

Buyer	Amount	Contract Number
Maile Nichols	TBD	419159

BROOKHAVEN NATIONAL LABORATORY

Brookhaven Science Associates

P.O. Box 5000

UPTON, L.I., N.Y. 11973-5000

*Name and Address of Contractor***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 with the United States of America (the "Government") represented by the United States Department of Energy ("DOE").

I. SCOPE OF WORK

The Contractor shall furnish all labor, services, materials, and equipment to build a deep reactive ion etch reactor (SiDRIE) with single wafer semi-automatic transfer chamber for the Center for Integrated Nanotechnologies (CINT) at Sandia National Laboratories (SNL). The SiDRIE will be procured by Brookhaven Science Associates (BSA) on behalf of the CINT as part of the Nanoscale Science Research Center Recapitalization (NSRC-Recap) project. The SiDRIE reactor supports microfabrication efforts for highly selective, precision etching of single crystal silicon and Silicon On Insulator (SOI) materials for the development of Mid-Infrared Photonics, MEMS and other advanced material research activities. Dual purpose Si etch capability, providing both high speed time- multiplexed, high aspect ratio/through wafer etch and plasma dicing, and also shallow etching of crystalline silicon structures in the sub-micron region with high precision. The new system will include a single 100-200mm transfer chamber, a heated reaction chamber that includes a high power inductively coupled plasma unit, a heated/CW and Pulsed LF biasing electrode with associated gas delivery, vacuum and cooling systems, optical emissions spectrometry and laser interferometry.

All work shall be conducted in strict accordance with Attachment (1) Brookhaven National Laboratory Statement of Work entitled "Silicon Deep Reactive Ion Etch Reactor (SiDRIE)", Version 1 dated July 26, 2022, Attachment (2) Brookhaven National Laboratory Technical Specifications entitled "Silicon Deep Reactive Ion Etch Reactor (SiDRIE)", Version 1 dated July 26, 2022 and Attachment (3) BNL QA-101, all of which are incorporated herein.

A. Reports/Deliverables: The Contractor shall provide the following deliverable(s)

to and as directed by BSA's Technical Representative:

Item	Deliverable	Due	BSA Approval
1	Program Plan	2 weeks after award of contract	Yes
2	Technical and Progress Teleconference	2 weeks after award of contract/weekly	No
3	Performance reports	5th of each month after receipt of Program Plan and Within 2 weeks of key project milestones	No
4	Manufacturing/Inspection/Test Plan	6 weeks after award of contract	Yes
5	Installation Work Plan	26th week after award of contract	Yes
6	Factory acceptance testing	50th week after award of contract	Yes
7	Delivery of the Instrument	52nd week after award of contract	Yes
8	Site Acceptance Test Report	60th week after award of contract	Yes
9	Commissioning Report	62nd week after award of contract	Yes

- B. **Key Personnel** The following individual(s) have been designated as "Key Personnel".

<u>Personnel</u>	<u>Title</u>
<u>Personnel</u>	<u>Title</u>
TBD	TBD

The Contractor agrees to assign such employee(s) or persons to the performance of the work under this contract and shall not reassign or remove the above individual(s) without written justification and prior approval of BSA Contractual Representative.

II. **PERIOD OF PERFORMANCE:**

This Contract shall be effective as of the date executed by BSA provided that the Contractor executes the Contract without exception or alteration. It shall remain in effect through March 31, 2024.

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 _____ US 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:

Item	Description	Due Date	Amount
1	Program Plan	2 weeks after award of contract	TBD
2	Technical and Progress Teleconference	2 weeks after award of contract/monthly	TBD
3	Performance reports	5th of each month after receipt of Program Plan and Within 2 weeks of key project milestones	TBD
4	Manufacturing/Inspection/Test Plan	6 weeks after award of contract	TBD
5	Installation Work Plan	26th week after award of contract	TBD
6	Factory acceptance testing	50th week after award of contract	TBD
7	Delivery of the Instrument	52nd week after award of contract	TBD
8	Site Acceptance Test Report	60th week after award of contract	TBD
9	Commissioning Report	62nd week after award of contract	TBD

Payment terms are Net 30.

Invoices shall be directed to BSA's Accounts Payable Section 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. Invoices shall be submitted in PDF format, via e-mail, to apinvoices@bnl.gov.

Hard copy invoices, in duplicate, shall be directed to BSA's Accounts Payable Section, 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 (for North American and international shipments insert:) FOB (Free on Board) destination, "DAP" Delivered At Place, Center for Integrated Nanotechnologies, Sandia National Laboratories, 1101 Eubank Blvd SE, Albuquerque, NM 87123 (Freight Prepaid).

- D. **Shipping and Labeling:**

Two (2) weeks prior to delivery of all items the contractor shall contact BSA as to the type of freight carrier that will be used.

IV. AUTHORIZED REPRESENTATIVES

- A. **BSA's Technical Representative:** TBD of the _____, located in Building _____ is BSA's Technical Representative, hereunder. *(He/She)* shall act as liaison between BSA and the Contractor in technical matters only. *(He/She)* can be reached at _____ (phone), _____ (e-mail).
- B. **BSA's Contractual Representative:** TBD located in Building _____, telephone no. _____, _____ (e-mail), 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 Procurement and Property Management Division's Manager, or his designee.
- C. **Contractor's Technical Representative:** TBD is the Contractor's authorized Technical Representative, hereunder. *(He/She)* shall act as point of contact between BSA and the Contractor in technical matters only. *(He/She)* can be reached at _____ (phone), _____ (e-mail).
- D. **Contractor's Contractual Representative:** TBD is the Contractor's authorized Contractual Representative, hereunder. *(He/She)* shall act as liaison between BSA and the Contractor. *(He/She)* can be reached at _____ (phone), _____ (e-mail).

VII. ADDITIONAL TERMS

The provisions of Brookhaven Science Associates, LLC General Terms and Conditions for Non-Commercial Items, (Rev 22.0 September 2022) are incorporated herein and made a part hereof.

