed.

#### 1.17.8 Portable Fire Extinguishers

The suitability, distribution, and maintenance of portable fire extinguishers shall be in accordance with [NFPA 10](#), "Standard for Portable Fire Extinguishers." The Contractor shall provide and maintain at least one 10-pound, multipurpose dry chemical fire extinguisher in a visible location on each floor of the construction area and at each usable stairway, at all times. The Contractor shall provide and maintain two 4-A, 60-B:C rated fire extinguishers within 25 feet of each asphalt (tar) kettle, during the period such kettle is being utilized, and one additional 4-A, 60-B:C fire extinguisher on the roof being covered. Contractor employees shall be instructed in the proper use of extinguishers.

#### 1.17.9 Temporary Heaters

When open-flame heating devices or other temporary heating equipment are used, the Contractor shall obtain a written permit from the Fire Chief for each use.

- o A list of temporary heating equipment, to be used on-site, shall be provided to the LaRC Fire Chief.
- o The temporary heating equipment shall be installed, used, and maintained in accordance with the manufacturer's instructions, including clearance to combustible material, equipment and/or construction areas.
- o Chimney or vent connectors, where required by direct-fired heaters,

shall be maintained at least 18-inches from combustibles and shall be installed in accordance with NFPA 211, "Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances."

- o Oil-fired heaters shall be designed and installed with features in accordance with NFPA 31, "Standard for the Installation of Oil-Burning Equipment."
- o Fuel supplies for liquefied petroleum gas-fired heaters shall be in accordance with NFPA 54, "National Fuel Gas Code," and NFPA 58, "Standard for the Storage and Handling of Liquefied Petroleum Gases."
- o Refueling operations shall be conducted in accordance with NFPA 58.
- o Temporary heating equipment, where utilized, shall be monitored for safe operation and maintained by properly trained personnel.
- o All heating equipment approved by the Contracting Officer shall be provided with safeguards, such that when tilted or tipped over, their power source will be automatically shut off.
- o Temporary burner-type heaters that are in use during other than normal working hours shall have an hourly firewatch provided.
- o Burner-type heaters are not permitted in areas where painting or similar operations may create an explosive atmosphere.

#### 1.17.10 Removal of Combustible Waste Material

The Contractor shall remove accumulations of combustible waste material, including paper/plastic packing and wrappings, scrap lumber, dust, and other construction rubbish from the structure and its immediate vicinity at the end of each work shift or more frequently as necessary for safe operations.

The Contractor shall promptly dispose of materials subject to spontaneous ignition, such as oily waste and rags used with paint, linseed oil or other flammable or combustible liquids. Such materials shall only be placed in noncombustible receptacles with tight-fitting lids that are physically located away from any building or structure.

Any materials that are generated from other than Contractor equipment shall be managed as waste described in the DISPOSAL OF HAZARDOUS WASTE MATERIAL paragraphs of this Section.

#### 1.17.11 Disposal of Rubbish

The burning or incineration of rubbish, such as construction debris, brush, or trees is prohibited on LaRC. The Contracting Officer will provide direction as to the appropriate method of disposal.

#### 1.17.12 Flammable and Combustible Liquids

Flammable and combustible liquids shall be stored and handled in accordance with NFPA 30, "Flammable and Combustible Liquids Code."

Open flames and smoking shall not be permitted in flammable and combustible liquid storage areas. Such areas shall be appropriately posted as "NO SMOKING" areas.

Flammable liquids, including Class I and Class II liquids, shall be kept and transported in the appropriate safety containers as defined in 29 CFR 1926.152.

Class I liquids shall be dispensed only where there are no open flames or other sources of ignition within the possible path of vapor travel.

Bulk storage of flammable liquids is prohibited unless the LaRC Fire Chief or designee has granted prior approval.

#### 1.17.13 Smoking

Smoking shall only be permitted in areas designated by the LaRC Fire Chief or designee. The Contractor shall provide receptacles of non-combustible construction designed for collection of waste smoking material.

#### 1.17.14 Non-Emergency Use of Fire Hydrants

Requests for the non-emergency use of fire hydrants shall be made to the LaRC Fire Chief or designee prior to use. Requests may be approved with the following restrictions:

- o The hydrant user shall install one valve on the 4-1/2-inch port on each hydrant to be used. (This 4-1/2-inch port with the valve installed is reserved for LaRC Fire Department use only.)
- o One or both of the 2-1/2-inch fire hydrant ports shall be reserved for non-emergency use. The hydrant user shall provide an approved 2-1/2-inch gate valve on one or both of the 2-1/2-inch fire hydrant ports, reduced down to 1-1/2-inches.

#### 1.17.15 Fire Department Access

Main access roadways shall not be obstructed in any manner.

The Contractor shall provide unobstructed access from the street to fire hydrants and to outside connections for standpipes, sprinklers, or other fire extinguishing equipment, whether permanent or temporary, shall be provided and maintained at all times.

Unobstructed access to the main fire alarm control panel, permanent, temporary, or portable first-aid fire equipment shall be provided and maintained at all times.

#### 1.18 ASBESTOS ABATEMENT

##### 1.18.1 General Requirements

These specifications present criteria for operations involving removal, repair, or other work with asbestos. Asbestos is defined as any material containing more than one-percent asbestos by weight. All asbestos operations shall be conducted in accordance with Federal, State, and Local regulations applicable to asbestos and including provisions of 40 CFR 61 Subpart M, National Emissions Standard for Hazardous Air Pollution; 29 CFR 1926.1101 Asbestos; Part 54.1-500 through 1-517 of the Code of Virginia; LPR 1740.2, Chapter IV, Asbestos; and LPR 8800.1, Chapter 8, Section 8.3.5 (Environmental Program Manual).

It is the responsibility of the Contractor to ensure that all asbestos removal work is performed thoroughly and conducted properly. The Contractor shall sequence and coordinate asbestos removal operations and other work to ensure that other trades performing renovation work are not exposed to asbestos.

The Contractor shall comply with the Commonwealth of Virginia asbestos handling licensing requirements for contractors, supervisors and workers. The Contractor shall provide a copy of its current asbestos-handling license to the Contracting Officer, prior to beginning on-site operations.

#### 1.18.2 Notification Requirements

Notification of Federal and State regulatory agencies is the responsibility of the contractor involved with the removal/abatement activity.

In work involving friable asbestos material of more than 10 linear feet and/or 10 square feet of insulating surfacing material, Contractor notification to the Commonwealth of Virginia is required. Additionally, the Contractor shall notify the Environmental Protection Agency of removal projects involving at least 260 linear feet or 160 square feet respectively. Contractor shall submit proof via mail receipt/slip that Environmental Protection Agency Region III has received the notification prior to beginning work on-site.

#### 1.18.3 Operational Procedure

The Contractor shall submit an [Asbestos Operational Procedure](#) (AOP) to the Contracting Officer for approval. A Virginia Licensed Asbestos Project Designer shall prepare the AOP, a work plan for asbestos abatement operations. The procedure shall specify how the Contractor will assure compliance with applicable regulations. It shall identify specific control measures and work procedures to be employed in the performance of work. The procedure shall include attention to the following elements as appropriate to the specific job:

- o A work schedule including start and anticipated finish dates
- o Work area control procedures
- o Personal protective equipment and clothing to be worn
- o Description and placement of engineering controls and physical containment elements.
- o Work practices to be observed
- o An air monitoring plan
- o Personal hygiene procedures
- o Labeling
- o Asbestos waste handling and disposal procedures, including a description of the waste and an estimate of volume to be generated
- o For asbestos mastic removal, a citrus based solvent that does not create a hazardous waste stream shall be used.

- o For occupied buildings, mastic removal is to be done after normal working hours.
- o Adequate ventilation is to be provided to reduce odor and worker exposure. This is to be accomplished by using HEPA filtered negative air machines.

#### 1.18.4 Additional Requirements for Removal of Friable Asbestos

All HEPA vacuums and negative air machines must be dioctyl phthalate tested within 90 calendar days prior to the start of work. Equipment is to be labeled and certification shall be submitted to the Contracting Officer prior to the start of work.

Negative pressure shall be monitored and recorded by a manometer with a strip chart printout. Printout shall be submitted to the Safety and Facility Assurance Branch (SFAB) Industrial Hygienist at the end of each phase of the project.

The decontamination unit shall be constructed to provide adequate room for workers to store their street clothes in the clean room. Shower must provide hot and cold running water. Water from the shower shall pass through a two-stage canister style filtration system prior to discharge. It is mandatory that all workers shower prior to exiting the asbestos work area.

All flex duct for negative air exhaust that is to be run through occupied areas shall be new duct material not previously exposed to asbestos contamination.

Asbestos removal contractor must submit written notification to equipment rental companies (e.g., scaffolding, personnel-lifts, and all other rental equipment), concerning the intended use of rental equipment and the possibility of asbestos contamination of the equipment. Copies of the notification shall be provided to the Prime Contractor (if a subcontractor is used) and to the Contracting Officer.

Prior to the establishment of containment and commencement of removal operations, all surfaces within the work area are to be pre-cleaned by wet wiping and HEPA vacuuming.

To the extent it is practicable, the asbestos removal contractor and prime contractor shall coordinate/combine asbestos removal and mechanical demolition.

All equipment (e.g., ladders, staging) brought on-site by the asbestos removal contractor shall be clean with no dirt, dust, or debris present. The equipment must be completely decontaminated prior to being removed from the asbestos work area.

When removal work is conducted in occupied areas, the asbestos removal contractor shall not perform bag-out during the hours of 7:00 a.m. to 5:00 p.m.

#### 1.18.5 Removal and/or Reinstallation of Transite Panels

When work involves removal and/or reinstallation of transite panels, the Contractor's operational procedure shall include the following precautions:

- o The area behind the panels shall be sealed off with polyethylene (poly) sheeting.
- o Disposable drop cloths shall be placed where the panels are to be removed and at the storage area.
- o Employees performing the work shall be certified asbestos workers wearing Tyvek coveralls and half face negative pressure respirators with High Efficiency Particulate Air (HEPA) filters.
- o Screw heads, nail heads or other fasteners shall be cut and panels removed intact.
- o All surfaces shall be vacuumed with a HEPA filtered vacuum.
- o All poly and coveralls shall be disposed of as asbestos waste.

#### 1.18.6 Disposal of Asbestos Waste

Asbestos removed from LaRC removal/abatement sites remains Government property throughout the removal activity and shall be processed as such on the Waste Shipment Record.

Disposal of asbestos waste is the responsibility of the Contractor performing the removal/abatement activity. The Contractor shall follow 40 CFR 61, Subpart M and Chapter 8, Section 8.3.5, Asbestos Removal/Abatement Contractor of the Environmental Program Manual, LPR 8800.1, and all Federal, State and Local regulations applicable. Transportation of asbestos material off-site shall be in accordance with Department of Transportation Regulations (40 CFR Part 173.1090).

Upon request, the Contractor may use an on-site staging area provided by the Government. The Contractor is responsible for the transportation of the properly packaged asbestos waste to the staging area. The Contracting Officer shall provide timely notification to the Contractor, of the location of the on-site staging area to be used for the accumulation of asbestos waste.

