BSA's Contractual Representative	Overall Value Amount	Contract Type	Contract Number
Jayce M. Blood	**TBD**	**Firm Fixed Price**	**476963**

BROOKHAVEN NATIONAL LABORATORY
Brookhaven Science Associates
P.O. Box 5000
UPTON, L.I., N.Y. 11973-5000

Name and Address of Contractor

DRAFT

CONTRACT

This Contract (the "Contract") is between the party named above (the "Contractor"), and Brookhaven Science Associates, LLC ("BSA"), the latter acting under a Prime Contract, DE-SC0012704, with the United States of America (the "Government") represented by the United States Department of Energy ("DOE").

I. SCOPE OF WORK

The Contractor shall be responsible for the engineering, purchase of all materials, manufacturing, assembly, inspecting, testing, delivering, installing, commissioning and training of a 200 kV cold-field-emission-gun (CFEG) high resolution transmission electron microscope (HRTEM)/scanning transmission electron microscope (STEM). All work shall be conducted in strict accordance with the attached BSA Statement of Work, dated April 24, 2026, and Technical Specification incorporated herein.

A. Reports/Deliverables: The Contractor shall provide the following deliverable(s) to BSA's Technical Representative (Tech Rep):

	Deliverable	Due Date
1.	Program Plan	2 weeks after contract award
2.	Preliminary Technical Design	6 weeks after contract award
3.	Final Technical Design	8 weeks after contract award
4.	Manufacturing/Inspection/Test Plan with Equipment footprint and laboratory requirements	10 weeks after contract award
5.	Installation Work Plan	40 weeks after contract award
6.	Factory Acceptance Testing	57 weeks after contract award
7.	Delivery of the 200 kV CFEG HRTEM/STEM	62 weeks after contract award

	Deliverable	Due Date
8.	Site Acceptance and Commissioning Report	68 weeks after contract award

II. PERIOD OF PERFORMANCE

This Contract shall be effective as of the date executed by both parties. It shall remain in effect through TBD.

III. FIRM FIXED PRICE AND PAYMENT

A. **Firm Fixed Price:** In full consideration of the Contractor's performance hereunder, BSA shall pay the Contractor the firm fixed price of *TBD U.S. Dollars ($0.00)*. The said sum shall constitute full compensation for all services and materials furnished hereunder.

B. **Payment:** Payment will be made upon receipt and approval of properly certified invoices. Payment will be in accordance with the following milestone payment schedule:

	Milestone	Amount
1.	BSA receipt and acceptance of the preliminary technical design.	TBD
2.	BSA receipt and acceptance of the final technical design.	TBD
3.	BSA receipt and acceptance of the factory acceptance test report.	TBD
4.	BSA receipt of the 200 kV CFEG HRTEM/STEM and acceptance.	TBD
5.	Commissioning of the 200 kV CFEG HRTEM/STEM and BSA acceptance	TBD
6.	Delivery and acceptance by BSA of the end item documentation package and training on the instrument.	TBD

Payment terms are Net XX *(large businesses 30, small businesses enter 10)*.

Invoices shall be directed to BSA's Accounts Payable Department via electronic or regular mail.

Electronic invoice submittal is preferred by BSA. The Contractor shall make every effort to have systems in place that allow for electronic invoice transmittal.

DRAFT

Invoices shall be submitted in PDF format, via email, to apinvoices@bnl.gov.

Hard copy invoices, if applicable, shall be directed to BSA's Accounts Payable Department, Contracts Division, Bldg. No. 400D.

The Contractor shall indicate the final invoice by clearly marking such invoice as "FINAL." A copy of the final invoice must be submitted to BSA's Contractual Representative.

C. **Freight**: Freight terms shall be FOB BSA National Laboratory, 98 Rochester Street, Upton, Long Island, New York, Freight Prepaid.

- or -

"DAP" Delivered At Place, BSA National Laboratory, 98 Rochester Street, Upton, Long Island, New York.

D. **Labelling, Packing, and Notification Requirements:**

More detailed instructions are available at https://www.bnl.gov/shipping/ or by emailing WarehouseOperations@bnl.gov.

Labeling Requirements

All shipments must comply with the following labelling requirements. Failure to do so may result in delayed payments. Labels must be placed on the upper left portion of the container when possible and contain:

Brookhaven National Laboratory
Brookhaven's Contract Number
98 Rochester St.
Upton, NY 11973
Box Number / Number of Boxes

Packing List Requirements

Every shipping container must include a packing list. The packing list must be clearly identified and affixed to a side of the shipping container. At a minimum, the packing list should contain the following information:

- Ship from company name and address
- Supplier contact name
- Supplier telephone number
- Ship to address as instructed by Buyer/Contracts Specialist
- Brookhaven's Contract number
- Part number, description, quantity, unit of measure, and corresponding BNL Contract line number

Special Notification of Delivery

If a shipment is heavier than 3,000 lbs., longer than 8 feet in any direction, or has

DRAFT

a high center of gravity, it will require rigging upon receipt and the shipper shall provide a minimum of 3 days' advance notice of delivery to BNL's Receiving Department via email to WarehouseOperations@bnl.gov. The shipper must obtain acknowledgement from BNL that delivery notification was received. Failure to contact BNL will result in delays during delivery and any resulting demurrage will be at the shipper's expense.

Marking of Outer Package

Each shipping container (transport package) with a gross weight equal to or greater than 400 lbs. (180 kilograms) must be marked with the center of gravity location and gross weight on at least one side or end panel. It must also meet the requirements of the latest revision of ASTM Standard D 3951, Standard Practice for Commercial Packaging. This applies to any item shipped (originally packaged or repackaged) to BNL or other locations cited in the Contract.

Protection of Material and Equipment

The Contractor shall employ procedures which ensure adequate protection of material and equipment during shipment and while in storage. Such protection shall include special environmental packaging as necessary. All items shipped (originally packaged or repackaged) to BNL or other locations cited in the PO or Contract shall comply with the requirements for preservation, packaging, and marking as stated in the latest revision of ASTM Standard D 3951-10, Standard Practice for Commercial Packaging.

Unacceptable Packing Material

Do not use vermiculite as a packaging material inside any shipments to BNL unless required by shipping regulation. "Vermiculite" as defined in this specification means the hydrous, silicate mineral classified as a phyllosilicate that has been expanded by heating. Vermiculite used as a packaging material in shipments must be determined to be free of asbestos (<1% chrysolite, amosite, crocidolite, tremolite, anthophyllite, and actinolite). All shipments containing vermiculite must be accompanied by documentation stating that the vermiculite used is certified asbestos-free. This documentation must be affixed to the outside of the package.

Ocean Shipments

Foreign shipments transported via ocean freight must use the 10+2 REQUIREMENTS Form (PDF). The form must be completed by the Contractor 72 hours before departure of the vessel. Send form to the following:

DRAFT

Interfreight Harmonized Logistics, Inc.
Fax: 516-371-6880
bnl@interfreight.net

Brookhaven National Laboratory
WarehouseOperations@bnl.gov

Once the form is submitted to customs, an acceptance number will be provided. Freight will not be loaded onto a vessel without an acceptance number. Failure to submit the 10+2 form may result in fines. It is the Contractor's responsibility to make sure the 10+2 form is submitted 72 hours prior to the vessel sailing. BSA shall withhold payment from the Contractor's final invoice for any penalties incurred by BSA due to late or incorrect ISF filing by the Contractor.

IV. AUTHORIZED REPRESENTATIVES

A. **BSA's Technical Representative:** TBD, telephone no. TBD, TBD (email), is BSA's Technical Representative, and shall act as liaison between BSA and the Contractor in technical matters only.

B. **BSA's Contractual Representative:** Jayce Blood, telephone no. (631) 344-2627, jblood@bnl.gov (email), is BSA's Contractual Representative. Any change or modification in the terms and conditions of this Contract shall require the written approval of BSA's Contractual Representative or designee.

C. **Contractor's Technical Representative**: TBD, telephone no. TBD, TBD (email), is the Contractor's authorized Technical Representative, and shall act as point of contact between BSA and the Contractor in technical matters only.

D. **Contractor's Contractual Representative:** TBD, telephone no. TBD, TBD (email), is the Contractor's authorized Contractual Representative and shall act as liaison between BSA and the Contractor.

V. PATENT CERTIFICATION - RESERVED

VI. GOVERNMENT PROPERTY - RESERVED

VII. ADDITIONAL TERMS

The provisions of Brookhaven Science Associates, LLC, General Terms and Conditions for Commercial Items and Services, *Rev 24.0 (April 2026)* are incorporated herein and made a part hereof.

The provisions of Brookhaven Science Associates, LLC, Supplemental Terms and Conditions for Work by Contractors Onsite at Brookhaven National Laboratory, *Rev 24.0 (April 2026)* are incorporated herein and made a part hereof.

As noted in this Contract, Supplemental Terms and Conditions for Work by Contractors Onsite at Brookhaven National Laboratory are incorporated herein. In accordance with

DRAFT

Article 8 of these Supplemental Terms and Conditions, the Contractor is required to provide a Phase Hazard Analysis (PHA).

This Contract is issued pursuant to Brookhaven Science Associates General and/or Supplemental Terms and Conditions listed above, which are incorporated herein by reference. The complete text of these terms and conditions can be viewed at PPM | Terms and Conditions. Should the Contractor have any questions and/or not have access to these terms and conditions, contact the Buyer or Contracts Specialist immediately.

The following documents attached hereto and made a part hereof, contain additional provisions of this Contract:

Attachment A Statement of Work, dated April 24, 2026
Attachment B Technical Specifications
Attachment C BNL Supplier Quality Assurance Requirements

This Contract does not bind nor purport to bind the Government of the United States.