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 via the internet at: <https://www.bnl.gov/ppm/terms-and-conditions.php>. 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 1 - Brookhaven National Laboratory Statement of Work entitled "Silicon Deep Reactive Ion Etch Reactor (SiDRIE)", Version 1 dated July 26, 2022.
- Attachment 2 - Brookhaven National Laboratory Technical Specifications entitled "Silicon Deep Reactive Ion Etch Reactor (SiDRIE)", Version 1 dated July 26, 2022.
- Attachment 3 - Brookhaven National Laboratory Supplier Quality Assurance

Requirements, BNL QA-101.

- Attachment 4 – Sandia National Laboratory NTESS Site-Specific Clauses
- Attachment 5 – RIBE Hazard Assessment dated December 08, 2022

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

ACCEPTED:

CONTRACTOR

**BROOKHAVENSCIENCE
ASSOCIATES, LLC.**

By: _____

By: _____

Name: _____

Name: _____

Title: _____

Title: _____

Date: _____

Date: _____

Should you accept this Contract without exception or alteration, one copy of the Contract executed by both parties shall be returned to BSA's Contractual Representative. Should you take any exceptions or attempt to alter the Contract in any manner, BSA's execution thereof shall be null and void. Should you wish to take exception(s)/alteration(s), you shall notify BSA's Contractual Representative. BSA will consider the requested exception(s)/alteration(s) and notify you accordingly. No Contract shall exist unless and until such differences are resolved.

STATEMENT OF WORK (SOW)
for
Silicon Deep Reactive Ion Etch Reactor (SiDRIE) with Single Wafer Semi-Automatic Transfer Chamber.

QA Category: A-2



Jeffrey Nelson

Director, Center for Integrated Nanotechnologies
Sandia National Laboratories



Aaron Stein

Project Manager, NSRC Recap
Center for Functional Nanomaterials




Charles Black

Project Director, NSRC Recap
Director, Center for Functional Nanomaterials



Ashley Head

Technical Representative
Center for Functional Nanomaterials



Wai-Lin Ng

ESH Coordinator
Center for Functional Nanomaterials



John Nogan

Author, Process/Equipment Engineer CINT



Shemara Purto

ESH Coordinator, CINT



Charles Gortakowski

Quality Assurance
Quality Management Office



Brian Swartzentruber

Level 3 Controls Account Manager, NSRC Recap
Center for Integrated Nanotechnologies
Sandia National Laboratories

VERSION CONTROL SHEET

VERSION	DESCRIPTION	DATE	AUTHOR	APPROVED BY
1	First Issue	26JUL22	John Nogan	See cover page.

Contents

1	SCOPE	1
1.1	BACKGROUND	1
1.2	DEFINITIONS/ACRONYMS	1
2	APPLICABLE DOCUMENTS.....	2
3	REQUIREMENTS	2
3.1	CONTRACTOR RESPONSIBILITIES.....	3
3.1.1	<i>Technical Performance</i>	3
3.1.2	<i>Tooling/Fixtures/Test Equipment</i>	3
3.1.3	<i>Factory Acceptance Testing</i>	3
3.1.4	<i>Installation</i>	3
3.1.5	<i>Acceptance Testing at SNL</i>	5
3.1.6	<i>Commissioning</i>	5
3.1.7	<i>Training</i>	5
3.2	MANUFACTURING REQUIREMENTS.....	5
3.2.1	<i>Acceptance Test Procedure</i>	5
3.2.2	<i>Commissioning Reports</i>	6
3.3	MANAGEMENT.....	6
3.3.1	<i>Program Plan</i>	6
3.3.2	<i>Progress Teleconference</i>	6
3.3.3	<i>Manufacturing/Inspection/Test Plan</i>	6
3.3.4	<i>Performance Reporting</i>	6
3.4	DOCUMENTATION AND DATA MANAGEMENT	6
3.5	CONFIGURATION MANAGEMENT.....	8
3.6	SOFTWARE REQUIREMENTS.....	8
3.7	ENVIRONMENT, SAFETY AND HEALTH (ESH)	8
3.7.1	<i>Contractor Work on Site at SNL</i>	8
3.7.2	<i>Electrical Safety</i>	8
3.7.3	<i>Pressure Safety</i>	10
3.7.4	<i>Fire Safety</i>	10
3.7.5	<i>Attachment Points and Lifting Fixtures</i>	10
3.8	PACKAGING	10
3.9	WARRANTY	11
4	QUALITY ASSURANCE	11
4.1	QUALITY ASSURANCE REQUIREMENTS	12
4.2	MATERIAL REVIEW BOARD (MRB) AUTHORITY	12
4.3	QA FLOW-DOWN	12
5	DELIVERABLES	13
6	SCHEDULE/ MILESTONES.....	13
7	VALUE ENGINEERING.....	13

1 SCOPE

This Statement of Work (SOW) will be the basis for the procurement of silicon deep reactive ion etch reactor (SiDRIE) with single wafer semi-automatic transfer chamber for the Center for Integrated Nanotechnologies (CINT) at Sandia National Laboratories (SNL). The SiDRIE will be procured by Brookhaven Science Associates (BSA) on behalf of the CINT as part of the Nanoscale Science Research Center Recapitalization (NSRC-Recap) project. The SiDRIE reactor supports microfabrication efforts for highly selective, precision etching of single crystal silicon and Silicon On Insulator (SOI) materials for the development of Mid-Infrared Photonics, MEMS and other advanced material research activities. Dual purpose Si etch capability, providing both high speed time-multiplexed, high aspect ratio/through wafer etch and plasma dicing, and also shallow etching of crystalline silicon structures in the sub-micron region with high precision. The new system will include a single 100-200mm transfer chamber, a heated reaction chamber that includes a high power inductively coupled plasma unit, a heated/CW and Pulsed LF biasing electrode with associated gas delivery, vacuum and cooling systems, optical emissions spectrometry and laser interferometry.

1.1 Background

The CINT is a user-oriented research center whose mission is to provide the scientific basis for integration of nanoscale materials and enhanced performance. Research at CINT has an emphasis on exploring the path from scientific discovery to achieving new material properties and functionalities, including the integration of nanostructures into the micro and macro worlds.