The Contractor shall provide a properly prepared waste shipment record which complies with 40 CFR 61.150 (d), two days prior to pickup, for the disposal of all Regulated, Asbestos-Containing Material (RACM), which:

1. Identifies NASA, Langley Research Center as owner and waste generator. Address of waste generator shall be:  
  
NASA, Langley Research Center  
Environmental Management Branch  
Mail Stop 213  
Hampton, VA 23681  
Telephone: (757) 864-3394
2. Contains name and address of the local, State or EPA Regional Office responsible for administering the asbestos NESHAP program. Address of responsible agency shall be:  
  
Department of Labor and Industry, Occupational Health  
13 South 13th Street  
Richmond, VA 23219

3. Contains the name and telephone number of the contractor responsible for the removal of asbestos at the building site.
4. Contains the approximate quantity in cubic meters and in cubic yards.
5. Contains the name and physical site location of the State-approved landfill disposal site.
6. Contains the name, address, and telephone number of the transporter(s).
7. Includes the date transported.
8. Shall be signed by a NASA official in the Environmental Management Branch only after completion of all information in Items 1 through 7 above.

#### 1.18.7 Submittals

The Contractor shall provide to the Contracting Officer, the following submittals as required by Section 01 33 00 SUBMITTAL PROCEDURES of these specifications, and by applicable law and regulations as cited above:

- o [Asbestos Operational Procedure](#) (AOP)
- o A copy of the Contractor's current asbestos handling license issued by the Commonwealth of Virginia.
- o Written proof of required notifications to the Commonwealth of Virginia and the EPA as may be appropriate.
- o Written asbestos waste handling and disposal procedure.
- o Signed certification statement from off-site transporter of asbestos.
- o A copy of the waste shipment record signed by the owner of the disposal facility indicating receipt of asbestos waste by the initial transporter. This copy shall be received by the generator within 35 calendar days of the date the RACM was accepted by the transporter.

#### 1.18.8 Monitoring Requirements

##### 1.18.8.1 Licensed Asbestos Project Monitor (LAPM)

The Contractor will be providing a Licensed Asbestos Project Monitor (LAPM) for the abatement work. The Contractor shall notify the Government in writing seven days prior to the start of any asbestos related abatement work. The general or abatement contractor shall be required to provide personal air sampling as required by OSHA.

The Contractor shall provide a Virginia Licensed Asbestos Project Monitor having a minimum of two years experience to serve as the on-site Project Monitor for all asbestos related activities. The Project Monitor shall function as an independent third party and shall have no employer-employee relationship or other financial relationship with the asbestos removal

contractor (i.e., Project Monitor shall be contracted directly by the prime contractor, not by the asbestos removal contractor).

The Contractor shall submit to the Contracting Officer a Project Monitoring Plan that describes the air sampling procedures and monitoring methods to be employed to ensure compliance of asbestos operations. The plan shall include documentation of the licenses and professional qualifications for the Project Monitor and written certification from the Project Monitor that no conflict of interest exists in performing as an independent third party monitoring the operations of the asbestos removal contractor.

A licensed Project Monitor is not required for removal of non-friable exterior asbestos materials including roofing material, exterior Transite paneling (where panels are removed intact), and window glazing/caulk.

#### 1.18.8.2 Duties of the Project Monitor

The Project Monitor shall ensure that the asbestos removal work is being conducted in compliance with all applicable State and Federal statutes, regulations and standards pertaining to asbestos removal and disposal. The monitor shall be respirator qualified and enter the containment on a regular basis (at least two times per work-shift) to ensure that the contractor work practices and control methods are appropriate. Problems and deficiencies noted shall be brought to the attention of the asbestos removal contractor and, if immediate corrective action is not taken, shall be documented and reported directly to the Contractor's on-site Superintendent.

The Project Monitor shall be on-site and observe all phases of the asbestos removal work including pre-cleaning, removal, bag-out, final cleaning, and teardown of containment following final clearance. The monitor shall ensure that each phase of the work is conducted properly and adequately.

The Project Monitor shall maintain a daily written log describing all contractor activities and work practices. This log shall be available to the Contracting Officer and his/her representatives for review at any time during the progress of the work. A copy of the log shall be submitted to the Contracting Officer for record at the conclusion of the asbestos removal work.

The Project Monitor shall perform air sampling and report test results as specified.

The Project Monitor shall perform a visual inspection in accordance with [ASTM E 1368](#), Standard for Visual Inspection Following Asbestos Abatement Projects, after the asbestos removal contractor completes fine cleaning in each containment or work area. A written inspection report shall be submitted for review by Safety and Facility Assurance Branch (SFAB) Industrial Hygienist prior to encapsulation of the work area and final clearance air sampling. The Contracting Officer may elect to have SFAB Industrial Hygienist accompany the Project Monitor during final visual inspection.

#### 1.18.8.3 Air Sampling

The Contractor shall perform personal (worker breathing zone) air sampling and shall submit the test results promptly (within 2 days of collection) to Safety and Facility Assurance Branch (SFAB) Industrial Hygienist for review. Results shall be faxed to 757-864-9449 or hand delivered to

Building 1232.

Air samples shall be analyzed by Phase Contrast Microscopy by a Virginia Licensed Asbestos Analytical Lab that has successfully participated in the Proficiency Analytical Testing (PAT) Program. Results shall be posted at the job site within 24 hours of sample collection (legible handwritten reports are acceptable). Safety and Facility Assurance Branch (SFAB) Industrial Hygienist shall be notified immediately by the Contractor if any outside work area sample result is

- o 2 inside work area samples
- o 2 negative air exhaust samples
- o 2 clean room samples
- o 2 outside work area environmental samples
- o 2 samples to be placed at the discretion of the Project Monitor
- o Personal air sampling in accordance with 29 CFR 1926.1101

#### 1.18.9 Final Clearance

The Safety and Facility Assurance Branch (SFAB) Industrial Hygienist will conduct air sampling for final clearance. Aggressive sampling techniques (as defined in 40 CFR 763) will be performed in accordance with EPA AHERA Protocols. At the discretion of the SFAB Industrial Hygienist, the air samples will be analyzed by Phase Contrast Microscopy or Transmission Electron Microscopy by a Virginia Licensed Asbestos Analytical Laboratory.

Prior to re-occupancy, Transmission Electron Microscopy samples must average <70 structures/mm<sup>2</sup> or each Phase Contrast Microscopy sample must contain <0.01 fibers/cc.

The first series of samplings and analysis for final clearance will be provided by the Government. If these samples do not meet the specified criteria for re-occupancy, the entire work area shall be re-cleaned and encapsulated by the Contractor at no additional cost to the Government. The work area will then be re-sampled and the cost of retesting additional samples to verify compliance with the specified criteria for re-occupancy shall be paid by the Contractor.

#### 1.19 USE OF EXPLOSIVES

The use of explosives is not permitted.

#### 1.20 FALL PROTECTION (OSHA 29 CFR 1926.501 THROUGH 1926.503)

Fall protection devices and systems shall be in accordance with OSHA 29 CFR 1926 Subpart M - Fall Protection.

The Contractor shall provide fall protection devices and systems for employees in accordance with OSHA 29 CFR 1926.501, when working at a height greater than 6 feet.

Body belts are not acceptable as part of a personal fall arrest system. Personnel shall use a full body harness with shock absorbing lanyard.

#### 1.21 LIFTING OPERATIONS

##### 1.21.1 General

Only capable and experienced riggers and equipment operators shall be

engaged in on-site lifting operations. In establishing the qualification of such riggers and equipment operators, it is essential that such personnel be knowledgeable about and capable of: determining center of gravity (C.G.) of items to be lifted; determining load weights; calculating lifting line strengths and the margins of safety; calculating sling tension loads; using common slings and hitches; selecting proper sizes and the use of chocks; using hydra-sets; using proof loading specifications; use of hand signals; using and determining strength of knots; using and determining strength of shackles/hooks; and the factors causing distortion of loads (blocking). Personnel involved in these operations shall have at least four years of experience in such efforts.

Certification Letter for Operators of Non-Government Owned Lifting Equipment

The Contractor shall provide a certification letter to the Contracting Officer listing all qualified riggers and equipment operators who will be working on-site stating: (1) their years of experience, (2) specialized training, and (3) medical qualifications, (i.e., any visual, hearing, or other physical limitations). This letter shall be submitted to the Contracting Officer prior to on-site lifting operations.

If lifting operations are being conducted in an unskillful manner, the Contracting Officer may, in accordance with FAR Clause 52.236-5, Material and Workmanship, require the Contractor to remove from the work any employee failing to follow appropriate procedures.

#### 1.21.2 Lifting Devices

All Contractor-furnished lifting devices used on-site shall conform to [NASA-STD-8719.9](#), "Standard for Lifting Devices and Equipment", and meet the minimum requirements of the applicable ANSI specifications incorporated in OSHA [29 CFR 1910](#), Occupational Safety and Health Standards, Subpart N, Materials Handling and Storage, and OSHA [29 CFR 1926](#), Safety and Health Regulations for Construction, Subpart N, Cranes, Derricks, Hoists, Elevators, and Conveyors.

All mobile/truck-mounted cranes must have a current annual inspection and "Certification of Load Test". The Certification must be kept on the crane and be made available for inspection by the NASA Inspector or the Safety and Facility Assurance Branch Representative upon request. The Safety and Facility Assurance Branch shall be notified prior to any mobile/truck mounted crane being brought onto LaRC, at 864-6496 or 864-7233. The SFAB Representative shall inspect the crane set-up prior to the lift.

The Contracting Officer may inspect at any time, any or all of the Contractor-furnished lifting devices used on-site. If any of the devices do not meet the above requirements, they will be barred from further use until all necessary repairs have been made and they have been reinspected.

Where cranes and derricks are used in or around high-voltage substations, overhead lines, or exposed energized parts, the operations and equipment shall be in accordance with OSHA Subpart N, Paragraph 1926.550, "Cranes and Derricks."

All lifting equipment shall be effectively grounded when being moved or operated in proximity to energized lines or equipment. Consideration shall also be given to grounding the load, particularly if insulated lifting straps are in use.

Lifting equipment shall be operated with a dedicated observer to warn the

equipment operator of potentially hazardous situations and/or movements.

#### 1.21.3 Guidelines for Proper Use of A-Frame Type Lifting Devices

A-frames shall be positioned directly over the object to be lifted with the lifting line vertical, the hoist-to-object attachment vertical, or the sling vertical.

Lifts shall be performed through the center of gravity of the object to be lifted or lateral movement restraints shall be imposed to maintain the lifting line vertical.

If the lifted object is to be transported by the A-frame, the center of gravity of the object shall be as low as practical and lateral restraints imposed to maintain the lifting line vertical during transport.

At no time during the use of A-frames shall the lifting line be allowed to get outside of the A-frame base dimensions.