ACCEPTED:

TBD	**BROOKHAVEN SCIENCE ASSOCIATES, LLC**
By: _____	**By:** _____
Name: _____	**Name:** _____
Title: _____	**Title:** _____
Date: _____	**Date:** _____

The Contractor shall sign and return one **(1) copy of this contract** via email to the attention of Jayce Blood, Procurement and Property Management Division at jblood@bnl.gov.

DRAFT

STATEMENT OF WORK (SOW)

for

200kV Cold Emission Gun Workhorse High Resolution/Scanning Transmission Electron Microscope

		Date
Prepared by:	Lihua Zhang Lihua Zhang, Technical Representative Center for Functional Nanomaterials	03-05-2026
Approved by:	Aaron Stein Center for Functional Nanomaterials	4/24/2026
Quality Assurance	Nicole Magliulo Nicole Magliulo Quality Management Office	03-05-2026
ESH Coordinator	Wai-Lin Ng Wai-Lin Ng Center for Functional Nanomaterials	03-04-2026

This document contains BNL procurement requirements and specifications for solicitation and technical evaluation. The information is high-level and does not include the detail necessary for 'development' or 'production' as defined under 15 CFR §772.1, 22 CFR §120.33, or 10 CFR part 810; therefor it does not constitute export-controlled technology or technical data.

Contents

1. SCOPE 1

1.1 BACKGROUND 1
1.2 DEFINITIONS/ACRONYMS 1

2 APPLICABLE DOCUMENTS 1

3 REQUIREMENTS 2

3.1 CONTRACTOR RESPONSIBILITIES 2
3.1.1 Technical Performance 2
3.1.2 Tooling/Fixtures/Test Equipment 2
3.1.3 Factory Acceptance Testing 2
3.1.4 Installation 3
3.1.5 Acceptance Testing at BNL 4
3.1.6 Commissioning 4
3.1.7 Training 4
3.2 DESIGN AND DESIGN REVIEW REQUIREMENTS 4
3.3 MANUFACTURING REQUIREMENTS 5
3.3.1 Acceptance Test Procedure 5
3.3.2 Commissioning Reports 5
3.4 MANAGEMENT 5
3.4.1 Program Plan 5
3.4.2 Progress Teleconference 5
3.4.3 Manufacturing/Inspection/Test Plan 5
3.4.4 Performance Reporting 6
3.5 DOCUMENTATION AND DATA MANAGEMENT 6
3.6 CONFIGURATION MANAGEMENT 7
3.7 SOFTWARE REQUIREMENTS 7
3.8 ENVIRONMENT, SAFETY AND HEALTH (ESH) 7
3.8.1 Contractor Work on Site at BNL 7
3.8.2 Electrical Safety 8
3.8.3 Pressure Safety 9
3.8.4 Fire Safety 9
3.8.5 Attachment Points and Lifting Fixture 10
3.8.6 Radiation Generating Devices 10
3.9 PACKAGING 10
3.10 WARRANTY 10

4 QUALITY ASSURANCE 11

4.1 QUALITY ASSURANCE REQUIREMENTS 11
4.2 NOTIFICATION OF CHANGE TO DESIGN, METHODS, OR PROCESSES 111
4.3 RECORDS 111
4.4 FRANCHISED / LICENSED "DISTRIBUTOR" TRACEABILITY 111
4.5 MATERIAL REVIEW BOARD (MRB) AUTHORITY 12
4.6 QA FLOW-DOWN 122
4.7 CERTIFICATE OF CONFORMANCE 122

5 DELIVERABLES 133

6 SCHEDULE/ MILESTONES 133

7 VALUE ENGINEERING 13

This page intentionally left blank, to accommodate back-to-back printing.

1. SCOPE

This Statement of Work (SOW) will be the basis for the procurement of a 200 kV cold-field-emission-gun (CFEG) high resolution transmission electron microscope (HRTEM)/scanning transmission electron microscope (STEM) for the Center for Functional Nanomaterials (CFN) at Brookhaven National Laboratory (BNL). The microscope, hereafter referred to as "Instrument", shall be designed to provide an optimum combination of capabilities for high-resolution imaging, energy dispersive X-ray spectroscopy (EDS), electron energy-loss spectroscopy (EELS), and nanoscale electron diffraction. High efficiency detectors for both transmitted electrons and secondary electrons are required. This new system will enable the determination of physical and chemical properties of various materials at high spatial and high energy resolution which is of importance to discoveries in materials science. This document outlines the Contractor's responsibilities and obligations necessary for completing the requirements as set forth herein.

1.1 Background

The CFN is a user-oriented research center whose mission is to be an open facility for the nanoscience research community and advance the science of nanomaterials that address the nations' energy challenge. Research at CFN focuses on the development of application of advanced techniques to understand structure-processing-property relationships in functional nanomaterials. New and unique capabilities would enrich for both internal research and our user program.

1.2 Definitions/Acronyms

ASME	American Society of Mechanical Engineers
ATP	Acceptance Test Procedure
BNL	Brookhaven National Laboratory
BSA	Brookhaven Science Associates
CFEG	Cold-Field-Emission-Gun
CFN	Center for Functional Nanomaterials
EDS	Energy Dispersive X-ray Spectroscopy
EELS	Electron Energy Loss Spectroscopy
ESH	Environment, Safety, and Health
HRTEM	High Resolution Transmission Electron Microscope
MRB	Material Review Board
MRP	Material Requirements Planning
NFPA	National Fire Protection Association
NRTL	Nationally Recognized Test Laboratory
QA	Quality Assurance
SOW	Statement of Work
STEM	Scanning Transmission Electron Microscope

2 APPLICABLE DOCUMENTS

In the event of a conflict between the Technical Specification and the SOW, the Contractor shall immediately notify the BSA Contractual Representative who shall in each instance determine which document takes precedence and advise the Contractor accordingly. Failure to notify BSA of a document conflict shall not relieve the Contractor's responsibility to ensure full compliance to all requirements.

The following documents are an integral part of the SOW; the applicable revision level will be the latest that is in effect at the time of award:

Document Number	Document Title

10CFR851	DOE Worker Safety and Health Program
BNL QA-101	Supplier Quality Assurance Requirements
ASME B30.26	Rigging Hardware
ASME BPV	Boiler and Pressure Vessel Code
ASME B31.3	Process Piping -2015 Edition
NFPA 70	National Electrical Code – 2020 Edition http://www.nfpa.org/aboutthecodes/AboutTheCodes.asp?DocNum=70
NFPA 70E	Standard for Electrical Safety in the Workplace – 2021 Edition or the most current version in place
ASMEY14.5M-2008	Dimensioning and Tolerancing
JHA	BNL Job Hazard Analysis Template (Attached)

3 REQUIREMENTS

In accordance with the applicable specifications, referenced documents, and instructions as defined in this Statement of Work, the contractor shall be responsible for the engineering, purchase of all materials, manufacturing, assembly, inspecting, testing, delivering, installing, commissioning and training on the Instrument.

Safety and code compliance must be paramount at every stage of a project, from the initial concept to the final installation and use. Electrical design and installation must follow the National Electrical Code NFPA 70 and Standard for Electrical Safety in the Workplace NFPA 70E.

3.1 Contractor Responsibilities

3.1.1 Technical Performance

In accordance with SOW/Technical Specification document and all referenced documents, the Contractor shall engineer, manufacture and assemble the Instrument. The Contractor shall first test the Instrument at the Contractor's facility, then deliver, test and commission the Instrument at BNL. It is the Contractor's responsibility to ensure that the Instrument complies with all the specification requirements and the safety codes and standards referenced herein.

3.1.2 Tooling/Fixtures/Test Equipment

The Contractor shall be responsible for supplying all materials, including (but not limited to) the construction of all tools, jigs, fixtures, and test equipment required to complete the engineering, manufacturing, assembly, inspecting, testing, delivering, and installing the Instrument. Gases, croygens, and samples for testing will be supplied by BNL.

3.1.3 Factory Acceptance Testing

The Instrument shall be tested at the Contractor's facility to demonstrate full compliance with the SOW/Technical Specification. The Instrument shall be fully assembled and be representative of the final as-delivered configuration for Final Acceptance Test (FAT). The tests listed in the SOW/

Technical Specification shall be conducted on the Instrument at the Contractor's facility according to the approved Acceptance Test Procedure (ATP), prior to delivery to BNL.

All test data shall be documented in the Factory Acceptance Test report and sent to BSA prior to the Instrument delivery. Acceptance of the test data is contingent upon data review and written approval by BSA technical representative prior to shipment of the Instrument.

3.1.4 Installation

3.1.4.1. The Contractor shall provide a footprint of the Instrument and utilities requirements.

3.1.4.2. The Contractor shall be responsible for all Instrument installation. BSA will not supply personnel for installation tasks other than identified herein. Unloading of containers and trucks, and staging of the Instrument at the installation site, shall be performed by BSA riggers. The Contractor shall not be permitted to drive BSA-owned forklifts for any reason. The Contractor shall submit an installation work plan that includes all onsite installation activities in a step-by-step format at least two months before the scheduled start of installation activities. This plan is a necessary prerequisite for obtaining a work permit and must be approved by BSA prior to the start of installation activities. The person (or persons) responsible for all onsite installation activities shall participate in the work planning process for the purpose of obtaining a work permit. This shall be completed during the Technical Review as well as after the Technical Review in video conferencing and/or teleconferences.

3.1.4.3. All training and safety requirements identified during the work planning process (or by BSA ES&H/Training staff members) shall be successfully completed by Contractor personnel who are participating in onsite installation work prior to issuance of a work permit and prior to installation.