1.2 Definitions/Acronyms

ASME	American Society of Mechanical Engineers	NFPA	National Fire Protection Association
ATP	Acceptance Test Procedure	NRTL	Nationally Recognized Test Laboratory
BSA	Brookhaven Science Associates	NSRC	Nanoscale Science Research Center
CFN	Center for Functional Nanomaterials	OEM	Original Equipment Manufacturer
CINT	Center for Integrated Nanotechnologies	SNL	Sandia National Laboratories
ESH	Environment, Safety, and Health	QA	Quality Assurance
FAT	Final Acceptance Test	SBMS	Standards Based Management System
MRB	Material Review Board	SOW	Statement of Work
MRP	Material Requirements Planning	AOA	Automated Objective Aperture

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 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
ASME BTH-1	Design of Below-the-Hook Lifting Devices, Design Category “A”
No Doc #	Sandia National Laboratories Job Hazard Analysis Template
No Doc #	Relevant BNL SBMS Subject Areas: <u>Cryogen Safety</u> <u>Electrical Safety</u> <u>Lifting Safety</u> <u>Pressure Safety</u> <u>Personal Protective Equipment</u>

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. Contractor must show, in writing, that the equipment functions within the performance parameters specified by the manufacturer(s).

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 first, then deliver, test and commission the Instrument at SNL. 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.

3.1.3 Factory Acceptance Testing

The Instrument shall be tested at the Contractor's facility in the presence of SNL and/or BSA representatives 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 SNL.

All test data shall be documented in the Acceptance Test reports 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 be responsible for instrument assembly, startup and qualifications. SNL 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 SNL riggers. The Contractor shall not be permitted to drive SNL-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 (2) months before the scheduled start of installation activities. This plan is a necessary prerequisite for obtaining a work permit and must be approved by SNL prior to the start of installation activities. As part of the work planning process, SNL may conduct a pre-job walk through with the Contractor or relevant subcontractor to ensure proper dimensions, approved anchor points for lifting and travel paths are determined before equipment arrives on site. 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. The work permit must be completed prior to start of installation activities. This shall be completed during the Technical Review as well as after the Technical Review in video conferencing and/or teleconferences.

3.1.4.2. All training and safety requirements identified during the work planning process (or by SNL 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.

3.1.4.2.1 Contractor employees, including their subcontractor, and lower tier contractor employees, who may be exposed to an electrical hazard (shock and/or arc flash) must be trained to the appropriate level per SNL's Electrical Safety Subject Area in accordance to their exposure.

3.1.4.2.2 LOTO training shall be required for all Contractor employees, including their subcontractor, and lower tier contractor employees, who “work on” systems or components requiring protection of personnel from unexpected energization or startup of machinery and equipment, or the release of hazardous energy during installation, demolition, or service and maintenance activities. Hazardous energy includes mechanical (rotational, gravitational), electrical, chemical, pressure or vacuum (hydraulic, pneumatic), ionizing and non-ionizing radiation, thermal and other energies that may cause harm. LOTO Training must be completed in compliance with SNL’s Lockout/Tagout (LOTO) for Installation, Demolition, or Service and Maintenance Subject Area.

- 3.1.4.3. CINT shall utilize SNL hoisting and rigging personnel to offload and relocate equipment as dictated by SNL work control requirements. Contractor may operate their own rigging/cranes that are installed as part of their equipment, original equipment manufacturer (OEM) components. All rigging equipment, including slings, must first be inspected by SNL. Additionally, any building anchor points intended for use by the contractor for rigging devices such as chain slings or hoists must be approved by SNL beforehand. Contractor shall be responsible for the Instrument until final acceptance.
- 3.1.4.4. Electrical tools/equipment needed for installation shall be inspected by SNL prior to use at SNL, to ensure compliance with SNL’s electrical safety standards referenced herein.
- 3.1.4.5. 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. Post work testing and acceptance: guidance concerning post work testing to ensure proper completion of work and/or system readiness to return to service
 - k. 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
- 3.1.4.6. Work involving exposure to an electrical hazard must be planned in accordance with the requirements of SNL’s Electrical Safety Subject Area in conjunction with SNL’s Work Planning and Controls Subject Area.
- 3.1.4.7. Work involving controlling hazardous energy sources for installation, demolition, or service and maintenance must be planned in accordance with the requirements of SNL’s

Lock/Tagout (LOTO) for Installation, Demolition, or Service and Maintenance Subject Area in conjunction with Work Planning and Controls Subject Area.

3.1.4.8. Note that disposal of waste packing material shall be the responsibility of SNL.

3.1.4.9. 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. The Contractor shall use plywood or similar protective material to prevent damage to flooring.

3.1.4.10. 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.

3.1.4.11. Installation includes hardware and software setups for computer-based remote control of the Instrument and data processing and analysis.

3.1.5 Acceptance Testing at SNL

The Instrument shall be tested at SNL by the Contractor to demonstrate full compliance with this SOW/Technical Specification documents. SNL shall witness acceptance testing and shall be given sufficient notice to ensure the appropriate staff are present. The tests listed in the SOW/Technical Specification shall be conducted on the Instrument at SNL 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 SNL. SNL shall witness Instrument commissioning and shall be given sufficient notice to ensure the appropriate staff are present.

Commissioning of the Instrument on site in its final configuration shall be performed with samples supplied by SNL. 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 SNL for two (2) SNL scientific and/or technical staffs for the safe operation and maintenance of the Instrument. SNL scientific and/or technical staff will review training plan prior to training and approve during the final acceptance process. This training shall be conducted at SNL for a period of five (5) working days during commissioning for the Instrument. Additionally, the Contractor shall provide two (2) sessions of hands-on user training at SNL for two (2) SNL personnel, each consisting of five (5) working days, for its operation. These training sessions will be scheduled within two (2) months of SNL approval of the final commissioning report.

3.2 Manufacturing Requirements

3.2.1 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 SNL prior to use. The ATP shall ensure that all test requirements as defined in the safety codes referenced herein are achieved.