- o A-frames shall be marked with their load capacity rating.
- o A-frames shall be constrained to a 2.5 to 1 height-to-base ratio, to allow the lifting line to be approximately 11 degrees from vertical before an unsafe condition could occur.
- o A-frame base support devices shall be provided for A-frames with wheels, to preclude overturn due to the loss of a wheel when lifting its rated load.

#### 1.21.4 Certification of Qualified Operators of Government Owned Lifting Equipment

Prior to using Government owned lifting equipment, all qualified operators shall be certified in accordance with LPR 1740.6, Chapter 8 (Hardware Handler). The Contractor shall submit a list of qualified operators as defined in this section to the Safety and Facility Assurance Branch (SFAB) by calling 864-6496 or 864-7233 to be scheduled for NASA safety training and examination in the use of lifting equipment.

Following the 2-hour training session and successful completion of a written exam, the qualified operators shall be scheduled for a visual and hearing acuity examination by the Contractor, and checked out on the specific equipment to be used, by a NASA Facility Safety Head or designee.

##### Certification Letter for Operators of Government Owned Lifting Equipment

The Contractor shall provide a certification letter to the Contracting Officer stating: (1) the names of the qualified operators, (2) the date of their NASA safety training, and (3) confirmation of their passing the written examination, visual and hearing acuity examination, and having been checked-out on the specific equipment. This letter shall be submitted to the Contracting Officer prior to on-site lifting operations.

#### 1.22 ACCIDENTS AND SAFETY RELATED INCIDENTS

##### 1.22.1 Emergency Response and First Aid Facilities

Contractor employees working onsite may use the Occupational Medical Center for emergency first aid. This facility is located in Building 1149 at 10 West Taylor Street. The telephone number is 864-3196.

To facilitate the rapid notification of emergency responders in the event of a fire, injury or other hazardous conditions, it is recommended the Contractor have a telephone available at the job site.

Emergency response may be obtained by dialing 911 from any Center telephone or by dialing 864-2222 from cellular telephones.

The Contractor shall assure that its personnel are aware of these emergency first aid and emergency response services and shall post the above information conspicuously at the job site.

#### 1.22.2 Accident Reporting

Accidents shall be reported to the Safety and Facility Assurance Branch at 864-7233 as soon as possible. A written report of the accident shall be filed with the Safety and Facility Assurance Branch within 3 working days after the accident.

All near miss/close call accidents occurring on the Center involving NASA property or equipment shall immediately be reported to the Safety and Facility Assurance Branch at 864-7233.

A near miss/close call accident is defined as a work-related accident that could have caused an injury or property/equipment damage.

#### 1.22.3 Hazard Identification and Tracking

Contractor shall have a system for initiating and tracking hazard identification and corrective action. The system shall: (1) track all hazards identified through inspections, investigations, employee reports/notification, surveys, near misses/close calls, etc.; (2) interim measures to protect employees and the environment from the identified hazard until permanent action is completed; and (3) the final corrective action taken to eliminate the identified hazard.

The records shall include as a minimum a description of the identified hazard; date, time, and location the hazard was identified; hazard abatement plan/interim measures if unable to eliminate the hazard immediately; and the final corrective action taken to eliminate the identified hazard, including the date. Upon imminent danger conditions, personnel shall be removed from exposure and the supervisor shall be immediately contacted. Corrective actions shall be taken to ensure safe conditions are in place prior to continuing operations.

#### 1.23 DISPOSAL OF HAZARDOUS WASTE MATERIAL

Disposal of hazardous waste shall be conducted in accordance with Resource Conservation Recovery Act (RCRA) and Federal regulations, State regulations (9 VAC 20-60), and LPR 8800.1, Chapter 5 (Environmental Program Manual). The Government will be responsible for disposal of all hazardous/regulated waste. Any waste generated by the Contractor at the construction site shall be reported to the Contracting Officer to determine if the waste is regulated or hazardous. The Contractor shall not generate hazardous/regulated waste until it has received written approval and been informed of all applicable regulations concerning the waste generated, by the Environmental Management Branch (EMB), Center Operations Directorate (COD). The Contractor will be audited by the EMB to assure that all RCRA regulations and proper hazardous waste practices are being followed.

Contractor shall take appropriate actions to assure compliance with all Hazardous Waste regulations. The Contracting Officer shall be advised of all waste disposal practices at the construction site and will be the liaison between EMB and the Contractor. The Contractor shall remove all mercury containing devices (such as switches, relays, gauges, used fluorescent light bulbs, and ballasts) from any electrical/mechanical equipment prior to transporting off LaRC property. EMB will provide labeled containers for accumulation and pickup of devices.

Disposal of hazardous waste into the storm or sanitary sewer is prohibited at all times. Disposal of non-hazardous wastes into sewer systems is authorized only after approval by the Contracting Officer. A permit issued by EMB is required before these waste practices can be permitted. The permit form is Attachment 2, [Sewer Disposal Permit](#), to this section.

#### 1.24 PERSONAL PROTECTIVE EQUIPMENT

Protective equipment, including personal protective equipment for eyes, face, head, and extremities, protective clothing, respiratory devices, and protective shields and barriers, shall be provided, used, and maintained in accordance with OSHA [29 CFR 1926](#), Safety and Health Regulations for Construction, Subpart E, Personal Protective and Life Saving Equipment, wherever it is necessary by reason of hazards, processes, environment, chemical hazards, radiological hazards, or mechanical irritants encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation or physical contact. See Paragraph 1.7.3.2 of this Section for additional information about Personal Protective Equipment (PPE) for electrical work.

#### 1.25 SIGNS, SIGNALS AND BARRICADES

##### 1.25.1 Accident Prevention Signs

Contractor shall place signs at locations where hazards exist, as described below. These signs shall be visible at all times when work is being performed and shall be removed or covered promptly when the hazard(s) no longer exists. (OSHA [29 CFR 1926.200](#))

Danger signs shall be used where an immediate hazard exists. Caution signs shall be used to warn against potential hazards or to caution against unsafe practices.

Safety instruction signs shall be used to identify safety requirements relating to the work (e.g., Hard Hats Area, Eye and Hearing Protection Required). Contractor shall post construction areas with legible traffic signs at points of hazard. All traffic control signs or devices used for protection of construction workers shall conform to [AASHTO MUTCD-1](#), Manual on Uniform Traffic Control Devices.

##### 1.25.2 Signaling

When operations are such that signs, signals, and barricades do not provide the necessary protection on or adjacent to a roadway, flagmen or another appropriate traffic control shall be provided. Signaling directions by flagmen shall conform to [AASHTO MUTCD-1](#), Manual on Uniform Traffic Control Devices.

### 1.25.3 Barricades

Barricades shall be used to deter the passage of persons or vehicles from a hazard, such as openings in walls, floors and roof edges. Barricades shall conform to the portions of [AASHTO MUTCD-1](#), Manual on Uniform Traffic Control Devices, relating to barricades. (OSHA [29 CFR 1926.202](#))

### 1.26 HAND AND POWER TOOLS

All hand and power tools and similar equipment shall be maintained in a safe condition. When power operated tools are designed to accommodate guards, they shall be equipped with such guards when in use.

Belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains, or other reciprocating, rotating or moving parts of equipment shall be guarded if such parts are exposed to contact by employees or otherwise create a hazard. Guarding shall meet the requirements as set forth in [ASME B15.1](#), Safety Standard for Mechanical Power Transmission.

The use of hand and power tools shall be in accordance with OSHA [29 CFR 1926](#) Subpart I - Tools - Hand and Power.

### 1.27 SCAFFOLDING

All scaffolding activities shall be in accordance with OSHA [29 CFR 1926](#) Subpart L - Scaffolds.

#### 1.27.1 Aerial Lifts

Aerial lifts acquired for use on or after January 22, 1973, shall be designed and constructed in accordance with the applicable requirements of the American National Standards, [ANSI/SIA A92.2-2002](#), for "Vehicle Mounted Elevating and Rotating Work Platforms." Aerial lifts acquired before January 22, 1973, which do not meet the requirements of [ANSI/SIA A92.2-2002](#), may not be used, unless they have been modified to conform to the applicable design and construction requirements of [ANSI/SIA A92.2-2002](#). A fall arrest system shall be used in accordance with OSHA [29 CFR 1910.66\(j\)](#).

All aerial lifts shall be in accordance with OSHA [29 CFR 1926.453](#).

### 1.28 STEEL ERECTION

All steel erection activities shall be in accordance with OSHA [29 CFR 1926](#) Subpart R - Steel Erection.

### 1.29 CONCRETE AND MASONRY CONSTRUCTION

All concrete and masonry construction shall be in accordance with OSHA [29 CFR 1926](#) Subpart Q - Concrete and Masonry Construction.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

-- End of Section --

Safety Program Guide  
Items That Must Be Addressed  
(Unless Totally Inapplicable) On All Safety Plans

Contract Identification - Job title and contract number and a brief summary and scope of the work. The safety representative shall be identified.

Policy - Provide Company's safety policy statement with the plan. (Required per Appendix E of NPR 8715.3B, "NASA Safety Manual.")

Goals and Objectives - Describe specific goals and objectives to be met. Describe the contractor's approach (including milestone schedule) to achieve and maintain level 5 of the NASA Performance Evaluation Profile in all areas. (Required per Appendix E of NPR 8715.3B, "NASA Safety Manual.")

Management Leadership - Describe management's procedures for implementing its commitment to safety and health through visible management activities and initiatives including a commitment to the exercise of management control to ensure work place safety and health. Describe processes and procedures for making this visible in all contract and subcontract activities and products. Include a statement from the project manager or designated safety official indicating that the plan will be implemented as approved and that the project manager will take personal responsibility for its implementation. (Required per Appendix E of NPR 8715.3B, "NASA Safety Manual.")

Employee Involvement - Describe procedures to promote and implement employee (e.g., non-supervisory) involvement in safety and health program development, implementation, and decision-making. Describe the scope and breadth of employee participation to be achieved so that approximate safety and health risk areas of the contract are equitably represented. (Required per Appendix E of NPR 8715.3B, "NASA Safety Manual.")

Assignment of Responsibility - Describe line and staff responsibilities for safety and health program implementation. Identify any other personnel or organization that provides safety services or exercises any form of control or assurance in these areas. State the means of communication and interface concerning related issues used by line, staff, and others (such as documentation, concurrence requirements, committee structure, sharing of the work site with NASA and other contractors, or other special responsibilities and support). As a minimum, the contractor will identify the following, as required per Appendix E of NPR 8715.3B, "NASA Safety Manual":

- a. Safety Representative - Identify by title the individual who will be responsible for the contractor's adherence to Center-wide safety, health, environmental and fire protection concerns and goals, and who will participate in meetings and other activities related to the Center's safety and Health program.
- b. Company Physician - The contractor shall identify their company physician, including name, address and telephone number.

Notice of Violations - The prime contractor shall respond to any Notice of Violation (NOV) issued to them or their subcontractors within 3 working days from issuance. This response shall be provided to the issuer of the NOV.

Accountability - Describe procedures for ensuring that management and employees will be held accountable for implementing their tasks in a safe and healthful manner. (Required per Appendix E of NPR 8715.3B, "NASA Safety Manual.")