3.1.4.4. BSA shall be responsible for offloading and rigging of heavy equipment. Contractors may operate their own rigging/cranes that are installed as part of their equipment, original equipment manufacturer (OEM) components. These must first be inspected by BSA.

3.1.4.5. Electrical tools/equipment needed for installation shall be inspected by BSA prior to use at BNL, to ensure compliance with electrical safety standards referenced herein.

3.1.4.6. The Installation Work Plan shall include at a minimum:

a. Work instructions/ installation plan: job steps or detailed step-by-step instructions

b. Prerequisites: preparatory actions to be performed before work can be started and any administrative and physical requirements (for example, review/ inspection/ approval of equipment, training, etc.)

c. Precautions: precautions that must be observed during performance of work

d. Identification for hold points and other monitoring

e. Operational limits imposed

f. Coordination of tasks

g. Special conditions for working alone

h. Scheduling, coordination, and notification

i. Changes impacting configuration management

j. ES&H work controls for mitigating identified hazards based on the following hierarchy, as practical:

i) Elimination/substitution of hazards

ii) Engineering controls

iii) Administrative controls and work practices

iv) Personal protective equipment

3.1.4.7. Note that disposal of waste packing material shall be the responsibility of BSA.

3.1.4.8. The Contractor shall supply all bolt-on wheels, transportation carts and custom tooling required for the installation of the Instrument which will remain the property of the Contractor at Contract Completion.

3.1.4.9. During assembly of all components, proper alignment and tightening shall be assured by the use of appropriate tools (e.g., torque wrenches) and by following the procedures recommended by the manufacturer, including the use of alignment tools and bolt-tightening sequences, etc.

3.1.4.10. Installation includes hardware and software setups for computer-based control of the Instrument.

3.1.5 Acceptance Testing at BNL

The Instrument shall be tested at BNL by the Contractor to demonstrate full compliance with this SOW and theTechnical Specification documents. The tests listed in the SOW and the Technical Specification documents shall be conducted on the Instrument at BNL according to the ATP, prior to final acceptance.

3.1.6 Commissioning

The Contractor shall be responsible for the commissioning of the Instrument. Commissioning shall be defined as all test and demonstration work performed on site at BNL.

Commissioning of the Instrument on site in its final configuration shall be performed with samples supplied by BSA and agreed to by Contractor. The Instrument shall be able to demonstrate the performance specifications as outlined in the separate Technical Specification document.

3.1.7 Training

During the commissioning phase of the contract, the Contractor shall provide hands-on training at BNL for two (2) BSA scientific and/or technical staffs for the safe operation and maintenance of the Instrument. This training shall be conducted at BNL for a period of three (3) working days during commissioning for the Instrument.

3.2 Design and Design Review Requirements

3.2.1 Preliminary Design Report

A preliminary design to meet all the technical requirements shall be presented to BNL staff. A three-dimensional depiction in .easm file, CAD file, or similar format, shall be provided to BNL. A videoconference meeting shall be held to discuss the design and facilitate questions. Changes to be incorporated shall be agreed upon by both BNL and the Contractor.

3.2.2 Final Design Report

A final design that incorporates and documents changes from the preliminary design shall be submitted to BNL. The final design shall be a three-dimensional depiction in .easm file, CAD file, or similar format. The instrument design in an .easm file or similar format shall be submitted. A videoconference may be convened if deemed necessary.

3.2.3 Approval to Proceed

BSA must approve in writing the final design, including any modifications introduced at the Final Design Review Meeting before the Contractor proceeds with ordering material and components.

3.3 Manufacturing Requirements

3.3.1 Acceptance Test Procedure

The contractor shall provide an ATP that is in accordance with this SOW/Technical Specification and all reference documents noted herein. The ATP must be approved by BSA prior to use. The ATP shall ensure that all test requirements as defined in the safety codes referenced herein are achieved.

3.3.2 Commissioning Reports

A Commissioning report shall be provided by the Contractor. The report shall include, but not limited to, the results of all tests performed including graphs, printouts, drawing updates, calibration data, and control system tuning parameters. The Contractor shall be responsible for remedying any noncompliance regarding the requirements in this SOW/Technical Specification, subject to BSA approval. A summary sheet including demonstrated remedy of any non-compliances shall be included. Final acceptance is contingent on BSA data review and written approval by BSA.

3.4 Management

3.4.1 Program Plan

Within the timeframe listed in Section 5, the Contractor must deliver a detailed program plan which includes a milestone schedule defining the design validation, manufacturing, inspection, testing, installation and commissioning phases in sufficient detail to allow regularly scheduled progress monitoring.

3.4.2 Progress Teleconference

Beginning within the timeframe listed in Section 5, monthly program technical and progress teleconferences and/or meetings between the Contractor and BSA shall be held at a mutually scheduled time. The discussions shall include the Contractor's progress, technical and contractual questions, presentations of analysis or testing results, design reviews, value engineering, trouble shooting, material status, tooling status, resources, and manufacturing issues.

3.4.3 Manufacturing/Inspection/Test Plan

A manufacturing plan shall be developed which identifies the manufacturing processes of work required to complete all efforts as identified in this SOW. It shall be submitted for review and approval by BSA within the timeframe indicated in the Contract. The plan may be a single document or may make use of existing travelers or other suitable planning and control documents. It shall address the Material Requirements Planning (MRP), and at a minimum include manufacturing, inspection, and test steps including identification of critical manufacturing operations and parts/subassemblies showing integrated flow into the end item(s). If the Contractor does not have

an MRP system in place, then details for purchasing all raw materials, shop loading (by work center), and a schedule for manufacturing all components and assemblies through packaging and shipping shall be provided by the Contractor.

3.4.4 **Performance Reporting**
Throughout the life of the contract, the Contractor shall supply a written report by the fifth of every month to the BSA technical representative and contractual representative clearly detailing progress through the prior month with respect to the program. This shall include milestone charts, detailed progress, open items, problems, recommended solutions, and risk mitigation.

3.5 Documentation and Data Management

3.5.1 All the documentation provided by the Contractor shall be in English.
3.5.2 All engineering drawings shall:

a. Be formatted in accordance with ASME Y14.5M-2008
b. Have views shown in third angle projection
c. Preferably use metric dimensions and tolerances
d. Have a separate parts list
e. Have part number designations in accordance with LT-ENG-RSI-STD-002

3.5.3 The Contractor shall provide an electronic copy (email, plus either CD ROM or USB data storage device) of all required documentation as noted in this SOW. Manufacturing drawing CAD files of all components and assemblies shall be in any of these formats: STP, SAT, IGS, IAM, or IPT.

3.5.4 **End Item Documentation Package**
The Contractor shall provide an electronic copy of the End Item documentation package in accordance with the schedule set forth in this SOW. The End Item documentation package shall consist of the following documentation:

a. Acceptance Test Reports and copies of test certificates
b. All manuals
c. Completed travelers (documents following instrument throughout manufacturing process)
d. Manufacturing/ Inspection/Test data for inspections performed at incoming inspection or during manufacturing
e. Certificate of Conformance as specified in Section 4
f. Copies of specification/ data sheets for viewports.
g. Copies of the Contractor's (or Subcontractors') weld certification/test reports
h. Documentation of required proof test procedures and results for vacuum vessels
i. Certification that all required pressure relieving devices used are approved by either the ASME or National Board of Boiler Inspectors (NBBI)Acceptance Test Reports and copies of test certificates

3.5.4.1 Documents

The Contractor shall provide an electronic copy (on a USB stick or BSA identified FTP site, in Microsoft Office format, or drawing format described in section 3.4 with formal "controlled copies" in PDF format) of the following documentation:

a. All documentation identified in this SOW

b. All parts and assembly solid models

c. User/operational manual

3.5.4.2 Operation and Maintenance Manuals

The Contractor shall provide the operation and maintenance manual in electronic format with formal PDF format on a USB stick and provide two (2) hardcopies.

Operation and maintenance manuals shall include:

3.5.5 A title to the front cover, identifying the title of the project and the date of issue

3.5.6 A table of contents

3.5.7 A general description of the Instrument installation

3.5.8 Copies of any permits to use copyrighted material

3.5.9 A technical description of each system and subsystem to allow the correct and safe operation, maintenance and repair of all systems and subsystems installed, including:

i. Operating manuals at all modes of operation described in Technical Specification document

ii. Standard maintenance operations not limited to beam alignment and adjustment of lens operations

iii. Trouble shooting techniques

iv. Recommendations for preventive maintenance

v. Disassembly, repair, cleaning and adjustment procedures

vi. List of recommended spare parts to keep on hand

vii. *Software documentation and source code for open-source processing routines*

3.6 Configuration Management

The Contractor shall establish and maintain a configuration control system to assure that all end items (including spares) are of the proper configuration, and that all approved configuration changes are incorporated at the specified effectivity points. Records shall be maintained verifying the configuration of each item.

3.7 Software Requirements

The Contractor shall provide and maintain the capability to receive and send CAD files of all components or assemblies in STP, SAT, IGES, IAM, or IPT file format at the request of BSA.

3.8 Environment, Safety and Health (ESH)

The Contractor shall design and build all equipment in accordance with ESH requirements in the appropriate specifications, codes, standards, and other documents listed in Section 2 of this SOW.

3.8.1 Contractor Work on Site at BNL

BSA will identify and designate space necessary to safely perform staging and installation activities. Any cordons, stanchions, or barriers required to designate and isolate the Contractor's work area will be supplied by BSA.

A Job Hazard Analysis (JHA) including a hazard list identifying all hazardous materials associated with the instrument, including Safety Data Sheets (SDS) shall be submitted to BSA for approval with the Installation Work Plan.