3.2.2 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 non-compliances in regards to 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.

3.3 Management

3.3.1 Program Plan

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. The program plan shall list specific intermediate milestones with a clearly defined schedule that will form the basis of the regular progress meetings detailed below. It shall be submitted for review and approval by BSA within two (2) weeks after award of contract.

3.3.2 Progress Teleconference

Within (2) weeks after award of contract, monthly program technical and progress teleconferences and/or meetings between the Contractor and SNL 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.

3.3.3 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 (6) weeks after award of 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.

3.3.4 Performance Reporting

Throughout the life of the contract, the Contractor shall supply a written report by the fifth of every month to the SNL technical representative and BSA 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.

3.4 Documentation and Data Management

3.4.1 All the documentation provided by the Contractor shall be in English.

3.4.2 All engineering drawings shall:

- a. Be formatted in accordance with ASME Y14.5M-2008
- b. Have views shown in third angle projection
- c. Use English or Metric dimensions and tolerances
- d. Have a separate parts list

- e. Have part number designations in accordance with LT-ENG-RSI-STD-002

3.4.2 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 compatible with Solidworks or Fusion CAD software in these formats: STP or IGS.

3.4.3 **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

3.4.3.1 *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

3.4.3.2 *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:

- a. A title to the front cover, identifying the title of the project and the date of issue
- b. A table of contents
- c. A general description of the Instrument installation
- d. Copies of any permits to use copyrighted material
- e. 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 for all modes of operation described in the Technical Specification document*

- ii. *Standard maintenance operations, not limited to beam alignment and adjustment of lens operations*
- iii. *Troubleshooting 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*

3.5 **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.

3.6 **Software Requirements**

The Contractor shall provide and maintain the capability to receive and send CAD files compatible with Solidworks or Fusion CAD software of all components or assemblies in STP or IGS file formats at the request of SNL.

The contractor shall provide a duplicate or back-up of all software and supporting files used to operate the system by means of external hard drive.

3.7 **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.

3.7.1 **Contractor Work on Site at SNL**

SNL 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 SNL. Contractor/manufacturer personnel shall follow all applicable requirements of the SNL as it relates to work control for contractor/subcontract work. The JSA must be completed by the contractor in collaboration with SNL staff and meet the SNL requirements, addressing all hazards that may be present during the work and the controls required. It must be submitted prior to on-site contractor work to the SNL technical representative for review according to the Terms and Conditions of the contract. The SNL technical representative will act as a conduit to SNL subject matter experts, as needed.

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

3.7.2 **Electrical Safety**

- 3.7.2.1 All electrical equipment and components must be in accordance to U.S. standards, must comply with NFPA70 and shall be approved listed by a Nationally Recognized Testing Laboratory (NRTL) and the BSASNL Electrical Authority Having Jurisdiction as specified in BNL-QA-101 document, clause 3.10. Note that the CE mark is not a NRTL

certification marking. In the case that the instrument is NRTL listed prior to delivery it will be inspected once installed to ensure NRTL listing is still valid. In the case of the instrument that is not NRTL listed as delivered from the Contractor/manufacturer, a third-party Field Evaluation Body (FEB), recognized by LANL electrical Authority Having Jurisdiction (AHJ), must perform an evaluation of the equipment. Results of the FEB evaluation must be provided to LANL electrical AHJ and approved before the equipment is to be operated.

All electrical work must be performed only by qualified electrical workers. Contractors who perform electrical work must meet LANL qualification requirements, including submitting proof of training such as for NFPA 70E, OSHA 10-hr, Cardio-Pulmonary Resuscitation/ First Aid, lockout/tagout, depending on the nature of the electrical work.

3.7.2.2 The contractor shall supply the following to BSA and SNL:

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

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

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

3.7.2.2.4 Documentation of specific hazards associated with the equipment.

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

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

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

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

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

3.7.2.4 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.

3.7.2.5 All exposed electrical connections/terminations \geq volts shall be covered so that all non-insulated charged surfaces protect workers 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.

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

3.7.2.7 Teflon® shall be allowed as an insulator in small quantities.

3.7.3 Pressure Safety

3.7.3.1 For process piping requirements, the contractor shall use ASME B31.3 or equivalent approved by BSA or SNL in writing. The gaseous nitrogen and cooling water lines shall be designed to ASME B31.3 requirements. Seamless and welded tubes shall be designed to ASTM A269-69 and A632-69 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.

3.7.4 Fire Safety

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

3.7.4.2 The Contractor shall ensure that any cable tray minimizes the possibility to damage cables. All cables to be installed in a cable tray shall be rated for Cable Tray use and conform to NFPA 70 requirements. The cable shall have the TC (Tray Cable) marking and be NRTL listed. markings. If a Contractor elects to use a cable not marked for Tray Cable use, then the Contractor must justify the election of the conductor in writing. The justification must detail why the requirement cannot be met, describe the proposed alternative, and state how it is equivalent to the requirement. shall use a cable that will meet IEEE 1202 or equivalent approved by BSA in writing. BSA and SNL shall approve the use of all non-NRTL marked listed tray cables in advance of the Contractor ordering the cable.

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

3.7.5 Attachment Points and Lifting Fixtures

3.7.5.1 The Contractor 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. All lifting fixtures will be inspected and approved by SNL before use.

3.7.5.2 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"). Hoist rings must meet ANSI B30.26 requirements.

3.8 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 (1) month prior to delivery.

3.8.1 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 back-filled with dry nitrogen gas.

3.8.2 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 not be used for packaging.

3.8.3 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 ($>2g_0$).

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

3.8.5 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.

3.9 **Warranty**

The Contractor shall provide a one-year warranty on all parts and labor commencing with SNL'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," American Society of Mechanical Engineers (ASME) Nuclear Quality Assurance (NQA-1), or equivalent Quality Management System/QA industry standard. 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**

The QA requirements form part of this SOW, specifically this includes the requirements detailed in Sections 3 and 4.