Voluntary Protection Program (VPP) - The contractor shall explain its approach to comply with the elements of the VPP while working on LaRC, which is a designated VPP Star site. This approach shall include, but is not limited to logs, records, minutes, procedures, checklists, statistics, reports, analyses, notes, or other written or electronic documentation that contains in whole or in part any subject matter pertinent to safety, health, environmental protection, or emergency preparedness. (Required per Appendix E of NPR 8715.3B, "NASA Safety Manual.")

Workplace Analysis - Describe the method by which hazards, within the contractor's workplace, shall be systematically identified. The identified method shall explain the information collection process through a combination of survey analyses, inspections of the workplace, investigations of mishaps and close calls, and the collection and trend analysis of safety and health data such as: records of occupational injuries and illnesses; reports of spills and inadvertent releases to the environment, facility related incidents, employee reports of hazards. (Required per Appendix E of NPR 8715.3B, "NASA Safety Manual.")

Hazard Identification - Describe the procedures and techniques to be used to compile an inventory of hazards associated with the work to be performed on the contract. This inventory of hazards shall address the work specified in the contract, as well as, operations and work environments, which are performed in the vicinity or in close proximity to contract operations.

(Required per Appendix E of NPR 8715.3B, "NASA Safety Manual.")

Employee Reports of Hazards - Identification of methods to encourage employee reports of hazardous conditions (e.g., close calls) and analyze/abate hazards. The contractor shall describe steps it will take to create reprisal-free employee reporting with emphasis on management support for employees and describe methods to be used to incorporate employee insights into hazard abatement and motivation/awareness activities. (Required per Appendix E of NPR 8715.3B, "NASA Safety Manual.")

Inspections - The contract shall include requirements for assignments, procedures and frequency for regular inspections and evaluation of work areas for hazards and accountability for implementation of corrective measures. (Required per Appendix E of NPR 8715.3B, "NASA Safety Manual.")

Accident Reporting - All serious accidents shall be reported (as soon as possible) to the Safety and Facility Assurance Office at 864-7233. A written report of the accident shall be filed with the Safety and Facility Assurance Office within 3 working days after the accident. (Required per Appendix E of NPR 8715.3B, "NASA Safety Manual.")

Recordkeeping - The Contractor shall maintain the appropriate records concerning accidents and injuries, in accordance with OSHA 29 CFR 1904. (Required per Appendix E of NPR 8715.3B, "NASA Safety Manual.")

Mishap Investigation - Identification of methods to assure the reporting and investigation of mishaps including corrective actions implemented to prevent recurrence. The contractor shall describe the methods to be used to report and investigate mishaps on NASA property and on contractor or third party property. The contractor shall discuss its procedures for immediate notification requirements for fires, hazardous materials spills and releases and other emergencies. (Required per Appendix E of NPR 8715.3B, "NASA Safety Manual.")

Hazard Prevention and Control - Describe approach to identify, control and/or eliminate hazards in the work place. (Required per Appendix E of NPR 8715.3B, "NASA Safety Manual.")

Hazardous Operations - Identify hazardous operations to be performed and written procedures developed to ensure the safety and health of employees while performing them. (Required per Appendix E of NPR 8715.3B, "NASA Safety Manual.")

Flammable Liquid Storage Containers - Flammable liquids shall only be stored in "approved" flammable liquid safety cans that have self-closing spouts.

NASA LaRC Lockout/Tagout System - All contractors/subcontractors shall comply with the NASA LaRC Lockout/Tagout system when performing work on-site, as described in LPR 1710.10, "Safety Clearance Procedures (Lockout/Tagout). Under no circumstances shall a NASA LaRC Lockout/Tagout device be violated.

Safety Regulations - In addition to OSHA and Federal Regulations, the Contractor shall adhere to all applicable State, Local and Langley Research Center Safety Regulations. (Required per Appendix E of NPR 8715.3B, "NASA Safety Manual.")

Confined Space Entry - Confined spaces shall not be entered until a Confined Space Entry Permit has been obtained. The Contractor shall have personnel trained in confined space entry, shall provide the permit and conduct initial and hourly readings as required by OSHA 29 CFR 1910.146.

Crane Certification - All mobile/truck-mounted cranes shall have a current "Annual Certification of Load Test". The Certification shall be kept on the crane and be made available for inspection by the NASA Inspector or the Safety and Facility Assurance Office Representative upon request. The Safety and Facility Assurance Office shall be notified immediately when any mobile/truck mounted crane is brought onto the Center, at 864-5594 or 864-7233.

Scaffolding - When scaffolding is required, it shall be designed, constructed and assembled in accordance with OSHA 29 CFR 1926.450 through 454.

Excavations and Trenching - Surface penetrations of 6 inches or more require a "Digging Permit" and shall follow all applicable standards under OSHA 1926.650-652.

Material Safety Data Sheets (MSDS) - A MSDS shall be available for each chemical, oil, lubricant, solvent, etc., used on the job-site. (Required per Appendix E of NPR 8715.3B, "NASA Safety Manual.")

Fall Protection - When fall protection is required, the Contractor shall comply with OSHA 29 CFR 1926.500 through 1926.503, which defines the types of fall protection devices and systems. Personnel shall use a full body harness with shock absorbing lanyard.

Extension Cords and Ground Fault Protection - All extension cords shall be the three wire grounded type and be in good working order (No broken or missing pins). Extension cords or other temporary wiring shall be protected by a Ground Fault Interrupt (GFI) device.

Subcontractor Compliance - All subcontractors shall comply with the Prime Contractor's Safety Plan.

Safety Meetings - The Contractor shall hold weekly safety meetings.

Hazardous Communications Program - The Contractor shall furnish a copy of his hazardous communications program as defined in CFR 29 Part 1910.1200.

Floors, Openings, Etc. - Unprotected openings in walls, floors or roof edges shall be guarded using standard handrails, barricades, or equivalent protection.

Steel Erection - When steel erection is required, it shall be performed in accordance with OSHA 29 CFR 1926.750 through 1926.752.

Personal Protective Equipment - When required, the appropriate PPE shall be used in accordance with OSHA 29 CFR 1926 Subpart E.

Hot Work Permit - Hot Work will not be permitted until a Hot Work Permit has been issued by the Fire Department, approved and posted. Deviations or waivers from this and must be presented to the LaRC Fire Chief, in writing, for review and consideration. Only the LaRC Fire Chief can grant deviation or waiver approval.

Appendix E, NPR 8715.3B, "NASA Safety Manual" may be viewed at:  
[http://nodis3.gsfc.nasa.gov/library/displayDir.cfm?Internal\\_ID=N\\_PG\\_8715\\_0003B\\_&page\\_name=AppendixE](http://nodis3.gsfc.nasa.gov/library/displayDir.cfm?Internal_ID=N_PG_8715_0003B_&page_name=AppendixE)

SEWER DISPOSAL PERMIT

PART ONE (TO BE COMPLETED BY REQUESTOR)

- 1. Name of material\_\_\_\_\_
- 2. Quantity\_\_\_\_\_
- 3. Date(s) of proposed disposal\_\_\_\_\_
- 4. Analytical Data: MSDS\_\_\_ Laboratory Analysis\_\_\_ Attached\_\_\_ (Check at least one)
- 5. Sanitary Sewer\_\_\_\_\_ Storm Sewer\_\_\_\_\_
- 6. Signature of Requestor\_\_\_\_\_
- 7. Organization\_\_\_\_\_
- 8. Date\_\_\_\_\_

PART TWO (TO BE COMPLETED BY THE ENVIRONMENTAL MANAGEMENT BRANCH)

Authorization for disposal of the material described above is granted. Any deviation invalidates this permit.

\_\_\_\_\_  
Environmental Management Branch

\_\_\_\_\_  
Date

### Contractor Safety and Health Log

<i>Reporting for Fiscal Year _____</i>	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	FY Totals
Hours Worked													
Recordable Injuries or Illnesses													
Days Away from Work Cases													

Project: \_\_\_\_\_  
 Contract Number: \_\_\_\_\_  
 Contractor: \_\_\_\_\_

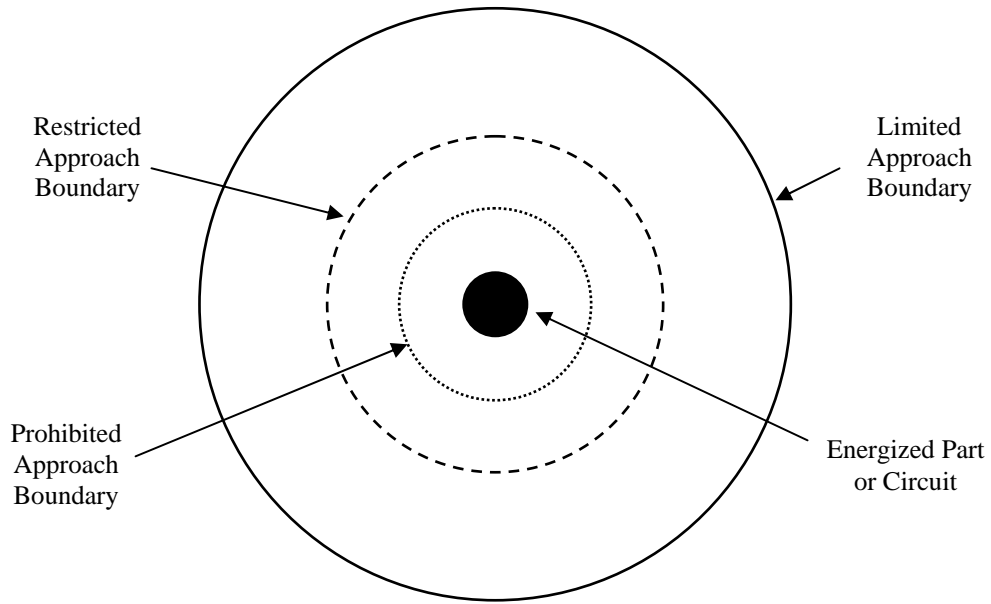
Data recorded on this form applies to onsite work performed by employees of the contractor and subcontractors associated with the above contract number.

Days Away from Work Cases = Number of Recordable Injuries or Illnesses Involving Days Away from Work, Restricted Work Activity, and/or Job Transfer.