3.8.2 **Electrical Safety**

3.8.2.1 All electrical equipment and components must be manufactured in accordance to U.S. standards and comply with NFPA70. The instrument shall be listed by a Nationally Recognized Testing Laboratory (NRTL). If the instrument is not NRTL-listed, the Contractor shall arrange for a third-party NRTL Field Evaluation to be done onsite at the completion of installation. The cost of the field evaluation shall be included in the quote. Any additional charges require BNL's prior written approval. Note that CE is not on the list of OSHA approved NRTLs. A report on the results of the field evaluation must be provided to BNL's Electrical Authority Having Jurisdiction (AHJ) and approved before the equipment is to be energized.

3.8.2.2 The contractor shall supply the following to BSA:

3.8.2.2.1 Documentation for the equipment installation, operation, service and maintenance that describes operation, shutdown, safety concerns, and nonstandard installations

3.8.2.2.2 Schematics, drawings, and bill of materials describing power feeds, voltages, currents and parts used for construction, maintenance, and operation of the equipment.

3.8.2.2.3 Safety Requirements and emergency shutdown procedures of equipment including lockout/tagout (LOTO) requirements.

3.8.2.2.4 Documentation of specific hazards associated with the equipment.

3.8.2.2.5 Documentation shall be provided if special tools, PPE, or other equipment is necessary for proper maintenance and operation of equipment.

3.8.2.3 The contractor shall include safety-related design concepts for electrical equipment and installations. Following methods can be considered:

3.8.2.3.1 Installing finger-safe components, covers, and insulating barriers to reduce access to exposed energized electrical conductors and circuit part due to inadvertent movement

3.8.2.3.2 Substituting ≥50 volts control circuit with non-hazardous <50 volt circuits.

3.8.2.3.3 Separate enclosures for hazardous and non-hazardous electrical conductors and circuit parts.

3.8.2.4 Contractor shall mark the equipment which includes the NRTL certification mark/Field Evaluation mark, Manufacturer, model #, manufacturing date, drawing number, current draw, power, frequency voltages entering and leaving the control cabinets, and equipment. Caution, Warning, or Danger labels shall be

affixed to the exterior describing specific hazards and safety concerns. Refer to ANSI Z535, Series of Standards for Safety Signs and Tags, for more information on precautionary marking of electrical system or equipment

3.8.2.5 All exposed electrical connections/terminations ≥50 volts shall be covered so that workers are protected from the hazards of electrical shock during operation and when performing service & maintenance. Plexiglas® is not allowed; Lexan® may be used for inadvertent contact. Electrical insulation must be Low Smoke, Zero Halogen (LSZH), Fire Retardant, and rated for its application. Non-LSZH cables shall be permitted in length <50 feet.

3.8.2.6 The contractor shall include safety-related design concepts for electrical equipment and installations. Following methods can be considered:

3.8.2.6.1 Installing finger-safe components, covers, and insulating barriers to reduce access to exposed energized electrical conductors and circuit part due to inadvertent movement.

3.8.2.6.2 Substituting ≥50 volts control circuit with non-hazardous <50 volt circuits.

3.8.2.6.3 Separate enclosures for hazardous and non-hazardous electrical conductors and circuit parts.

3.8.2.7 Electrical wiring must be installed in a neat and workmanlike manner.

3.8.2.8 Teflon® shall not be used as an insulation material, except in small quantities

3.8.3 Pressure Safety

For process piping requirements, the contractor shall use ASME B31.3 or equivalent approved by BSA in writing. The liquid nitrogen, gaseous nitrogen, and cooling water lines shall be designed to ASME B31.3 requirements. In all cases, 100% proof testing shall be completed on each component to 150% of the maximum working pressure for hydrostatic tests, or 110% of the maximum working pressure for pneumatic tests.

To prevent inadvertant overpressurization of vacuum vessel(s), the system must be supplied with burst disk per ASME BPVCode.

3.8.4 Fire Safety

3.8.4.1 The Contractor shall ensure that any electrical equipment or wiring minimizes combustibility by the use of flame-resistant materials.

3.8.4.2 The Contractor shall ensure that any cable tray minimizes the possibllity to damage cables. All cables to be installed in a cable tray shall be rated for Cable Tray use. The cable shall have the TC (Tray Cable) and NRTL markings. If a Contractor elects to use a cable not marked for Tray Cable use, then the Contractor shall use a cable that will meet IEEE 1202 or equivalent approved by BSA in writing. BSA shall approve the use of all non-NRTL marked tray cables in advance of the Contractor ordering the cable.

3.8.4.3 All other cables shall be Low Smoke Zero Halogen (LSZH). Non-LSZH cables shall be permitted in length <50 feet.

3.8.5 **Attachment Points and Lifting Fixture**

3.8.5.1 The Contactor shall provide lifting eyes, either permanent or removable, on each piece of equipment or stand of sufficient capacity and number to allow the equipment to be safely lifted.

3.8.5.2 All lifting fixtures must meet the requirements specified in ASME B30.26 (Rigging Hardware) and ASME BTH-1 (Design of Below-the-Hook Lifting Devices, Design Category "A").

3.8.6 **Radiation Generating Devices**

X-ray sources when operating in UHV chamber shall have a maximum dose rate < 50 µrem/hr at 30 cm from any surface.

3.9 Packaging

In preparation for shipping, the Instrument shall be covered or wrapped for protection against weather elements, dust, and damage to projections, shock loads, impacts, and rubbing. The Instrument shall be properly braced and cushioned within the packing so that it will not shift during handling and shipment. The method of shipping will be specified by BSA one month prior to delivery.

3.9.1 After the component or piece of the Instrument has been cleaned and tested, it shall be packed to ensure that it remains clean and free from damage during both storage and shipping. All seal faces and/or knife edges should be protected. Vacuum components shall be backfilled with dry nitrogen gas.

3.9.2 Added protection against contamination and humidity shall be given to the sensors and electrical connections. Durable materials, such as clean wood, bubble wrap, or similar non-contaminating materials, are to be used to support and protect the components from one another during transit and storage. Peanut-type material shall <u>not</u> be used for packaging.

3.9.3 All assemblies or sub-assemblies with *moving* parts shall be secured to prevent damage due to unwanted motion or vibration. The packaging must be designed to withstand acceleration loads in excess of twice the acceleration due to gravity ($>2g_0$).

3.9.4 Each packing crate shall be fitted with Shockwatch and Tipwatch sensors or an equivalent approved in writing by BSA.

3.9.5 The container shall be appropriately labeled with the listing of contents, destination, gross weight, location of center of gravity, purchase order number, and contact information.

3.10 Warranty

The Contractor shall provide a one-year warranty on all parts and labor commencing with BSA's acceptance of the installed and tested Instrument. A recommended spare parts list shall be available from the Contractor. Remote diagnosis and troubleshooting from Contractor shall be available upon request within 24 hours during regular workdays.

4 QUALITY ASSURANCE

The Contractor shall maintain and apply an effective QA program for the design, manufacture, and testing of all systems and equipment provided. The system shall meet the requirements of the ISO-9001 Standard, "Quality Management System Requirements," or equivalent. The Contractor shall supply the necessary documentation to demonstrate this compliance. Post-award surveys may be required and shall be supported.

4.1 Quality Assurance Requirements

As set forth in BSA Form BNL-QA-101, "Brookhaven National Laboratory Supplier Quality Assurance Requirements," as amended herein, forms a part of this statement of work. Specifically, this includes the following sections: 1, 2, 3, 3.1, 3.1.2, 3.2 to 3.22, 4.0, 4.1, 4.2, 4.3, 4.4, 4.4.3, 4.5, 4.6, 4.7, 4.7.1, 4.7.3, 4.10, 4.10.1, 4.10.2, 4.10.3, 4.13, 4.14, 4.16, 4.19, 4.21, 4.30, 4.31, 4.34, 4.35, 4.36, 4.37, and 4.39. With each Component delivered, the Contractor shall supply to BSA a Certificate of Conformance, in accordance with section 4.16 of BNL-QA-101.

4.2 Notification of Change to Design, Methods, or Processes

The Supplier shall immediately notify the Buyer of any significant changes (those that may affect form, fit, function, reliability, safety, or interchangeability) in product design, fabrication methods, materials, or processing from those used by the Supplier at time of Supplier's quotation or offer to the Buyer, which resulted in the PO.

4.3 Records

The Supplier shall retain objective evidence, including records, of the inspections and tests performed in the course of manufacturing, testing, inspecting, preserving, packaging, and preparation for shipment of procured items. These records shall be made available to the Buyer's representative for review upon request. These records shall be maintained for a minimum of three (3) years, unless otherwise specified in the procurement documentation, after the completion of the PO/contract.

4.4 Franchised / Licensed "Distributor" Traceability

Products that are not purchased directly from the Original Equipment Manufacturer (OEM)/Original Component Manufacturer (OCM) must be purchased only from a franchised/licensed distributor of the product being offered. The distributor shall ensure traceability of all products to the original equipment manufacturer by identifying the original manufacturer for each lot/date code on the Certificate of Conformance. The distributor shall provide a copy of the Manufacturer's certificate for the lot number being supplied, along with their franchised distributor certification. The distributor shall not use

unapproved brokers (any company, person, or entity who is not an OEM/OCM) for the purchase of components and parts, unless pre-approval has been granted by Brookhaven Science Associates (BSA).

4.5 Material Review Board (MRB) Authority

4.5.1 Unless, and until, Material Review Board (MRB) authority has been requested and received, the Contractor shall be restricted to dispositions of rework, scrap, and return-to-supplier, i.e., the contractor shall not use nonconforming materials via unique or standard repair processes, nor via use-as-is-dispositions.

4.5.2 The Contractor shall not delegate MRB authority to suppliers without the prior knowledge and written approval of BSA.