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

- 4.3.1 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-vendor; i.e., the contractor shall not use nonconforming materials via unique or standard repair processes, nor via use-as-is-dispositions.
- 4.3.2 The Contractor shall not delegate MRB authority to suppliers without the prior knowledge and written approval of BSA.
- 4.3.3 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.
- 4.3.4 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

The Contractor shall ensure a proper and complete flow-down of all applicable QA requirements to its suppliers and sub-tier suppliers. 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	SNL Approval
1	Program Plan	2 weeks after award of contract	Yes
2	Technical and Progress Teleconference	2 weeks after award of contract/weekly	No
3	Performance reports	5th of each month after receipt of Program Plan within 2 weeks of key project milestones	No
4	Manufacturing/Inspection/Test plan	6 weeks after contract award	Yes
5	Installation Work Plan	26 th week after award of contract	Yes
6	Factory acceptance testing	50 th week after award of contract	Yes
7	Delivery of the Instrument	52 th week after award of contract	Yes
8	Site Acceptance Test Report	60 th week after award of contract	Yes
9	Commissioning Report	62 th 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.

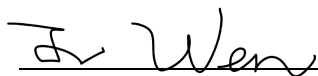
Milestone	Calendar weeks after award
Delivery to NL	52 th week
Commissioning of instrument	60 th week
Training of instrument	60 th week
Delivery of End Item Documentation Package	62 th week

7 VALUE ENGINEERING

- 7.1 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. When investigations point to advantages that may be realized, the recommendation for change shall be


presented to BSA for review and, if approved, authorized in writing. An equitable agreement will be negotiated between BSA and the Contractor to share the savings of any recommended change that is approved and implemented.

TECHNICAL SPECIFICATIONS
FOR A DYNAMIC DOUBLE ABERRATION-CORRECTED SCANNING
TRANSMISSION ELECTRON MICROSCOPE (DYNAMIC DAC-STEM)

 6/15/2022

Jianguo Wen

Center for Nanoscale Materials
Argonne National Laboratory

 6/16/2022

Gary Wiederrecht

Center for Nanoscale Materials
Argonne National Laboratory

 6/16/2022

Ilke Arslan

Director, Center for Nanoscale Materials
Argonne National Laboratory

 6/22/22


Charles Black

NSRC Recap, Project Director
Center for Functional Nanomaterials

 6/21/2022

Aaron Stein

NSRC Recap, Project Manager
Center for Functional Nanomaterials

 06/21/2022

Ashley Head

Technical Representative
Center for Functional Nanomaterials

June 6, 2022

Rev 1.0

Center for Functional Nanomaterials
Brookhaven National Laboratory

Wai-Lin Ng

6/21/2022

Wai-Lin Ng

ESH Coordinator

Center for Functional Nanomaterials

Charles Gortakowski

6/21/2022

Charles Gortakowski

Quality Assurance Representative

Quality Management Office

Hua Chen

6/15/2022

Hua Chen

CNM ESH Coordinator/CNM Quality Assurance

Argonne National Laboratory

VERSION CONTROL SHEET

VERSION	DESCRIPTION	DATE	AUTHOR	APPROVED BY
1	First Issue	15June22	Aaron Stein	See signature page

Contents

1.	GENERAL.....	5
2.	PRINCIPAL CONFIGURATION OF THE MICROSCOPE.....	5
3.	PERFORMANCE REQUIREMENT.....	6
4.	ANALYTICAL CAPABILITIES	6
5.	CUSTOMIZED NEW CAPABILITY DEVELOPMENT.....	7
6.	POWER, ENVIRONMENT, AND SAFETY.....	8

1. General

- 1.1. This specification describes the requirements for a Dynamic double aberration-corrected scanning transmission electron microscope (Dynamic DAC-STEM) for the Center for Nanoscale Materials (CNM) at Argonne National Laboratory (ANL). The microscope shall be designed to provide a combination of capabilities for sub-angstrom spatial resolution with simultaneous temporal resolution in the microsecond regime. This microscope is required to provide an atomic-sized probe and accelerating voltages ranging from 30-200kV.
- 1.2. Principal capabilities of the microscope include, but are not limited to, atomic resolution imaging and single atom chemical sensitivity for the characterization of structure, defects, elemental composition, chemical, bonding, and electronic properties of nanoscale materials.
- 1.3. The electron microscope shall provide an electrostatic dose modulator capable of ultrafast beam blanking (< 20 ns switching time) and a high-speed imaging system with frame rates of 87 kHz or better. This new system will be capable of sub-angstrom spatial resolution with simultaneous temporal resolution in the microsecond regime, which are important for the understanding of irreversible transient states in materials.

2. Principal Configuration of the Microscope

- 2.1. The electron microscope shall be a 200 kV (or 300 kV) scanning/transmission electron microscope (S/TEM) equipped with a field emission gun (FEG), aberration (C_s) corrected in both imaging (TEM) and probe (STEM) modes, capable of both electron energy loss spectroscopy (EELS) and energy dispersive spectroscopy (EDS) spectroscopies down to the atomic scale, with a multitude of imaging modes and detectors included (detailed below).
- 2.2. The microscope column must be highly stabilized and reinforced in order to achieve observation and analysis with resolution of the highest quality. Shielding (e.g., magnetic, thermal) shall be incorporated into the column design.
- 2.3. Conventional TEM imaging is required.
- 2.4. The required diffraction modes shall include convergent beam electron diffraction, micro-beam electron diffraction, and nano-beam electron diffraction.
- 2.5. Required STEM imaging modes shall include high-angle annular dark field (HAADF), bright field (BF), and annular bright field (ABF), each coming from a dedicated STEM detector. Up to four scanning signals shall be obtained simultaneously.
- 2.6. STEM Nanobeam diffraction alignments must be provided.
- 2.7. The TEM stage must be operable through piezoelectric drives in three dimensions (X,Y,Z).
- 2.8. Lorentz TEM mode shall be a standard alignment inclusion.
- 2.9. Lorentz STEM mode shall be a standard alignment inclusion.
- 2.10. The S/TEM shall include a descanner system with independent post-specimen coils and controls to enable large area EELS mapping without artifacts caused by shifting of the energy loss signal on the spectrometer.
- 2.11. The microscope vacuum system shall be dry, consisting of turbo-molecular and scroll pumps.
- 2.12. Free lens control over the microscope lens systems must be available, to enable the user to individually adjust various lenses.