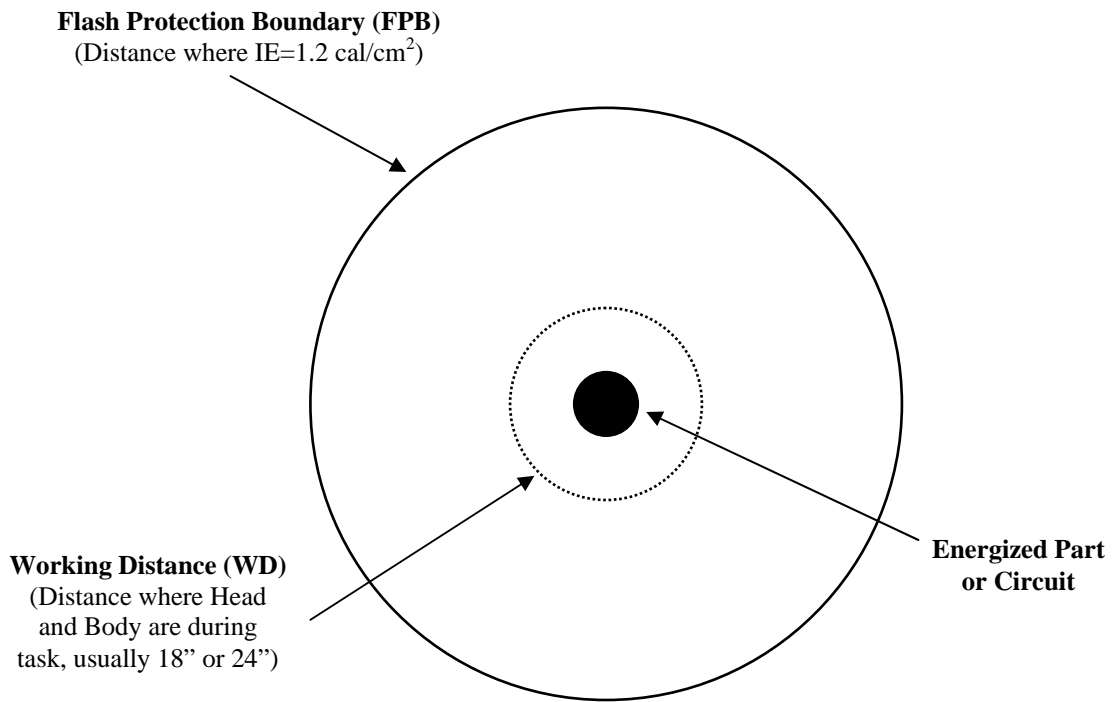
See the following OSHA Regulation for criteria of Recordable Injury or Illness and Days Away from Work.

[OSHA Regulations \(Standards - 29 CFR\)](#)

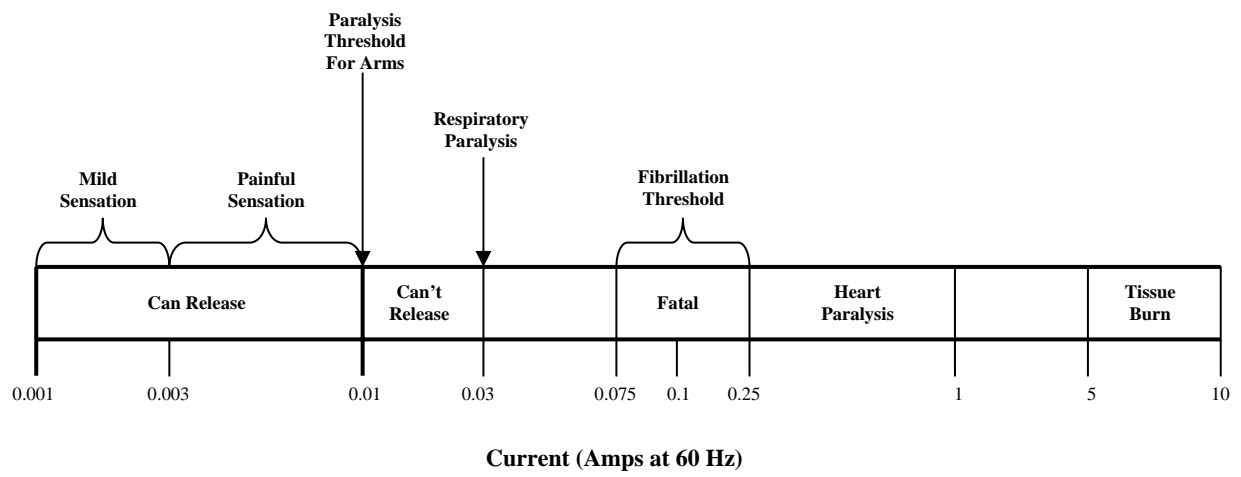
[PART 1904 Recording and Reporting Occupational Injuries and Illness](#)



**Figure – Boundaries for Shock Hazard Protection Based on System Voltage Levels**  
(Attachment 5)



**Figure – Boundaries for Arc-Flash Protection Based on Arc Flash Incident Energy Levels**  
(Attachment 6)



**Figure – Effects of Current on Average Human**  
(Attachment 7)

SECTION TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01 42 00

SOURCES FOR REFERENCE PUBLICATIONS

PART 1 GENERAL

1.1 REFERENCES

1.2 ORDERING INFORMATION

-- End of Section Table of Contents --

## SECTION 01 42 00

## SOURCES FOR REFERENCE PUBLICATIONS

## PART 1 GENERAL

## 1.1 REFERENCES

Various publications are referenced in other sections of the specifications to establish requirements for the work. These references are identified in each section by document number, date and title. The document number used in the citation is the number assigned by the standards producing organization, (e.g., ASTM B 564 Nickel Alloy Forgings). However, when the standards producing organization has not assigned a number to a document, an identifying number has been assigned for reference purposes.

## 1.2 ORDERING INFORMATION

The addresses of the standards publishing organizations whose documents are referenced in other sections of these specifications are listed below, and if the source of the publications is different from the address of the sponsoring organization, that information is also provided. Documents listed in the specifications with numbers which were not assigned by the standards producing organization should be ordered from the source by title rather than by number.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS  
(AASHTO)

444 North Capital Street, NW, Suite 249  
Washington, DC 20001  
Ph: 202-624-5800  
Fax: 202-624-5806  
E-Mail: [info@ashto.org](mailto:info@ashto.org)  
Internet: <http://www.aashto.org>

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

1819 L Street, NW, 6th Floor  
Washington, DC 20036  
Ph: 202-293-8020  
Fax: 202-293-9287  
E-mail: [info@ansi.org](mailto:info@ansi.org)  
Internet: <http://www.ansi.org/>

ASME INTERNATIONAL (ASME)

Three Park Avenue, M/S 10E  
New York, NY 10016  
Ph: 212-591-7722 or 800-843-2763  
Fax: 212-591-7674  
E-mail: [infocentral@asme.org](mailto:infocentral@asme.org)  
Internet: <http://www.asme.org>

ASTM INTERNATIONAL (ASTM)

100 Barr Harbor Drive, P.O. Box C700  
West Conshohocken, PA 19428-2959  
Ph: 610-832-9500

Fax: 610-832-9555  
E-mail: [service@astm.org](mailto:service@astm.org)  
Internet: <http://www.astm.org>

ELECTRONIC INDUSTRIES ALLIANCE (EIA)  
2500 Wilson Boulevard  
Arlington, VA 22201-3834  
Ph: 703-907-7500  
Fax: 703-907-7501  
Internet: <http://www.eia.org>

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)  
445 Hoes Lane  
Piscataway, NJ 08855-1331  
Ph: 732-981-0060  
Fax: 732-981-1712  
E-mail: [customer-services@ieee.org](mailto:customer-services@ieee.org)  
Internet: <http://www.ieee.org>

INTERNATIONAL CODE COUNCIL (ICC)  
5360 Workman Mill Road  
Whittier, CA 90601  
Ph: 562-699-0541  
Fax: 562-699-9721  
E-mail: [webmaster@iccsafe.org](mailto:webmaster@iccsafe.org)  
Internet: [www.iccsafe.org](http://www.iccsafe.org)

LANGLEY RESEARCH CENTER (LaRC)  
100 Nasa Road  
Hampton, VA 23681-2199  
Ph: 757-864-1000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)  
Publication(s) Available From  
Superintendent of Documents  
U.S. Government Printing Office  
Washington, DC 20402  
Ph: 202-783-3238

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)  
1300 North 17th Street, Suite 1752  
Rosslyn, VA 22209  
Ph: 703-841-3200  
Fax: 703-841-5900  
E-mail: [webmaster@nema.org](mailto:webmaster@nema.org)  
Internet: <http://www.nema.org/>

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)  
1 Batterymarch Park  
Quincy, MA 02169-7471  
Ph: 617-770-3000  
Fax: 617-770-0700  
E-mail: [webmaster@nfpa.org](mailto:webmaster@nfpa.org)  
Internet: <http://www.nfpa.org>

STATE OF VIRGINIA ADMINISTRATIVE CODE (VAC)  
Virginia Code Commission  
General Assembly Building, 2nd Floor  
910 Capitol Street

Richmond, Virginia 23219  
Ph: 804-786-3591  
Fax: 804-692-0625  
Internet: <http://leg1.state.va.us/000/srr.htm>

UNDERWRITERS LABORATORIES (UL)  
333 Pflingsten Road  
Northbrook, IL 60062-2096  
Ph: 847-272-8800  
Fax: 847-272-8129  
E-mail: [customerexperiencecenter@us.ul.com](mailto:customerexperiencecenter@us.ul.com)  
Internet: <http://www.ul.com/>

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)  
8601 Adelphi Road  
College Park, MD 20740-6001  
Ph: 866-272-6272  
Fax: 301-837-0483  
Internet: <http://www.archives.gov>

Order documents from:  
Superintendent of Documents  
U.S. Government Printing Office (GPO)  
732 North Capitol Street, NW  
Washington, DC 20401  
Ph: 202-512-1800  
Fax: 202-512-2104  
E-mail: [contactcenter@gpo.gov](mailto:contactcenter@gpo.gov)  
Internet: <http://www.gpoaccess.gov>

-- End of Section --

## SECTION TABLE OF CONTENTS

## DIVISION 26 - ELECTRICAL

## SECTION 26 00 00.00 20

## BASIC ELECTRICAL MATERIALS AND METHODS

## PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 RELATED REQUIREMENTS
- 1.3 DEFINITIONS
- 1.4 ELECTRICAL CHARACTERISTICS
- 1.5 QUALITY ASSURANCE
  - 1.5.1 Regulatory Requirements
  - 1.5.2 Standard Products
    - 1.5.2.1 Alternative Qualifications
    - 1.5.2.2 Material and Equipment Manufacturing Date
- 1.6 WARRANTY
- 1.7 MANUFACTURER'S NAMEPLATE
- 1.8 FIELD FABRICATED NAMEPLATES
- 1.9 ELECTRICAL REQUIREMENTS AND ARC FLASH LABELS

## PART 2 PRODUCTS

- 2.1 FACTORY APPLIED FINISH

## PART 3 EXECUTION

- 3.1 FIELD APPLIED PAINTING
- 3.2 FIELD FABRICATED NAMEPLATE MOUNTING

-- End of Section Table of Contents --

## SECTION 26 00 00.00 20

## BASIC ELECTRICAL MATERIALS AND METHODS

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

## ASTM INTERNATIONAL (ASTM)

**ASTM D 709** (2001; R 2007) Laminated Thermosetting Materials

## INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

**IEEE Std 100** (2000) The Authoritative Dictionary of IEEE Standards Terms

## NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

**NEMA 250** (2008) Enclosures for Electrical Equipment (1000 Volts Maximum)

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

**NFPA 70** (2008; AMD 1 2008) National Electrical Code - 2008 Edition

## 1.2 RELATED REQUIREMENTS

This section applies to certain sections of Divisions 22 and 23, PLUMBING and HEATING VENTILATING AND AIR CONDITIONING. This section applies to all sections of Division 26, ELECTRICAL, of this project specification unless specified otherwise in the individual sections.