4.5.3 BSA may delegate MRB Authority to the Contractor, when requested by the Contractor. Such request shall be accompanied by 1) the Contractor's procedure for the identification, evaluation, disposition, and control of non-conformances; and 2) the resumes of personnel to be assigned as MRB members.

4.5.4 All non-conformances requiring MRB action shall be documented and sent to the BSA technical representative within five (5) working days of the decision

4.6 QA Flow-Down

The Contractor shall ensure a proper and complete flow-down of all applicable QA requirements to its suppliers and sub-tier suppliers.

4.7 Certificate of Conformance

With each shipment, the Contractor shall submit a Certificate of Conformance (C of C). In case of drop shipment, a copy of the certificate shall be submitted to BSA at the time of shipment. The certificate shall include the title of and be signed by an authorized representative of the company, and shall constitute a representation by the Contractor that:

A. Materials used are those which have been specified by BSA, and that the items delivered were produced from materials for which the Contractor has on file, reports of chemical or physical analysis, or any other equivalent evidence of conformance of such items to applicable specifications;

B. Processes used in the fabrication of items delivered were in compliance with applicable specifications included as part of the PO/contract, or BSA-approved procedures or specifications;

C. The items as delivered comply with all applicable drawings, specifications, deviations/waivers, and other requirements of the procurement documentation; and-

D. When specified, cleaning and cleanliness requirements have been completely satisfied. The C of C shall reference the Contractor's applicable cleaning procedures.

5 DELIVERABLES

The Contractor shall supply the following:

Item	Deliverable	Due	BSA Approval
1	Program Plan	2nd week after award of contract	Yes
2	Technical and Progress Teleconference	2nd week after award of contract/monthly	no
3	Performance reports	5th of each month after receipt of Program Plan and within 2 weeks of key project milestones	No
4	Preliminary Technical Design	6th week after contract award	Yes
5	Final Technical Design	8th week after contract award	Yes
6	Equipment footprint and laboratory requirements	10th week after contract award	Yes
5	Manufacturing/Inspection/Test plan	10th week after contract award	Yes
6	Installation Work Plan	40th week after award of contract	Yes
7	Factory acceptance testing	57th week after award of contract	Yes
8	Delivery of the Instrument	62th week after award of contract	Yes
9	Site Acceptance Test and Commissioning Report	68th week after award of contract	Yes

6 SCHEDULE/ MILESTONES

The following schedules are for planning purposes only. Schedule requirements set forth in the contract will take precedence.

Milestone	Calendar weeks after award
Preliminary Technical Design Submitted	6th week
Final Technical Design Approved	8th week
Factory Acceptance Test Report	57th week
Delivery to BNL	62th week
Commissioning of instrument	67th week
Training on instrument	67th week
Delivery of End Item Documentation Package	68th week

7 VALUE ENGINEERING

The Contractor is encouraged to make recommendations for changes that might lead to an improvement in performance, reliability, quality, safety, or reduction in cost. Simplicity in operation, ease of maintenance, and an improvement in the performance and reliability of the specific functions beyond the requirements of this specification are objectives which shall be considered in the production. Where it appears a substantial improvement in simplicity of design, performance, ease of maintenance or reliability will result from the use of materials, parts and processes other than those specified, it is desirable that their use be investigated.

This document contains BNL procurement requirements and specifications for solicitation and technical evaluation. The information is high-level and does not include the detail necessary for 'development' or 'production' as defined under 15 CFR §772.1, 22 CFR §120.33, or 10 CFR part 810; therefore it does not constitute export-controlled technology or technical data.

Technical Specifications for 200 kV Workhorse TEM

1. General

1.1. This specification describes the requirements for a 200kV workhorse cold-field-emission-gun (CFEG) high resolution transmission electron microscope (HRTEM)/scanning transmission electron microscope (STEM) for the Center for Functional Nanomaterials (CFN) at Brookhaven National Laboratory. The microscope shall be designed to provide an optimum combination of capabilities for high-resolution imaging, energy dispersive X-ray spectroscopy (EDS), electron energy-loss spectroscopy (EELS), and nanoscale electron diffraction. This instrument is required to operate at 200kV and 80kV. High efficiency detectors for both transmitted electrons and secondary electrons shall be included.

1.2. Principal capabilities of the microscope include, but not limited to, atomic-resolution characterization of structure and defects, elemental composition, chemical (e.g. valence), bonding, and electronic properties of nanoscale materials.

1.3. The electron microscope shall be a high-resolution instrument for imaging, diffraction and spectroscopy. It shall offer high quality of combined accomplishments in spatial and energy resolution, mechanical stability, and high vacuum.

2. Principal Configuration of the Microscope

2.1. The electron microscope must not be aberration corrected.

2.2. The electron microscope is defined as a cold field emission gun high resolution/scanning transmission electron microscope with post-specimen diffraction, energy dispersive x-ray spectroscopy, electron energy-loss spectroscopy**,** high angle annular dark- field STEM detector, bright field STEM detector and backscattered electron image detector**.**

2.3. The microscope must have a cold field emission electron source.

a) The source must have a high brightness of 8 x 10^8 A/cm^2 sr (or higher), giving 2.5 nA of current in a 0.7 nm probe.
b) The source is capable of a wide range of probe and gun extraction settings to satisfy gentle-beam, high-current analytical, and high-energy-resolution modes, while maintaining high spatial resolution.

c) The probe current has a high degree of stability (>90% probe current retention 4-6hr after a tip flash).
d) The vendor must demonstrate commercially available TEM CFEG technology, with existing toolsets exhibiting continued and reliable performance.

2.4. TEM (point) resolution is guaranteed to be 0.23nm or better. STEM resolution is guaranteed to be 0.136nm or better. EELS (optional) energy resolution is guaranteed to be 0.3eV or greater.

2.5. The microscopy must have an independent Descan system (coils and control) post specimen, to allow large areas to be mapped by EELS without artifacts caused by the shifting of the EELS spectrum on the spectrometer.

2.6. The EDS system must consist of at least two large (100 mm^2 or greater) silicon drift detectors (SDD), at a resolution of 133 eV (or better) at Mn Kα. The system must have a high P/B ratio of 4000 or more, while maintaining minimal contribution from spurious peaks (1.0% or less).

2.7. The microscopy must be equipped with an automated sample holder loading system. The user must be able to load the TEM sample holder into the autoloading system, push a button, and have the specimen holder automatically loaded in the TEM.

2.8. The required imaging modes shall include high-angle annular dark-field (HAADF) and bright field (BF) imaging, both in STEM mode. All types of image modes shall be operated separately or simultaneously.

2.9. The required diffraction modes shall include convergent-beam diffraction, micro-beam diffraction, nano-beam diffraction and Ronchigram acquisition.

2.10. Other operation modes include, but not limited to, electron energy-loss spectroscopy (optional), conventional transmission electron microscopy (CTEM) imaging, secondary electron imaging (SEI) and free-lens control mode for magnetic imaging.

2.11. Ronchigram and diffraction pattern shall be recorded on a 4kx4k CMOS camera for both convergent beam and parallel beam electron diffraction.

2.12. The TEM stage must be operable through piezoelectric drives in three dimensions (X, Y, Z).

2.13. Electrostatic dose modulator (EDM) system as fast beam blanking system with a pre-sample electrostatic deflector with which the beam can be switched on/off in less than 50ns for dose control on the sample.

2.14. Nanometer pattern generation system (NPGS) for nanoscale lithography, with control of the fast beam blanking system.

2.15. Principal components shall include:

a) Cold field emission electron gun (CFEG) operated at 20-200 kV.
b) Electron microscope column operated at 20-200 kV.
c) High resolution polepiece.
d) Noise cancelling quadruplet CL aperture.
e) Motor drive quadruplet IL aperture with aperture diameter 100, 50, 20 and 10μm.
f) Motor drive Faraday cage hard X-ray aperture.
g) High-stability 5-axis sample goniometer (X, Y, Z linear motions and alpha, beta sample tilts) with ±30° tilt. Maximum specimen tilting range to ±80° with high tilt holder. Drift correction for both TEM and STEM mode shall be provided.
h) Motor- and piezo-driven X, Y, Z specimen stage.
i) A single tilt holder with 30° tilt in a single axis and a reinforced, low background (analytical) double-tilt holder with ±30° tilt on two orthogonal axes shall be provided.
j) High angle annular Dark Field (HAADF) STEM detector, Bright Field (BF) STEM detector.
k) Backscattered electron image detector on the side of the incoming beam with resolution of 1nm or better.
l) Fast CMOS camera with 4kx4k pixels for 2D diffraction pattern/Ronchigram pattern detection, and 4D-STEM.
m) At least two 100mm^2 or greater silicon-drift EDS detectors.
n) Auto sample holder loading/unloading system with one button operation mode.
o) Motorized beam stopper for electron diffraction to protect camera.
p) Fluorescent screens (large and small) and binoculars shall be provided to visualize TEM images and electron diffraction.
q) A water chiller system and 200-240V universal power supply (UPS) shall be provided.
r) User-friendly instrument-control panel, computers, data acquisition and automation hardware and software, and data processing and analysis software (Gatan Microscopy Suite Software or equivalent).
s) Flat-screen monitors displaying microscope's operating conditions, instrument parameters (e.g., acceleration voltage, magnification, camera length, specimen position and tilt).

3. Optional Configuration of the Microscope

The configuration below must be provided by vendors as optional to be installed later.

3.1 High Energy Resolution Electron Energy Loss Spectrometer with energy resolution of 0.3eV or better, without the use of monochromator, as measured by full width half maximum of the zero low peak in an EEL spectrum.