- 2.13. Principal components shall include
 - 2.13.1. FEG operable from 30 kV – 200 kV (or 300 kV)
 - 2.13.2. Electrostatic beam blanker (< 20 ns switching time)
 - 2.13.3. STEM 5th-order C_s corrector
 - 2.13.4. TEM 3rd-order (or higher-order) C_s corrector
 - 2.13.5. HAADF, BF, ABF, segmented detectors
 - 2.13.6. CMOS-type camera with in-situ recording capabilities
 - 2.13.7. High-speed high dynamic range direct electron imaging system
 - 2.13.8. High-energy resolution electron energy loss spectrometer (EELS)
 - 2.13.9. Energy-filtered imaging system

3. Performance Requirement

3.1. Electron gun

- 3.1.1. The S/TEM shall have a FEG emission source with beam current better than 20 nA at 200 kV. A FEG with higher beam current is preferred.
- 3.1.2. The FEG has a built-in electrode short switch.
- 3.1.3. The minimum energy resolution shall be 1 eV or better, without the use of a monochromator, as measured by full-width at half maximum of the zero loss peak in an EELS spectrum.
- 3.1.4. The probe current stability shall be better than 90% within four hours of flashing.
- 3.1.5. Emission current stability shall be better than 50% within four hours of flashing.
- 3.1.6. Tip flashing routines shall be automated and allow for immediate recovery of image resolution specifications following a flash.

3.2. Condenser System

- 3.2.1. The microscope shall have a three-stage condenser lens system.
- 3.2.2. Eight, noise-cancelling condenser apertures shall be included.

3.3. Aberration corrector

- 3.3.1. The microscope shall be equipped with a higher-order (six-fold astigmatism) STEM C_s aberration corrector.
- 3.3.2. The microscope shall be equipped with a higher-order TEM C_s aberration corrector.
- 3.3.3. The microscope and aberration correctors shall be aligned at 30 kV, 80 kV, and 200 kV (or 300 kV).
- 3.3.4. Aberration correction shall be accomplished using an automated algorithm and not require a special “alignment” sample, i.e., only a general/amorphous sample region is required to run the alignments.
- 3.3.5. The DF STEM resolution shall be better than 0.1 nm at 200 kV (or 300 kV). The DF STEM resolution shall be better than 0.12 nm at 80 kV, 0.2 nm at 30 kV.
- 3.3.6. The TEM point resolution shall be better than 0.12 nm (200 kV), 0.15 nm (80 kV), 0.35 nm (30 kV).

4. Analytical Capabilities

- 4.1.1. EDS.

- 4.1.1.1. The microscope EDS system must contain two large (each 100 mm² or greater) silicon drift detectors (SDD), positioned for efficient EDS tomography (offset 90° from each other), each with a high takeoff angle to minimize shadowing.
- 4.1.1.2. This system must have a large solid angle of 1.8 steradians or greater; this value will have been calculated with prior accounting for any detector shadowing, etc. i.e., it is the true value of the system.
- 4.1.1.3. This system must have a high P/B ratio of 4000 or more, while maintaining minimal contribution from spurious peaks (1% or less).
- 4.1.1.4. The energy resolution of this system must be better than 150 eV.
- 4.1.2. EELS.
 - 4.1.2.1. The microscope shall be equipped with a Gatan 1069 K3 Continuum GIF (or the current highest-performance, direct detect EELS with imaging filter).
 - 4.1.2.2. This system utilizes “direct detection” detector technology.
 - 4.1.2.3. EELS and EFTEM are available.
 - 4.1.2.4. This system has a high-speed 100 ns electrostatic shutter.
 - 4.1.2.5. This system has 2kV DualEELS enabled.
 - 4.1.2.6. This system has real-time Zero-Loss Peak (ZLP) stabilization.
 - 4.1.2.7. This system has high-speed spectrum imaging with 75 fps at full resolution and high-speed spectra imaging maximum spectra rate of better than 3000 sps.
 - 4.1.2.8. This system can operate simultaneously with the S/TEM EDS system, also at high speed.
 - 4.1.2.9. This system has an integrated BF/DF detector.
 - 4.1.2.10. This system has centered beam stop.
- 4.1.3. High dynamic range direct electron detector for 4D STEM.
 - 4.1.3.1. The microscope shall be equipped with a high dynamic range direct electron detector.
 - 4.1.3.2. This detector is integrated with microscope control software to allow for seamless diffraction imaging and 4D STEM.
 - 4.1.3.3. This system is capable of operating at 30 – 200 kV.
 - 4.1.3.4. This system enables diffraction imaging, low-kV diffraction, in situ diffraction, 4D STEM diffraction, and diffraction tomography.

5. Customized New Capability Development

- 5.1. The microscope must include an electrostatic dose modulator for ultimate control of specimen dose
 - 5.1.1. This dose modulator must be capable of ultrafast beam blanking, < 20 ns switching time.
 - 5.1.2. Dose is real-time, user-controlled through a continuously-adjustable dial; immediate dose feedback can be observed as the effective beam brightness in the microscope.
 - 5.1.3. This system enables dose control without altering the illumination conditions of the microscope.
 - 5.1.4. Dose attenuation is offered via pulsed illumination with rates up to 500 kHz and durations down to 100 ns.

- 5.1.5. This system must be synchronized to function in both TEM and STEM modes and during EDS acquisition; programmable, temporal dose structuring must be available.
- 5.2. The microscope shall be equipped with a high-speed imaging system
 - 5.2.1. This system provides ultrafast camera, enabling both high-speed imaging and diffraction capabilities.
 - 5.2.2. This system has frame rates of 87 kHz or better (or equivalent technique to achieve frame rate better than 87 kHz).
 - 5.2.3. The system has a high dynamic range.
 - 5.2.4. The system with more pixel sizes is preferred.