## 1.3 DEFINITIONS

- a. Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, shall be as defined in **IEEE Std 100**.
- b. The technical sections referred to herein are those specification sections that describe products, installation procedures, and equipment operations and that refer to this section for detailed description of submittal types.
- c. The technical paragraphs referred to herein are those paragraphs in PART 2 - PRODUCTS and PART 3 - EXECUTION of the technical sections that describe products, systems, installation procedures, equipment, and test methods.

#### 1.4 ELECTRICAL CHARACTERISTICS

Electrical characteristics for this project shall be 480/277V (panel P-200) three phase, four wire, 60 Hz, and 208/120V (panels L-300 and L-600) three phase, four wire. Final connections to the power distribution system at the existing electrical panelboards shall be made by the Contractor as directed by the Contracting Officer.

#### 1.5 QUALITY ASSURANCE

##### 1.5.1 Regulatory Requirements

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

##### 1.5.2 Standard Products

Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in the technical section.

##### 1.5.2.1 Alternative Qualifications

Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.

##### 1.5.2.2 Material and Equipment Manufacturing Date

Products manufactured more than 3 years prior to date of delivery to site shall not be used, unless specified otherwise.

#### 1.6 WARRANTY

The equipment items shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

#### 1.7 MANUFACTURER'S NAMEPLATE

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be

acceptable.

#### 1.8 FIELD FABRICATED NAMEPLATES

In addition to standard manufacturer's identification plates, engraved laminated plastic identification plates shall be provided for each electrical equipment connection. Identification plates shall designate the function and rating of the equipment, unit number and the electrical circuit feeder source.

The Contractor shall furnish and install a laminated nameplate on the tank-less water heater that reads:

##### **TANKLESS WATER HEATER-208 VOLT SINGLE PHASE**

**WARNING: THIS WATER HEATER IS POWERED FROM THREE (3) INDIVIDUAL CIRCUIT BREAKERS (L-623, L-627, AND L-631). ALL OF THESE CIRCUIT BREAKERS SHALL BE OPENED AND LOCKOUT-TAGOUT (LOTO) APPLIED PRIOR TO WORKING ON THE HEATER.**

Example for Air Compressor disconnect switch identification plate:

Air Compressor  
480V, 3 0, 60 Hz  
Fed from panel P-200 breaker #21

**ASTM D 709.** Provide laminated plastic nameplates for each equipment enclosure, relay, switch, and device; as specified in the technical sections or as indicated on the drawings. Each nameplate inscription shall identify the function and, when applicable, the position. Nameplates shall be melamine plastic, 0.125 inch thick, 2 layer, black with white center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be one by 2.5 inches. Lettering shall be a minimum of 0.25 inch high normal block style.

#### 1.9 ELECTRICAL REQUIREMENTS AND ARC FLASH LABELS

Electrical installations shall conform to **NFPA 70**, and requirements specified herein.

Arc flash labels as provided by the Contracting Officer shall be installed on panels and safety disconnect switches of electrical equipment with operating voltage greater than 120VAC.

### PART 2 PRODUCTS

#### 2.1 FACTORY APPLIED FINISH

Electrical equipment shall have factory-applied painting systems which shall, as a minimum, meet the requirements of **NEMA 250** corrosion-resistance test and the additional requirements specified in the technical sections.

### PART 3 EXECUTION

#### 3.1 FIELD APPLIED PAINTING

Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria. Painting shall be

as specified in the section specifying the associated electrical equipment.

### 3.2 FIELD FABRICATED NAMEPLATE MOUNTING

Provide number, location, and letter designation of nameplates as indicated. Fasten nameplates to the device with a minimum of two sheet-metal screws or two rivets.

-- End of Section --

## SECTION TABLE OF CONTENTS

## DIVISION 26 - ELECTRICAL

## SECTION 26 05 00.00 40

## COMMON WORK RESULTS FOR ELECTRICAL

## PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 PREVENTION OF CORROSION
- 1.4 GENERAL REQUIREMENTS

## PART 2 PRODUCTS

- 2.1 MATERIALS
  - 2.1.1 Rigid Steel Conduit
  - 2.1.2 Electrical Metallic Tubing (EMT)
  - 2.1.3 Flexible Metallic Conduit
  - 2.1.4 Rigid Nonmetallic Conduit
  - 2.1.5 Wireways and Auxiliary Gutters
  - 2.1.6 Surface Raceways and Assemblies
- 2.2 WIRE AND CABLE
- 2.3 SPLICES AND CONNECTORS
- 2.4 SWITCHES
  - 2.4.1 Safety Switches
  - 2.4.2 Toggle Switches
- 2.5 RECEPTACLES
- 2.6 OUTLETS, OUTLET BOXES, AND PULL BOXES
- 2.7 CIRCUIT BREAKERS
- 2.8 LAMPS AND LIGHTING FIXTURES

## PART 3 EXECUTION

- 3.1 CONDUITS, RACEWAYS AND FITTINGS
  - 3.1.1 Rigid Steel Conduit
  - 3.1.2 Electrical Metallic Tubing (EMT)
  - 3.1.3 Flexible Metallic Conduit
  - 3.1.4 Rigid Nonmetallic Conduit
  - 3.1.5 Wireway and Auxiliary Gutter
  - 3.1.6 Surface Raceways and Assemblies
- 3.2 WIRING
- 3.3 SAFETY SWITCHES
- 3.4 WIRING DEVICES
  - 3.4.1 Wall Switches and Receptacles
  - 3.4.2 Device Plates
- 3.5 BOXES AND FITTINGS
- 3.6 LAMPS AND LIGHTING FIXTURES
- 3.7 PAINTING
- 3.8 FIELD TESTING

-- End of Section Table of Contents --



## SECTION 26 05 00.00 40

## COMMON WORK RESULTS FOR ELECTRICAL

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## ELECTRONIC INDUSTRIES ALLIANCE (EIA)

EIA 480 (1981) Toggle Switches

## INTERNATIONAL CODE COUNCIL (ICC)

ICC A117.1 (2003; R 2004) Standard for Accessible and Usable Buildings and Facilities

## NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA FB 1 (2007) Standard for Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable

NEMA KS 1 (2001; R 2006) Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)

NEMA OS 1 (2008) Standard for Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports

NEMA TC 2 (2003) Standard for Electrical Polyvinyl Chloride (PVC) Tubing and Conduit

NEMA TC 3 (2004) Standard for Polyvinyl Chloride PVC Fittings for Use With Rigid PVC Conduit and Tubing

NEMA WD 1 (1999; R 2005) Standard for General Requirements for Wiring Devices

NEMA WD 6 (2002; R 2008) Standard for Wiring Devices - Dimensional Requirements

NEMA Z535.1 (2006) Standard for Safety Colors

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2008; AMD 1 2008) National Electrical Code - 2008 Edition

## UNDERWRITERS LABORATORIES (UL)

UL 1	(2005; Rev thru Jul 2007) Standard for Flexible Metal Conduit
UL 489	(2009) Standard for Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
UL 6	(2007) Standard for Electrical Rigid Metal Conduit-Steel
UL 797	(2007) Standard for Electrical Metallic Tubing -- Steel
UL 870	(1995; Rev thru Jul 2003) Standard for Wireways, Auxiliary Gutters, and Associated Fittings

## 1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

## SD-03 Product Data

Submit manufacturer's catalog data for the following items:

Conduits, Raceway and Fittings  
Wire and Cable  
Splices and Connectors  
Switches  
Receptacles  
Outlets, Outlet Boxes, and Pull Boxes  
Circuit Breakers  
Lamps and Lighting Fixtures  
Camera Equipment and Accessories (see Drawing 1263274)

## SD-06 Test Reports

Continuity Test  
Phase-Rotation Tests  
Insulation Resistance Test

## SD-08 Manufacturer's Instructions

Material, Equipment, and Fixture Lists.  
Submit Manufacturer's Instructions.  
Camera Equipment and Accessories

## 1.3 PREVENTION OF CORROSION

Protect metallic materials against corrosion. Provide equipment enclosures with the standard finish by the manufacturer when used for most indoor installations. Do not use aluminum when in contact with earth or concrete and, where connected to dissimilar metal, protect by approved fittings and treatment. Ferrous metals such as, but not limited to, anchors, bolts, braces, boxes, bodies, clamps, fittings, guards, nuts, pins, rods, shims, thimbles, washers, and miscellaneous spare parts not of corrosion-resistant

steel shall be hot-dip galvanized except where other equivalent protective treatment is specifically approved in writing.

#### 1.4 GENERAL REQUIREMENTS

Submit [Material, Equipment, and Fixture Lists](#) for the following items showing manufacturer's style or catalog numbers, specification and drawing reference numbers, warranty information, and fabrication site.

Submit [Manufacturer's Instructions](#) including special provisions required to install equipment components and system packages. Special notices shall detail impedances, hazards and safety precautions.

### PART 2 PRODUCTS

#### 2.1 MATERIALS

Materials and equipment to be provided shall be the standard cataloged products of manufacturers regularly engaged in the manufacture of the products.

##### 2.1.1 Rigid Steel Conduit

Rigid steel conduit shall comply with [UL 6](#) and be galvanized by the hot-dip process.

Fittings for rigid steel conduit shall be threaded.

Gaskets shall be solid. Conduit fittings with blank covers shall have gaskets, except in clean, dry areas.

Covers shall have captive screws and be accessible after the work has been completed.

##### 2.1.2 Electrical Metallic Tubing (EMT)

EMT shall be in accordance with [UL 797](#) and be zinc coated steel. Couplings and connectors shall be zinc-coated, raintight, gland compression with insulation throat. Crimp, spring, or setscrew type fittings are not acceptable.

##### 2.1.3 Flexible Metallic Conduit

Flexible metallic conduit shall comply with [UL 1](#) and be galvanized steel.

Fittings for flexible metallic conduit shall be specifically designed for such conduit.

Provide liquidtight flexible metallic conduit with a protective jacket of PVC extruded over a flexible interlocked galvanized steel core to protect wiring against moisture, oil, chemicals, and corrosive fumes.

Specifically design fittings for liquidtight flexible metallic conduit for such conduit.

##### 2.1.4 Rigid Nonmetallic Conduit

Rigid nonmetallic conduit shall comply with [NEMA TC 2](#) and [NEMA TC 3](#) with wall thickness not less than Schedule 40.

### 2.1.5 Wireways and Auxiliary Gutters

Wireway and auxiliary gutters shall be a minimum 4- by 4 inch trade size conforming to [UL 870](#).

### 2.1.6 Surface Raceways and Assemblies

Surface metal raceways and multi-outlet assemblies shall conform to [NFPA 70](#). [Receptacles](#) shall conform to [NEMA WD 1](#), Type 5-20R.