3.2 High tilt holder for tomography ±80° tilt on two orthogonal axes, and corresponding software.

BROOKHAVEN NATIONAL LABORATORY
SUPPLIER QUALITY ASSURANCE REQUIREMENTS
(BNL-QA-101)

PO/Contract No.: 476963

1.0 PURPOSE & SCOPE

1.1 This document establishes quality assurance requirements to which Suppliers to Brookhaven Science Associates (BSA) must conform when specified in the procurement documentation.

1.2 This document contains two main sections. Section 3.0 covers the general requirements that are applicable to all Suppliers. Section 4.0 contains special quality requirements that are applicable only when specifically invoked in the procurement documentation.

2.0 DEFINITIONS

2.1 The term Procurement documentation means the purchase order (PO), contract, subcontract, Request for Proposal (RFP), Request for Quotation (RFQ) or other written agreement with the Supplier (seller) in which the requirements of BSA are incorporated.

2.2 The term Buyer means BSA operating Brookhaven National Laboratory, acting by and through its Procurement & Property Management Division (PPM) issuing the PO/contract.

2.3 The term Supplier (seller) means the legal entity, which is the contracting party, with the Buyer with respect to the procurement documentation.

2.4 The term article or item means a product and/or a service.

3.0 GENERAL REQUIREMENTS

Unless otherwise specified in the procurement documentation, the following General Requirements apply:

3.1 Supplier's Quality System and Quality Requirements

The Supplier must have and maintain an effective quality system that will, as a minimum, comply with all of the requirements as designated by the following:

☐ **3.1.1** A quality system certified/registered to the ISO 9001 standard: (latest revision as of the date of issuing the procurement documentation).

☒ **3.1.2** A quality system that meets the requirements of the ISO 9001 standard: "Quality Management Systems – Requirements" (latest revision as of the date of issuing the procurement documentation).

☐ **3.1.3** Conformance to Supplier's/Manufacturer's quality program or system.

☐ **3.1.4** Other: Refer to procurement documentation, (e.g. PO, Statement of Work [SOW], specifications, drawings) for quality requirements.

NOTE: Clauses 3.2 through 3.22 apply to all POs and will be included collectively in other procurement documentation when required/specified.

3.2 Assessment by Buyer

The Supplier's quality system is subject to assessments by the Buyer's Representative(s) for conformance with the requirements of the PO. Supplier or Distributor must allow BSA representatives, BSA customers, and regulatory agencies right of entry into the Supplier's facilities to determine and verify product, processes, records, personnel, material, procedures, and systems.

3.3 Change Approval

No change(s) are permitted to be made to any Buyer requirements, (e.g. part number, model number, etc.) without the prior written approval of the Buyer.

3.4 Responsibility for Subcontractors

It is the responsibility of the Supplier to impose applicable requirements from this document upon their subcontractors. Additionally, the Buyer reserves the right to disapprove, in writing, any subcontractor**.** For nuclear facility requirements per NQA-1, the Supplier must incorporate NQA-1 requirements in sub-tier procurement documents.

3.5 Responsibility for Conformance

The Supplier is responsible to provide items that conform to the requirements of the PO regardless of any assessments, surveillances, inspections and/or tests by the Buyer or its representatives at either the Supplier' or Buyer's facility. The Buyer reserves the right to request failure analysis and corrective action for non-conforming articles or items submitted or supplied to the Buyer. The Supplier is responsible for notifying the Buyer of any recalls or alerts associated with this PO.

When NQA-1 requirements are imposed, prior to shipment, the Supplier must report any nonconformance that cannot be corrected to full conformance and obtain approval from BNL for possible Use-As-Is or Repair dispositions. Additionally, for commercial grade services, a service performance record must be provided that documents the adequacy of the service performed to the identified critical characteristics documented in the PO/contract.

3.6 Protection of Material and Equipment

The Supplier must employ procedures that assure adequate protection of material and equipment during shipment and while in storage. Such protection must include special environmental packaging, as necessary. All items shipped (originally packaged or repackaged) to BNL or other locations cited in the PO or contract, must comply with the requirements for preservation, packaging and marking as stated in the latest revision of ASTM Standard D 3951 Standard Practice for Commercial Packaging.

3.7 Measuring and Test Equipment (M&TE) Calibration

The Supplier must calibrate any M&TE used in the fulfillment of the PO requirements against certified standards that are traceable to the National Institute of Standards and Technology (NIST), or some other recognized national or international standard, or physical constant. The Supplier must notify the Buyer of any condition found during the calibration, servicing or repair of measuring and test equipment that can affect the end item requirements.

3.8 Suspect Counterfeit Parts

- The Supplier shall verify the procurement source and associated documentation certifying authenticity.

- Appropriate incoming inspection and / or test methods shall be used to detect potential suspect counterfeit items.
- The Supplier shall flow this requirement down to all sub-tier suppliers to prevent the inadvertent use of suspect counterfeit items.
- Distributors shall not modify, rework or repair any items shipped on this order.
- For reference only, a list of authorized/franchised distributors for electronic components can be found at: https://www.trustedparts.com/

* For more information refer to the following Department of Energy website: https://www.energy.gov/ehss/corporate-reporting-analysis/databases/suspectcounterfeit-and-defective-items

3.9 Electrostatic Discharge Control
Items that are susceptible/sensitive to electrostatic discharge (ESDS) must be handled and packaged to protect them from damage. Items and/or packages must be labeled to indicate the susceptibility to electrostatic discharge.

3.10 Electrical or Fire Protection Equipment, Material, and Systems
All electrical or fire protection equipment, material, and systems delivered to BNL must be certified, listed, or labeled by a Nationally Recognized Testing Laboratory (NRTL). The CE mark is NOT a recognized NRTL certification mark. (For a listing of OSHA-recognized NRTLs, refer to http://www.osha.gov/)

For electrical or fire protection equipment, material, and systems which no NRTL accepts, certifies, lists, labels, or otherwise determined to be safe, the Supplier must determine the equipment to be safe for its intended use. The determination must be made on the basis of test data. The determination and test data documents must be made available to BSA prior to or upon delivery for review and acceptance by the applicable BSA Authority Having Jurisdiction (AHJ).

In accordance with 29 CFR 1910.147(c)(2)(iii) whenever new machines or equipment are provided with energy isolating devices, those devices must be designed to accept a lockout device.

3.11 Hoisting & Rigging Equipment
All hoisting & rigging equipment used at BNL must meet the requirements of the latest applicable OSHA Regulations and ASME B30 Series standards for design, construction, markings, and proof load testing**.**

When proof load testing is required by the standards, a certificate must be provided upon delivery documenting the proof test.

3.12 Deleted – requirements were added to each Purchase Order as the "Advance Notification of Delivery."

3.13 Powered Machine Shop Equipment
All powered machine shop equipment (e.g., lathe) delivered to BNL must meet the requirements of the latest applicable OSHA 1910 Regulations (e.g., part subpart O). Equipment purchased must include an integrated NFPA 79 compliant emergency stop and an anti-restart device.

3.14 Vehicle-Mounted Elevating and Rotating Aerial Devices
All vehicle-mounted and rotating aerial devices equipment used at BNL must meet the requirements of ANSI A92.2.

3.15 Self-propelled Elevating Work Platform Equipment
All self-propelled elevating work platform equipment (e.g., scissor lift) used at BNL must meet the requirements of ANSI A92.6.

3.16 Manually Propelled Elevating Aerial Platform Equipment
All manually propelled elevating aerial platform equipment used at BNL must meet the requirements of ANSI 92.3.

3.17 Boom Supported Elevating Work Platform Equipment
All boom supported elevating work platform equipment used at BNL must meet the requirements of ANSI 92.5.

3.18 Powered Industrial Trucks and Attachments
Powered industrial trucks (e.g. forklifts, hi-lows) must meet the requirements of the ANSI/ITSDF B56 series for design, construction, markings, and test loading. Industrial truck attachments must be approved by the truck manufacturer and supplied with an attachment data plate indicating the new truck capacities.

3.19 Used Industrial Equipment
For used industrial equipment (e.g. scissor lifts, forklifts, etc.), a Certificate of Conformance as defined in clause 4.16 must be provided as objective evidence and must additionally state that all maintenance and manufacturing alerts have been screened and all required repairs and improvements have been completed. The Supplier must provide records of the last year of maintenance.

3.20 Global Harmonized System Compliance
The supplier of chemicals must deliver the chemical in full compliance with the Department of Labor, Occupational Safety & Health Administration (OSHA)'s Globally Harmonized System (GHS) Hazard Communication Standard (29CFR1910.1200), available at:
https://www.osha.gov/dsg/hazcom/HCSFinalRegTxt.html

All hazardous chemicals delivered to BNL must be accompanied by an GHS Safety Data Sheets (SDS) with the format and content specified in 29CFR1910.1200. For information on the GHS SDS see OSHA Brief- Hazard Communication Standard: Safety Data Sheets Publication 3514 available at:
https://www.osha.gov/Publications/OSHA3514.pdf

All hazardous chemicals delivered to BNL after 12/01/2015 must have a label with the elements specified in 29CFR1910.1200 [product identifier; pictograms; signal words; hazard statement(s); precautionary statement(s); and manufacturer, importer, or distributor's name, address, and telephone number]. For information on the GHS label, see OSHA Brief- Hazard Communication Standard: Labels and Pictograms Publication 3636 available at:
https://www.osha.gov/Publications/OSHA3636.pdf

3.21 Age/Shelf Life and Storage Control
The Supplier must have an effective storage and age control system for items where acceptability is limited by the age or manner of storage of the item. The system must include a method of identifying the expiration date on the containers in which material is delivered to the Buyer. Special handling conditions must be recorded on certifications and shipping documents covering the material delivered to the Buyer. At the time of receipt, the material must not have less than three-quarters of its shelf life remaining, without prior written approval from the Buyer for each shipment.