6. Power, Environment, and Safety

- 6.1. The electron microscope and all accessories including its aberration correctors, detectors, and spectrometer shall meet the X-ray safety specifications.
- 6.2. Electrical power for the microscope shall be 120-398 VAC, +/-5% Stability 50-60Hz, up to 20 kVA.
- 6.3. The chiller for the microscope requires 208VAC and many accessories requires 110VAC.
- 6.4. Contractor shall be responsible for installation of all components and provision of all interconnecting power, communication, control, and instrument cabling, and all liquid and gas piping, and tubing between components and to the supply points identified by BSA.
- 6.5. An uninterruptible power-supply (UPS) shall be provided by the Contractor in the event of a power outage. UPS selected shall be energy-efficient and Energy Star certified, if one is available
- 6.6. In the event of fire, flood, or power disruption, the system can be completely turned off for days, and then restarted and returned to operation within 5 days.

7. CNM/ANL site-specific requirements

- 7.1. With this order, written documentation shall be provided verifying that the products ordered by the Company based on the stated specifications, product descriptions, and performance statements, or associated supplier quotes have been supplied.
- 7.2. The items shall be provided with all needed installation requirements and instructions, and operating and maintenance instructions to ensure correct installation, usage, and maintenance. All documentation shall be provided in English.
- 7.3. Where applicable, documentation shall include the rated capacities and capabilities, accuracy, and uncertainty performance specifications of each device.
- 7.4. The Seller shall furnish with each system a replacement parts listing giving the part number and serial or lot control number of each replacement part that may be necessary to maintain the system in a fully functioning condition.
- 7.5. It is the Seller's responsibility to meet all applicable US electrical and associated safety and health code requirements relative to the described equipment.
- 7.6. The system shall be tested/inspected at the Seller's site to ensure that all technical requirements of the product specification have been met. The Company reserves the right to have a representative present during any manufacturing, assembly, test, inspection, or other activities associated with this system. Test/inspection results shall be documented and provided to the Company's representative prior to shipment of the system. The Company's representative shall be notified of planned testing at least ten working days prior to commencement.
- 7.7. Associated computer codes shall be validated and verified for correctness prior to release to the customer.

- 7.8. All deviations from the technical specification that were not approved prior to conduct of activities associated with these deviating conditions shall be classified as nonconformances. All nonconformance documentation shall be provided to the Company's representative two weeks prior to shipment of the system. Shipment shall not take place until all nonconformances have been approved by the Company's representative.
- 7.9. Where applicable, documentation shall include the calibration status (calibrated or not calibrated) of each device and - if shipped in a calibrated condition - a description or reference to the method used to perform the calibrations at the time of shipment including the reference standard(s) used for this purpose.
- 7.10. Where applicable, documentation shall include instructions concerning the calibration of associated devices, instruments, or components to fully ensure the stated operating capabilities based on methods traceable to the US National Institutes for Standards and Technology.
- 7.11. The Seller is responsible for all packing and shipping provisions to ensure that the products in this order arrive at the Company's site in an undamaged, working condition.
- 7.12. Final acceptance of the described equipment shall be based on testing to the technical requirements of the specifications after completion of installation at the Company's site.

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

PO/Contract No.: 417320

1.0 PURPOSE & SCOPE

- 1.1 This document establishes quality assurance requirements to which Suppliers to Brookhaven Science Associates (BSA) shall 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 shall 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.

3.20/2d01e011.docx

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 shall 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) shall 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.

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's 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.

3.6 Protection of Material and Equipment

The Supplier shall employ procedures that assure 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 Standard Practice for Commercial Packaging.

3.7 Measuring and Test Equipment (M&TE) Calibration

The Supplier shall 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 shall 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 certifying paperwork.
- Appropriate incoming inspection test methods shall be used to detect potential counterfeit parts and materials.
- The Supplier shall flow this requirement down to all sub-tier suppliers to prevent the inadvertent use of counterfeit parts and materials.
- Distributors shall not modify, rework or repair material shipped on this order.

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

3.9 Electrostatic Discharge Control

Items that are susceptible/sensitive to electrostatic discharge (ESDS) shall be handled and packaged to protect them from damage. Items and/or packages shall 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 shall 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 shall 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 shall 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 shall be designed to accept a lockout device.

3.11 Hoisting & Rigging Equipment

All hoisting & rigging equipment used at BNL shall 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 shall be provided upon delivery documenting the proof test.

3.12 Deleted

3.13 Powered Machine Shop Equipment

All powered machine shop equipment (e.g., lathe) delivered to BNL shall 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 shall 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 shall 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 shall 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 shall meet the requirements of ANSI 92.5.

3.18 Powered Industrial Trucks and Attachments

Powered industrial trucks (e.g. forklifts, hi-lows) shall meet the requirements of the ANSI/ITSDF B56 series for design, construction, 3.20/2d01e011.docx

markings, and test loading. Industrial truck attachments shall 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, fork lifts, 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 shall provide records of the last year of maintenance.

3.20 Global Harmonized System Compliance

The supplier of chemicals shall 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 shall 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 shall 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 shall 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 shall be recorded on certifications and shipping documents covering the material delivered to the Buyer. At the time of receipt, the material shall 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 should 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 shall submit a copy of their Quality Assurance Program or Manual with their proposal for review and evaluation.

☐ **4.2 Configuration Control System**

The Supplier shall 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 shall be maintained to verify the configuration of each item.

☐ **4.3 Process Sheets, Travelers, etc.**

The Supplier shall 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, shall 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 shall 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 shall 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 shall 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.

☐ **4.6 Test and Inspection Procedures**

Test and inspection procedures required to demonstrate satisfactory completion of requirements shall 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) shall be performed in accordance with detailed written procedures. These procedures shall 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 shall 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 shall 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 shall, 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 shall be used to perform that process. Records of such qualification shall 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 shall 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 shall 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 shall 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 shall 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 shall maintain a failure reporting, analysis and corrective action system that shall, as 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 shall be documented and available for review by the Buyer.