## 2.2 WIRE AND CABLE

Conductors installed in conduit shall be copper 600-volt type THWN. All conductors [AWG No. 8](#) and larger, shall be stranded. All conductors smaller than [AWG No. 8](#) shall be solid.

Flexible cable shall be Type SO and contain a grounding conductor with green insulation.

Conductors installed in plenums shall be marked plenum rated.

## 2.3 SPLICES AND CONNECTORS

Make all splices in [AWG No. 8](#) and smaller with approved insulated electrical indentor crimp-type connectors and compression tools.

Make all splices in [AWG No. 6](#) and larger with indentor crimp-type connectors and compression tools. Joints shall be wrapped with an insulating tape that has an insulation and temperature rating equivalent to that of the conductor.

## 2.4 SWITCHES

### 2.4.1 Safety Switches

Safety switches shall comply with [NEMA KS 1](#), and be the heavy-duty type with enclosure, voltage, current rating, number of poles, and fusing as indicated. Switch construction shall be such that, when the switch handle in the "ON" position, the cover or door cannot be opened. Cover release device shall be coinproof and be so constructed that an external tool shall be used to open the cover. Make provisions to lock the handle in the "OFF" position, but the switch shall not be capable of being locked in the "ON" position.

Provide switches of the quick-make, quick-break type. Approve terminal lugs for use with copper conductors.

Safety color coding for identification of safety switches shall conform to [NEMA Z535.1](#).

### 2.4.2 Toggle Switches

Toggle switches shall comply with [EIA 480](#), control incandescent, mercury, and fluorescent lighting fixtures and be of the heavy duty, general purpose, noninterchangeable flush-type.

Toggle switches shall be commercial grade toggle type, single or double-pole, two-position devices rated 20 amperes at 277 volts, 60 hertz

alternating current (ac) only.

All toggle switches shall be products of the same manufacturer.

## 2.5 RECEPTACLES

Receptacles shall be commercial grade, 20A, 125 VAC, 2-pole, 3-wire duplex conforming to NEMA WD 6, NEMA 5-20R.

## 2.6 OUTLETS, OUTLET BOXES, AND PULL BOXES

Outlet boxes for use with conduit systems shall be in accordance with NEMA FB 1 and NEMA OS 1 and be not less than 1-1/2 inches deep. Furnish all pull and junction boxes with screw-fastened covers.

## 2.7 CIRCUIT BREAKERS

Circuit-breaker interrupting rating shall be not less than those indicated in existing panels. Multipole circuit breakers shall be the common-trip type with a single handle. Molded case circuit breakers shall be bolt-on type conforming to UL 489.

## 2.8 LAMPS AND LIGHTING FIXTURES

Manufacturers and catalog numbers shown are indicative of the general type desired and are not intended to restrict the selection to fixtures of any particular manufacturer. Fixtures with the same salient features and equivalent light distribution and brightness characteristics, of equal finish and quality, are acceptable. Provide lamps of the proper type and wattage for each fixture.

Ballasts shall be high power factor and be energy efficient with integral lineside ballast disconnect. Ballasts shall have a Class P terminal protective device for 120-volt operation as indicated and be rapid-start fluorescent. Ballasts shall be "A" sound rated. Fluorescent lamps shall be standard reduced wattage type.

## PART 3 EXECUTION

### 3.1 CONDUITS, RACEWAYS AND FITTINGS

Conduit runs between outlet and outlet, between fitting and fitting, or between outlet and fitting shall not contain more than the equivalent of three 90-degree bends, including those bends located immediately at the outlet or fitting.

Do not install crushed or deformed conduit. Avoid trapped conduit runs where possible. Take care to prevent the lodgment of foreign material in the conduit, boxes, fittings, and equipment during the course of construction. Clear any clogged conduit of obstructions or be replaced.

Conduit and raceway runs concealed in or behind walls, above ceilings, or exposed on walls and ceilings 5 feet or more above finished floors and not subject to mechanical damage may be electrical metallic tubing (EMT).

#### 3.1.1 Rigid Steel Conduit

Make field-made bends and offsets with approved hickey or conduit bending machine. Conduit elbows larger than 2-1/2 inches shall be long radius.

Rigid steel conduit shall be used for outdoor locations, in concrete and where required.

3.1.2 Electrical Metallic Tubing (EMT)

EMT shall be grounded in accordance with NFPA 70, using pressure grounding connectors especially designed for EMT.

3.1.3 Flexible Metallic Conduit

Use flexible metallic conduit to connect recessed fixtures from outlet boxes in ceilings, transformers, and other approved assemblies.

Bonding wires shall be used in flexible conduit as specified in NFPA 70, for all circuits. Flexible conduit shall not be considered a ground conductor.

Electrical connections to vibration-isolated equipment shall be made with flexible metallic conduit.

Liquidtight flexible metallic conduit shall be used in wet and oily locations and to complete the connection to motor-driven equipment.

3.1.4 Rigid Nonmetallic Conduit

Rigid PVC conduit shall be direct buried.

A green insulated copper grounding conductor shall be in conduit with conductors and be solidly connected to ground at each end. Grounding wires shall be sized in accordance with NFPA 70.

3.1.5 Wireway and Auxiliary Gutter

Straight sections and fittings shall be bolted together to provide a rigid, mechanical connection and electrical continuity. Dead ends of wireways and auxiliary gutters shall be closed. Plug all unused conduit openings.

Wireways for overhead distribution and control circuits shall be supported at maximum 5-foot intervals.

Auxiliary gutters used to supplement wiring spaces for equipment not contained in a single enclosure shall contain no switches, overcurrent devices, appliances, or apparatus.

3.1.6 Surface Raceways and Assemblies

Surface raceways shall be mounted plumb and level, with the base and cover secured. Minimum circuit run shall be three-wire with one wire designated as ground.

3.2 WIRING

Feeder and branch circuit conductors shall be color coded as follows:

<u>CONDUCTOR</u>	<u>COLOR 208/120VAC</u>	<u>COLOR 480VAC</u>
Phase A	Black	Brown

<u>CONDUCTOR</u>	<u>COLOR 208/120VAC</u>	<u>COLOR 480VAC</u>
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Gray
Equipment Grounds	Green	Green with Yellow Stripe

Conductors up to and including **AWG No. 2** shall be manufactured with colored insulating materials. Conductors larger than **AWG No. 2** shall have ends identified with color plastic tape in outlet, pull, or junction boxes.

Splice in accordance with the **NFPA 70**. Provide conductor identification within each enclosure where a tap, splice, or termination is made and at the equipment terminal of each conductor. Terminal and conductor identification shall match as indicated.

Where several feeders pass through a common pullbox, the feeders shall be tagged to clearly indicate the electrical characteristics, circuit number, and panel designation.

### 3.3 SAFETY SWITCHES

Securely fasten switches to the supporting structure or wall, utilizing a minimum of four **1/4 inch** bolts. Do not use sheet metal screws and small machine screws for mounting. Do not mount switches in an inaccessible location or where the passageway to the switch may become obstructed. Mounting height shall be **5 feet** above floor level, when possible.

### 3.4 WIRING DEVICES

#### 3.4.1 Wall Switches and Receptacles

Install wall switches and receptacles so that when device plates are applied, the plates will be aligned vertically to within **1/16 inch**.

Ground terminal of each flush-mounted receptacle shall be bonded to the outlet box with an approved green bonding jumper when used with dry wall type construction.

#### 3.4.2 Device Plates

Device plates for switches that are not within sight of the loads controlled shall be suitably engraved with a description of the loads.

Device plates and receptacle cover plates for receptacles other than 125-volt, single-phase, duplex, convenience outlets shall be suitably marked, showing the circuit number, voltage, frequency, phasing, and amperage available at the receptacle. Required marking shall consist of a self-adhesive label having **1/4 inch** embossed letters.

Device plates for convenience outlets shall be similarly marked indicating the supply panel and circuit number.

### 3.5 BOXES AND FITTINGS

Furnish and install pullboxes where necessary in the conduit system to

facilitate conductor installation. Conduit runs longer than 100 feet or with more than three right-angle bends shall have a pullbox installed at a convenient intermediate location.

Securely mount boxes and enclosures to the building structure with supporting facilities independent of the conduit entering or leaving the boxes.

Mounting height of wall-mounted outlet and switch boxes, measured between the bottom of the box and the finished floor, shall be in accordance with ICC A117.1 and as follows:

<u>LOCATION</u>	<u>MOUNTING HEIGHT</u>
Receptacles in shops and laboratories	48 inches
Switches for light control	48 inches

### 3.6 LAMPS AND LIGHTING FIXTURES

Install new lamps of the proper type and wattage in each fixture. Securely fasten fixtures and supports to structural members and install parallel and perpendicular to major axes of structures.

### 3.7 PAINTING

Exposed conduit, supports, fittings, cabinets, pull boxes, and racks shall be thoroughly cleaned and painted.

### 3.8 FIELD TESTING

Submit Test Reports in accordance with referenced standards in this section.

After completion of the installation and splicing, and prior to energizing the conductors, perform wire and cable continuity and insulation tests as herein specified before the conductors are energized.

Contractor shall provide all necessary test equipment, labor, and personnel to perform the tests, as herein specified.

Isolate completely all wire and cable from all extraneous electrical connections at cable terminations and joints. Substation and switchboard feeder breakers, disconnects in combination motor starters, circuit breakers in panel boards, and other disconnecting devices shall be used to isolate the circuits under test.

Perform **Insulation-Resistance Test** on each field-installed conductor with respect to ground and adjacent conductors. Applied potential shall be 500 volts dc for circuits rated 300 volts or less and 1000 volts dc for circuits rated 480 volts. Take readings after 1 minute and until the reading is constant for 15 seconds. Minimum insulation-resistance values shall not be less than 25 Megohms for 300 volt rated cable and 100 Megohms for 600 volt rated cable. For circuits with conductor sizes 8AWG and smaller insulation resistance testing is not required.

Perform **Continuity Test** to insure correct cable connection (i.e correct phase conductor, grounded conductor, and grounding conductor wiring) end-to-end. Any damages to existing or new electrical equipment resulting from contractor mis-wiring will be repaired and re-verified at contractor's expense. All repairs shall be approved by the CO prior to acceptance of

the repair.

Conduct [Phase-Rotation Tests](#) on all three-phase circuits using a phase-rotation indicating instrument. Perform phase rotation of electrical connections to connected equipment clockwise, facing the source.

Final acceptance will depend upon the successful performance of wire and cable under test. Do not energize any conductor until the final test reports are reviewed and approved by the CO.

Ground Fault Receptacle Test: Test ground fault receptacles with a "load" (such as a plug in light) to verify that the "line" and "load" leads are not reversed.