3.22 Product Recalls/Product Bulletins/Safety Alerts
Any and all product recall alerts, product bulletins, or safety alerts must be communicated by email directly to ProductRecallAlert@BNL.gov. Provide the Purchase Order Number(s) and names of purchasers with notification to assist BNL in locating and identifying the subject material.

4.0 SPECIAL REQUIREMENTS
The following Special Requirements are applicable only when specified in the procurement documentation or as indicated by check mark hereon. These Requirements can be modified as required.

INSTRUCTIONS: Since sub-clauses (e.g., 4.4.1) are tied to the main clause (e.g., 4.4), the requirements of the main clause will apply by default whenever any sub-clause is selected (regardless of whether the main clause was selected/checked).

☒**4.1 Quality Assurance Program or Manual**
The Supplier must submit a copy of their Quality Assurance Program or Manual with their proposal for review and evaluation.

☐ **Suppliers providing A1/A2 but without a quality system compliant with NQA-1, i.e., Commercial Grade Supplier,** must follow applicable Commercial Grade Dedication Instructions as defined in the SOW.

OR

☐ Supplier must utilize the QA Program audited and approved by BNL.

☒**4.2 Configuration Control System**
The Supplier must establish and maintain a system to assure that all end items (including spares) are of the proper configuration, and that all approved configuration changes are incorporated at the specified effectivity points. Records must be maintained to verify the configuration of each item.

☒**4.3 Process Sheets, Travelers, etc.**
The Supplier must maintain a system of process sheets, shop travelers, or equivalent means to define the sequence of manufacturing, inspection, installation and test activities to be performed. Flow sheets, or equivalent, must be provided for sign-off by designated inspection personnel at specified inspection and test points, including, as required, re-inspection and re-test points, to assure completion as well as proper sequencing of required operations.

☒**4.4 Manufacturing/Inspection/Test Plan**
Sixty (60) calendar days prior to performance of work, the Supplier must submit for the Buyer's approval a Manufacturing/Inspection/ Test Plan for the item(s) to be produced. Once approved, changes/ revisions must be approved by the Buyer prior to implementation. The Plan must satisfy one or more of the following as selected:

☐**4.4.1** Identification of parts and subassemblies showing integrated flow into end item(s).

☐**4.4.2** Identification of critical manufacturing operations, as well as inspection and test checkpoints.

☒**4.4.3** The Plan may be a single document, or may make use of existing "travelers," or other suitable planning and control documents.

☒**4.5 "Witness" Points**
The Buyer reserves the right to designate selected manufacturing, inspection, and/or test operations as "witness" points. The Supplier must provide the Buyer with five (5) working days' notice in advance of reaching such witness points during the manufacturing and test cycle of each item. For nuclear facility applications (NQA-1), witness points are required when Source Inspection is invoked. (see Clause 4.14)

☒**4.6 Test and Inspection Procedures**
Test and inspection procedures required to demonstrate satisfactory completion of requirements must be prepared by the Supplier and submitted to the Buyer for approval sixty (60) calendar days prior to use of such procedures. Once approved, changes/revisions must be approved in writing by the Buyer prior to implementation.

☒**4.7 Special Processes**
Processes (e.g., welding, brazing, bonding, plating, chemical machining, chemical coating, chemical cleaning, precision cleaning, heat treating, or waste processing) that either cannot be verified non-destructively or require a unique (special) non-destructive test/inspection (e.g., radiographic inspection, ultrasonic testing, pressure leak testing) must be performed in accordance with detailed written procedures. These procedures must specifically describe the exact manner in which the processes are to be performed. Additionally, the following requirements apply as selected:

☒ **4.7.1** Copies of special process procedures must be made available on request for review by the Buyer's representative.

☐ **4.7.2** At least sixty (60) calendar days prior to use on items deliverable to the Buyer, the Supplier must submit to the Buyer copies of all applicable process procedures for review and approval. Revisions or changes to Buyer-approved special process procedures must be submitted to the Buyer for review and approval prior to implementation.

☒**4.7.3 Qualification of Procedures, Facilities, Equipment and Personnel**
The Supplier must, prior to use, qualify the procedures/specifications, facilities, equipment and personnel that will be used for the performance of special processes. Only those personnel who have been qualified to perform a specific special process must be used to perform that process. Records of such qualification must be available to the Buyer's representative upon request.

4.8 Qualification of Procedures, Facilities, Equipment
Superseded by Sub-clause 4.7.3

4.9 Qualification of Special Process Personnel
Superseded by Sub-clause 4.7.3

☒**4.10 End-Item Documentation Package**
The Supplier must provide a documentation package for each shipment of the item(s) supplied, which consists of objective evidence of compliance with PO requirements. This documentation package must be complete, legible, indexed, and traceable to the item supplied. Additionally, the following requirements apply as selected:

☒**4.10.1** Copies of reports of all required or necessary inspections, examinations and tests, properly validated by the Supplier's authorized personnel.

☒**4.10.2** A listing of the as-built configuration of each delivered item; this may be defined by the use of drawing numbers and revisions, unique parts lists or other such means of positive identification.

☒**4.10.3** Copies of nonconformance reports dispositioned as "rework/repair" or "use-as-is", and all BSA approved deviation/waivers.

☐ **4.10.4** Copies of material test certificates for specified materials, showing physical and chemical properties.

4.10.5 – Superseded by Clause 4.16

☐**4.11 Release for Shipment**
The documentation package required in Clause 4.10 must be approved by the Buyer's representative prior to release of the item for shipment.

☐**4.12 Shipment of Documentation Package to Buyer**
Three (3) copies of the documentation package required in Clause 4.10 must be shipped to the Buyer with or prior to each shipment of the purchased items.

☒**4.13 Failure Reporting, Analysis and Corrective Action**
The Supplier must maintain a failure reporting, analysis and corrective action system that must, at a minimum, evaluate, analyze and correct failures occurring during qualification, first article and end-item acceptance testing and inspection. The results of all failure evaluations and analyses must be documented and available for review by the Buyer.

☒**4.14 Source Inspection/Verification**
Items to be delivered require inspection, tests or surveillance by the Buyer's representative at the Supplier's facility. Five (5) working days advance notice, for acceptance inspections and tests, must be provided by the Supplier to the Buyer to permit scheduling of source inspection. For nuclear facility applications (NQA-1), source verification must be conducted in accordance with a Verification Plan to inspect, test, or examine at predetermined/Witness points (see Clause 4.5). Documented evidence of acceptance must be provided upon completion of all verifications.

☐**4.15 Chemical and Physical Test Report**
One copy of the actual chemical and physical test report(s) for each heat, batch or lot must accompany each shipment. Test reports must list the actual parameters tested, the acceptable limits for each parameter, and must contain the actual readings taken during test.

☒**4.16 Certificate of Conformance (C of C)**
With each shipment, per the procurement documentation, the Supplier must submit a Certificate of Conformance (C of C). In case of drop shipment, a copy of the certificate must be submitted to the Buyer at the time of shipment. The certificate must identify the purchased item/material/equipment by PO number and quantity, include the title of and be signed by an authorized representative of the company, and must constitute a representation by the Supplier that:

A. Materials used are those which have been specified by the Buyer, and that the items delivered were produced from materials for which the Supplier has on file, reports of chemical or physical analysis, or any other equivalent evidence of conformance of such items to applicable specifications;

B. Processes used in the fabrication of items delivered were in compliance with applicable specifications included as part of the PO/contract, or Buyer-approved procedures or specifications;

C. The items as delivered comply with all applicable drawings, specifications, deviations/waivers and other requirements of the procurement documentation; and-

D. When specified, cleaning and cleanliness requirements have been completely satisfied. The C of C must reference the Supplier's applicable cleaning procedures.

☐**4.16.1 Additional C of C Requirements for Nuclear (NQA-1) Purchases**

A. The certificate must be signed by the person responsible for the quality function and whose function and position is described by the supplier's QA program/system.

B. The Supplier's Certification system must be described in their QA Program/system documentation and include the process for completing the C of C along with the review and Approval of the C of C prior to delivery.

C. The Buyer reserves the right to verify the validity of Supplier's certificates and the effectiveness of the Supplier's certification system. This verification will be commensurate with the Supplier's quality performance/history.

4.17 Report with Each Shipment
Superseded by Clause 4.10

☐**4.18 First Article Acceptance**
Buyer acceptance of first article(s) is required prior to the production run. The first article(s) must be identified as such, including the PO number/contract, part number, and part name. The Supplier is required to:

☐ **4.18.1** Submit the first article(s) to the Buyer's representative for test/inspection to be conducted at the Supplier's facility by the Buyer's representative.

☐ **4.18.2** Submit the first article(s) to the Buyer for test / inspection by the Buyer at the Buyer's facility.

☐ **4.18.3** Submit the first article(s) to the Buyer together with documents showing data representing results of the Supplier's first article(s) test/inspection, including the actual dimension or value for each specified characteristic.

☐ **4.18.4** After Buyer acceptance of first article(s), all of the remaining units required by the PO/contract must be produced by the Supplier and the Supplier's suppliers using the same design, materials, processes, methods and tooling that were used to manufacture the approved first article(s). Any changes must have prior written approval from the Buyer.

☒**4.19 Notification of Change to Design, Methods, or Processes**
The Supplier must immediately notify the Buyer of any significant changes (those that may affect form, fit, function, reliability, safety, or interchangeability) in product design, fabrication methods, materials, or processing from those used by the Supplier at time of Supplier's quotation or offer to the Buyer, which resulted in the PO.

4.20 Age/Shelf Life and Storage Control
Superseded by Clause 3.21

☒**4.21 Serial Numbers**
The Supplier must assign/mark a separate and distinct serial number to each end-item in accordance with the procurement documentation. A record of the serial number, for each part number, must be maintained by the Supplier.