-- End of Section --

## SECTION TABLE OF CONTENTS

## DIVISION 26 - ELECTRICAL

## SECTION 26 05 71.00 40

## LOW VOLTAGE OVERCURRENT PROTECTIVE DEVICES

## PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 GENERAL REQUIREMENTS

## PART 2 PRODUCTS

- 2.1 MOTOR CONTROL
  - 2.1.1 Manual Motor Controllers
- 2.2 ENCLOSURES
  - 2.2.1 Equipment Enclosures
  - 2.2.2 Remote-Control Station Enclosures
- 2.3 CIRCUIT BREAKERS
  - 2.3.1 Molded-Case Circuit Breakers
- 2.4 FUSES
- 2.5 CONTROL DEVICES
  - 2.5.1 Magnetic Contactors
  - 2.5.2 Control-Circuit Transformers
- 2.6 FACTORY TESTING
- 2.7 INDICATING LIGHTS
  - 2.7.1 General-Purpose Type
- 2.8 FINISH

## PART 3 EXECUTION

- 3.1 INSTALLATION
- 3.2 FIELD TESTING

-- End of Section Table of Contents --

## SECTION 26 05 71.00 40

## LOW VOLTAGE OVERCURRENT PROTECTIVE DEVICES

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(2008) Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA AB 1	(2002) Molded-Case Circuit Breakers, Molded Case Switches, and Circuit-Breaker Enclosures
NEMA AB 3	(2001) Molded Case Circuit Breakers and Their Application
NEMA C78.23	(1995; R 2003) Standard for Incandescent Lamps - Miscellaneous Types
NEMA FU 1	(2002; R 2007) Low Voltage Cartridge Fuses
NEMA ICS 1	(2000; R 2005; R 2008) Standard for Industrial Control and Systems General Requirements
NEMA ICS 2	(2000; R 2005; Errata 2008) Standard for Industrial Control and Systems: Controllers, Contactors, and Overload Relays Rated Not More than 2000 Volts AC or 750 Volts DC: Part 8 - Disconnect Devices for Use in Industrial Control Equipment
NEMA ICS 6	(1993; R 2006) Standard for Industrial Controls and Systems Enclosures

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2008; AMD 1 2008) National Electrical Code - 2008 Edition
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## UNDERWRITERS LABORATORIES (UL)

UL 489	(2009) Standard for Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
UL 50	(2007) Standard for Enclosures for

## Electrical Equipment

UL 508

(1999; Rev thru Sep 2008) Standard for  
Industrial Control Equipment

## 1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

## SD-03 Product Data

Submit manufacturer's equipment and performance data for the following items including use life, system functional flows, safety features, and mechanical automated details.

Motor Control  
Instrument Transformers  
Enclosures  
Circuit Breakers  
Control Devices  
Indicating Lights

## SD-10 Operation and Maintenance Data

Submit Operation and Maintenance Manuals for the following equipment:

Manual Motor Controllers

## 1.3 GENERAL REQUIREMENTS

Section 26 00 00.00 20 BASIC ELECTRICAL MATERIALS AND METHODS applies to work specified in this section.

## PART 2 PRODUCTS

## 2.1 MOTOR CONTROL

Conform to NEMA ICS 1, NEMA ICS 2, and UL 508 for motor controllers. Provide controllers that have thermal overload protection in each phase.

## 2.1.1 Manual Motor Controllers

Provide full-voltage, manually operated manual motor controllers for the control and protection of single-phase 60-hertz ac fractional-horsepower squirrel-cage induction motors.

Provide single-throw, single- or double-pole, three-position controllers rated at not more than 1 horsepower at 115- and 230-volts single phase. Include a supporting base or body of electrical insulating material with enclosed switching mechanism, yoke, thermal overload relay, and terminal connectors. Provide controllers that clearly indicate operating condition: on, off, or tripped.

Provide toggle- or key-operated type manual motor controllers as indicated and arrange so that they are lockable with a padlock in the "OFF" position.

Provide recessed manual motor controllers for single-speed,

**fractional-horsepower** squirrel-cage induction motors, that include a single controller and indicating light in a 4-inch square wall outlet box, for flush-wiring devices with matching corrosion-resistant steel flush cover plate. Provide surface-mounted manual motor controllers for single-speed, **fractional-horsepower** squirrel cage induction motors that include a single controller and indicating light in a **NEMA 250**, Type 3R general-purpose enclosure.

## 2.2 ENCLOSURES

### 2.2.1 Equipment Enclosures

Provide enclosures for equipment in accordance with **NEMA 250**.

Contain equipment installed inside, clean, dry locations in a NEMA Type 1, general-purpose sheet-steel enclosure.

Contain equipment installed in wet locations in a NEMA Type 4 watertight, corrosion-resistant sheet-steel enclosure, constructed to prevent entrance of water when tested in accordance with **NEMA ICS 6** for Type 4 enclosures.

Fabricate sheet-steel enclosures from uncoated carbon-steel sheets of commercial quality, with box dimensions and thickness of sheet steel in accordance with **UL 50**.

### 2.2.2 Remote-Control Station Enclosures

Provide remote-control station enclosures for pushbuttons, selector switches, and indicating lights in accordance with the appropriate articles of **NEMA ICS 6** and **NEMA 250**.

Contain remote-control stations installed in indoor, clean, dry locations in NEMA Type 1 general-purpose, sheet-steel enclosures. Contain recessed remote-control stations in standard wall outlet boxes with matching corrosion-resistant steel flush cover plate.

Contain remote-control stations installed in wet locations in NEMA Type 4 watertight, corrosion-resistant sheet-steel enclosures constructed to prevent entrance of water when tested in accordance with **NEMA ICS 6** and **NEMA 250** for Type 4 enclosures.

## 2.3 CIRCUIT BREAKERS

Provide circuit breakers that conform to **UL 489**, **NEMA AB 1**, and **NEMA AB 3**.

### 2.3.1 Molded-Case Circuit Breakers

Provide molded case, manually operated, trip-free, circuit breakers, with inverse-time thermal-overload protection and instantaneous magnetic short-circuit protection as required. Completely enclose circuit breakers in a molded case, with the calibrated sensing element factory-sealed to prevent tampering.

Locate thermal-magnetic tripping elements in each pole of the circuit breaker, and provide inverse-time-delay thermal overload protection and instantaneous magnetic short-circuit protection. Provide instantaneous magnetic tripping element, that is adjustable and accessible from the front of the breaker on frame sizes larger than 100 amperes.

Size breaker as required for the continuous current rating of the circuit. Provide breaker class as required.

Provide sufficient interrupting capacity of the panel and lighting branch circuit breakers, to successfully interrupt the maximum short-circuit current imposed on the circuit at the breaker terminals. Provide circuit breaker interrupting capacities to match existing panel ratings and that conform to [NEMA AB 3](#).

Provide the common-trip type multipole circuit breakers having a single operating handle and a two-position on/off indication. Provide circuit breakers with temperature compensation for operation in an ambient temperature of [104 degrees F](#). Provide circuit breakers that have root mean square (rms) symmetrical interrupting ratings sufficient to protect the circuit being supplied. Interrupting ratings may have selective type tripping (time delay, magnetic, thermal, or ground fault).

Provide phenolic composition breaker body capable of having such accessories as handle-extension, handle-locking, and padlocking devices attached where required.

Provide circuit breakers used for meter circuit disconnects that meet the applicable requirements of [NFPA 70](#) and that are of the motor-circuit protector type.

For circuit breakers used for service disconnection, provide an enclosed circuit-breaker type with external handle for manual operation. Provide sheet metal enclosures with a hinged cover suitable for surface mounting.

## 2.4 FUSES

Provide a complete set of fuses for all switches and switchgear. Rate fuses that have a voltage rating of not less than the circuit voltage.

Provide nonrenewable cartridge type fuses for ratings 30 amperes, 125 volts or less. Provide renewable cartridge type fuses for ratings above 30 amperes 600 volts or less with time-delay dual elements, except where otherwise indicated. Conform to [NEMA FU 1](#) for fuses.

Label fuses showing UL class, interrupting rating, and time-delay characteristics, when applicable. Additionally, clearly list fuse information on equipment drawings.

Provide porcelain fuse holders when field-mounted in a cabinet or box. Do not use fuse holders made of such materials as ebony asbestos, Bakelite, or pressed fiber for field installation.

## 2.5 CONTROL DEVICES

### 2.5.1 Magnetic Contactors

Provide magnetic contactors in accordance with [NEMA ICS 1](#) and [NEMA ICS 2](#) as required for the control of low-voltage, 60-hertz, tungsten-lamp loads, fluorescent-lamp loads, resistance-heating loads, and the primary windings of low-voltage transformers.

Provide core-and-coil assembly that operates satisfactorily with coil voltage between 85 and 110 percent of its voltage rating.

Provide contactor that is designed with a normally open holding circuit auxiliary contact for control circuits, with a rating in accordance with NEMA ICS 1 and NEMA ICS 2.

Furnish solderless pressure wire terminal connectors, or make available for line-and-load connections to contactors in accordance with NEMA ICS 1 and NEMA ICS 2.

Provide magnetic contactors with a rating in accordance with NEMA ICS 1 and NEMA ICS 2.

#### 2.5.2 Control-Circuit Transformers

Provide control-circuit transformers within the enclosure of magnetic contactors and motor controllers when the line voltage is in excess of 120 volts. Provide encapsulated dry type, single-phase, 60-hertz transformer, with a 120-volt (or 24-volt) isolated secondary winding.

Do not provide a transformer with a rated primary voltage less than the rated voltage of the controller, or a rated secondary current less than the continuous-duty current of the control circuit.

Provide voltage regulation of the transformer such that, with rated primary voltage and frequency, the secondary voltage is not less than 95 percent nor more than 105 percent of rated secondary voltage.

Provide source of supply for control-circuit transformers at the load side of the main disconnecting device. Protect secondary winding of the transformer and control-circuit wiring against overloads and short circuits, with fuses selected in accordance with NEMA ICS 6. Ground secondary winding of the control-circuit transformer in accordance with NEMA ICS 6.

#### 2.6 FACTORY TESTING

Perform factory tests on control and low voltage protective devices in accordance with the manufacturer's recommendations.

Conduct short-circuit tests in accordance with Section 2 of NEMA ICS 1.

#### 2.7 INDICATING LIGHTS

##### 2.7.1 General-Purpose Type

For indicating lights, provide oiltight instrument devices with threaded base and collar for flush-mounting, translucent convex lens, candelabra screw-base lampholder, and 120-volt, 6-watt, Type S-6 incandescent lamp in accordance with NEMA C78.23. Provide indicating lights color coded in accordance with NEMA ICS 6.

Provide indicating lights in remote-control stations when pushbuttons and selector switches are out of sight of the controller.

#### 2.8 FINISH

Protect metallic materials against corrosion. Provide equipment with the standard finish by the manufacturer when used for most indoor installations.

## PART 3 EXECUTION

## 3.1 INSTALLATION

Install **Control devices** and protective devices that are not factory installed in equipment, in accordance with the manufacturer's recommendations and field adjusted and operation tested. Conform to **NFPA 70**, **NEMA ICS 1** and **NEMA ICS 2** requirements for installation of control and protective devices.

## 3.2 FIELD TESTING

Demonstrate to operate as indicated control and protective devices not factory installed in equipment.

Ratio and verify tap settings of instrumentation, potential, and current transformers.

-- End of Section --