☐**4.22 Lot or Batch Numbers**
For items furnished in accordance with the procurement documentation, the manufacturing lot or batch number must be indicated on the packing list, certifications and other applicable documents. Where impractical to mark individual parts due to size or shape, the lot or batch number must be marked on identifying tags or the smallest unit package.

☐ **4.23 Material Traceability**
Materials used must be identified by material type, applicable specification and revision number, and be traceable to their lot and/or heat number(s). Traceability records must be available for review by the Buyer's representative.

☐ **4.24 Shipment Destination Other than BNL**
The material ordered is to be shipped to other than the Buyer's facilities. Copies of the data required in accordance with the procurement documentation must accompany the shipment; in addition, one copy of such data must be mailed to the Buyer on the same day that shipment is made.

4.25 Heat Treat Bars
Superseded by Clause 4.7

☐ **4.26 Burn-in**
Burn-in must be performed on each completed item, per the procurement specification or Supplier's Burn-In process approved by the Buyer. Records of burn-in testing, repairs and test results must be maintained and must be available to the Buyer's representative upon request.

4.27 Welding Procedures
Superseded by Clause 4.7

☐ **4.28 Weld/Braze Inspection Report**
A report(s) must be submitted that indicates the complete inspection of welds or brazes from the initial fit-up stage through final inspection. Inspection reports must be accompanied by all radiographic films, filler metal reports etc. The reports must contain the signature or stamp, and title of an authorized Supplier representative.

☐ **4.29 Radiographic Quality Requirements**
Items requiring radiographic inspection must be radiographed and processed in accordance with the Supplier's special process procedures that satisfy design specifications, standards or other procurement documentation requirements. Personnel reading and interpreting film must have been examined and certified. Responsibility for this certification must rest with the Supplier, whether the Supplier does the work or subcontracts to a specialized laboratory. A report of the findings must include the name of the reader and the signature and title of a responsible representative. The radiographic film and a reproducible copy of the report must accompany each shipment. An adequate method of identifying and cross-referencing each film exposure, report, and item must be provided. When parts are serialized, serial numbers must appear on the report and the film.

☒ **4.30 Nondestructive Test Reports**
All nondestructive testing must be conducted in compliance with the Supplier's special process procedures that satisfy the applicable provisions of the design specifications, or other procurement documentation requirements. Personnel and equipment utilized in performance of such tests must be qualified for the type of test performed. The Supplier must furnish with, or prior to, each shipment reports of such nondestructive examination of material or items furnished. These reports must be identifiable to the respective item or material including the specific section, joints or views of the item furnished. These reports must contain the signature and title of an authorized Supplier representative. When items are serialized, the serial numbers must appear on the reports.

☒ **4.31 Pressure or Leak Test Reports**
Test reports must be prepared for all pressure and leak tests. Such reports must state the requirement, the Supplier's test procedure number, and the observed result for each item, joint or connection tested. When items are serialized, the serial numbers must appear on the report. Reports must contain the signature/title of an authorized Supplier representative and must accompany each shipment.

4.32 Cleaning Certification
Superseded by Clause 4.16 D

☐ **4.33 Calibration Certification**
The Supplier must submit with each instrument/system a certification that the instrument/system has been calibrated and is ready for use. The certification must contain, at a minimum, the identity of the instrument/system, identification of the calibration procedure used, identification of the standards and/or equipment utilized for the calibration, and a statement that the calibration of the standards and/or equipment used is traceable to the NIST or some other recognized national or international standard, or physical constant. Unless otherwise specified, detailed support data must remain on file for minimum of three (3) years with the Supplier and must be available for review by the Buyer. The certification must also contain the signature and title of an authorized Supplier representative.

☐ **4.33.1** The Supplier will provide "As Found" (i.e., before) and "As Left" (i.e., after) measurements with the certification.

☐ **4.33.2 Additional NQA-1 Calibration Certification Requirements**
The Calibration Certificate must be signed by the person responsible for the quality function and whose function and position is described by the supplier's QA program/system.

The Supplier's Certification system must be described in their QA Program/system documentation and include the process for completing the Calibration Certificate along with the review and Approval of the Certificate prior to delivery.

The Buyer reserves the right to verify the validity of Supplier's Certificates and the effectiveness of the Supplier's certification system. This verification will be commensurate with the Supplier's quality performance/history.

The Certificate must include the following:

- M&TE ID or Asset number
- The Supplier's calibration procedure
- The recommended frequency of calibration
- The calibration date
- The next calibration due date
- As-found calibration data must be reported in the Calibration Certificate when calibrated items are found to be out-of-tolerance.
- The standards used for calibration
- The PO number
- Any additional technical and quality requirements, as necessary.

On the Certificate, the supplier must also attest that the contracted calibration or test service has been performed in accordance with their ISO/IEC-17025 program, has been performed within their scope of accreditation, is traceable to NIST, the PO's requirements are met, and identify all nonconforming conditions.

☒**4.34 Operating-Maintenance Manual**
Documentation containing operating procedures, maintenance instructions, spare parts lists, and handling procedures must be submitted with the shipment of the first item.

☒**4.35 Computer Software Configuration Management**
The Supplier must have and maintain an effective software configuration management system. The Supplier's system must establish requirements for placing software under configuration control, provide for the positive identification of software, and the control of all software baseline changes.

☐ **4.35.1** The Supplier must submit a copy of their software configuration management procedure(s) with their proposal for review and evaluation, and specifications for software features, including requirements for safety, security, functions, and performance.

4.35.2 Superseded by Sub-clause 4.35.1

☒**4.36 Computer Software Verification and Validation (V&V)**
The Supplier must develop written procedures describing the controls applied to the design of software and the validation of the design through independent technical review. The procedures must provide for documentation of review activities, including requirements for documenting comments and resolution of comments. Supplier software designs and review documentation must be subject to review and approval by the Buyer.
The Supplier must test and verify computer software developed or modified to fulfill the requirements in the procurement documentation. The verification testing must be accomplished by a comparison of test results with those from other verified software, or by a comparison with results from analytical solutions or Buyer-approved alternatives.

☒**4.37 Computer Software Notification of defects, new releases or other issues**
For Safety Software, the Supplier must provide a process to (a) notify users of defects, new releases, or other issues that impact the operation and (b) mechanisms for the users of the software to report defects and request assistance in operating software.

4.38 Computer Software User Training
The Supplier must provide formal on-site, off-site or on-line training for users.

☒**4.39 Records**
The Supplier must retain objective evidence, including records, of the inspections and tests performed in the course of manufacturing, testing, inspecting, preserving, packaging, and preparation for shipment of procured items. These records must be made available to the Buyer's representative for review upon request. These records must be maintained for a minimum of three (3) years, unless otherwise specified in the procurement documentation, after the completion of the PO/contract.

4.40 Electrical, Fire Protection, or Scaffolding Equipment, Material, and Systems
Superseded by Clause 3.10

4.41 Hoisting & Rigging Equipment
Superseded by Clause 3.11

4.41.1 Powered Industrial Truck Attachments
Superseded by Clause 3.18

4.41.2 Custom-made Equipment
Superseded by Clause 3.11

4.41.3 Critical Lifts
Superseded by Clause 3.11

4.42 Marking of Outer Package and Hoisting & Rigging Services
Superseded by Clause 3.12

☐**4.43 Franchised/Licensed "Distributor" Traceability**
Products that are not purchased directly from the Original Equipment Manufacturer (OEM)/Original Component Manufacturer (OCM) must be purchased only from a franchised/licensed distributor of the product being offered. The distributor must provide documentation that the distributor is contractually authorized by the manufacturer as a franchised / licensed distributor along with the geographic region(s) covered by the authorization. The distributor must not use brokers (any company, person, or entity who is not an OEM/OCM or authorized by the OEM/OCM) for the purchase of items, unless pre-approval has been granted by Brookhaven Science Associates (BSA). For reference only, a list of authorized/franchised distributors for electronic components can be found at:
https://www.trustedparts.com/

☐ **4.43.1** The distributor must ensure traceability of all products to the Original Equipment Manufacturer (OEM)/Original Component Manufacturer (OCM) by identifying the Original Equipment Manufacturer (OEM)/Original Component Manufacturer (OCM) for each lot and / or date code on the Certificate of Conformance. The distributor must provide a copy of the Manufacturer's certificate for the lot number being supplied, along with their franchised distributor documentation.

4.44 Power Machine Shop Equipment
Superseded by Clause 3.13

4.45 Aerial Lifts Equipment
Superseded by Clause 3.14

4.46 Self-propelled Elevating Work Platform Equipment
Superseded by Clause 3.15

☐**4.47 Nuclear (NQA-1) Calibration Services**
The service must be provided in accordance with the supplier's accredited ISO/IEC-17025 program and scope of accreditation. As-found calibration data must be reported in the certificate of calibration when calibrated items are found to be out-of-tolerance. The equipment and standards used to perform the calibration must be identified in the certificate of calibration. Subcontracting of these accredited services is prohibited. BNL must be notified of any condition that adversely impacts the supplier's ability to maintain the scope of accreditation. Performance of the services listed on this order is contingent on the Supplier's accreditation having been achieved through an on-site accreditation assessment by the accreditation body within the past 48 months. Any additional technical and quality requirements, as necessary.

☐**4.48 Nuclear (NQA-1) Right of Access**
BNL or designated representative may enter the premises of Supplier (or its sub-tier supplier) and review records for the purpose of inspection, surveillance, or quality assurance audit.

☐ **4.49 Nuclear (NQA-1) Partial Orders**
Supplier may not ship partial orders without prior written approval from BNL.