4.14 Source Inspection/Surveillance

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, shall be provided by the Supplier to the Buyer to permit scheduling of source inspection.

4.15 Chemical and Physical Test Report

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

4.16 Certificate of Conformance (C of C)

With each shipment, per the procurement documentation, the Supplier shall submit a Certificate of Conformance (C of C). In case of drop shipment, a copy of the certificate shall be submitted to the Buyer 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 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 shall reference the Supplier's applicable cleaning procedures.

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) shall 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 shall 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 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.

4.20 Age/Shelf Life and Storage Control

Superseded by Clause 3.21

4.21 Serial Numbers

The Supplier shall 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, shall 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 shall 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 shall 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 shall 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 shall accompany the shipment; in addition, one copy of such data shall 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 shall 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 shall be maintained and shall 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) shall be submitted that indicates the complete inspection of welds or brazes from the initial fit-up stage through final inspection. Inspection reports shall be accompanied by all radiographic films, filler metal reports etc. The reports shall contain the signature or stamp, and title of an authorized Supplier representative.

4.29 Radiographic Quality Requirements

Items requiring radiographic inspection shall 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 shall have been examined and certified. Responsibility for this certification shall rest with the Supplier, whether the Supplier does the work or subcontracts to a specialized laboratory. A report of the findings shall 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 shall accompany each shipment. An adequate method of identifying and cross-referencing each film exposure, report, and item shall be provided. When parts are serialized, serial numbers shall appear on the report and the film.

☐ **4.30 Nondestructive Test Reports**

All nondestructive testing shall 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 shall be qualified for the type of test performed. The Supplier shall furnish with, or prior to, each shipment reports of such nondestructive examination of material or items furnished. These reports shall be identifiable to the respective item or material including the specific section, joints or views of the item furnished. These reports shall contain the signature and title of an authorized Supplier representative. When items are serialized, the serial numbers shall appear on the reports.

☐ **4.31 Pressure or Leak Test Reports**

Test reports shall be prepared for all pressure and leak tests. Such reports shall 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 shall appear on the report. Reports shall contain the signature/title of an authorized Supplier representative and shall accompany each shipment.

4.32 Cleaning Certification

Superseded by Clause 4.16 D

☐ **4.33 Calibration Certification**

The Supplier shall submit with each instrument/system a certification that the instrument/ system has been calibrated and is ready for use. The certification shall contain, as 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 shall remain on file for minimum of three (3) years with the Supplier and shall be available for review by the Buyer. The certification shall 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.

☐ **4.34 Operating-Maintenance Manual**

Documentation containing operating procedures, maintenance instructions, spare parts lists, and handling procedures shall be submitted with the shipment of the first item.

☐ **4.35 Computer Software Configuration Management**

The Supplier shall have and maintain an effective software configuration management system. The Supplier's system shall 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 shall submit a copy of their software configuration management procedure(s) with their proposal for review and evaluation.

4.35.2 Superseded by Sub-clause 4.35.1

☐ **4.36 Computer Software Validation**

The Supplier shall develop written procedures describing the controls applied to the design of software and the validation of the design through independent technical review. The procedures shall provide for documentation of review activities, including requirements for documenting comments and resolution of comments. Supplier software designs and review documentation shall be subject to review and approval by the Buyer.

☐ **4.37 Computer Software Verification Testing**

The Supplier shall test and verify computer software developed or modified to fulfill the requirements in the procurement documentation. The verification testing shall 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.

4.38 Electrostatic Discharge Control

Superseded by Clause 3.9

☐ **4.39 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.

4.40 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 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).

4.44 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



Subcontract Terms and Conditions

Table of Contents

Terms and Conditions.....	4
A. SECTION I CLAUSES	4
1. DELEGATION OF AUTHORITY - 404KDB (04-21)	4
2. PERSONAL IDENTITY VERIFICATION FOR EXTENDED PHYSICAL AND CYBER ACCESS –600ACC (11-20)	4
3. HOMELAND SECURITY - 600HLS (3-21)	5
4. CONTRACT SPECIFIC SAFETY - 603CSS (04-21)	6
5. TOBACCO-FREE WORKPLACE - 613TFW (05-17)	7
6. COVID-19: SAFE AND SECURE WORK PRACTICES TRAINING FOR SUBCONTRACTORS WORKING ON-SITE - 702REQ (06-20)	7
7. NTESS NORMAL WORKWEEK, WORK HOURS AND HOLIDAYS - 921SWH (12-21)	7



Terms and Conditions

A. SECTION I CLAUSES

1. DELEGATION OF AUTHORITY - 404KDB (04-21)

The following NTESS personnel are hereby authorized to act as Sandia Delegated Representatives (SDRs) for the specific purpose(s) shown below, subject to the Section II limitations as authorized. SDRs shall exercise no supervision over the Subcontractor's employees.

SDR(s):

Name/Org No/Phone Number

DUTIES DELEGATED:

Act as the technical liaison; inspect and accept deliverables; ensure safety in accordance with NTESS's *Environment, Safety, and Health* (ES&H) Laboratory Policy System (LPS) which includes obtaining management approval of the Contract Specific Safety Plans (CSSP), and retain a copy of the approved CSSP; track subcontractor compliance to all required safety and security requirements; track all required training for subcontractor personnel.

For the purpose of adding/modifying the SDR the revision may occur via an email notification reflecting the change to the clause. A subcontract revision is not required if this notification is issued. A copy of the email notification shall be part of the subcontract file and shall be legally binding on the parties.

2. PERSONAL IDENTITY VERIFICATION FOR EXTENDED PHYSICAL AND CYBER ACCESS – 600ACC (11-20)

In accordance with [NNSA SD 206.2](#), *Implementation of Personal Identity Verification (PIV) for Uncleared Contractors*, background investigations may be required for uncleared subcontractor and lower-tier subcontractor employee(s) requiring physical or cyber access to NTESS/SNL or DOE/NNSA owned or leased facilities and/or designated Information Technology (IT) systems for more than 179 calendar days. This includes any physical and cyber access combinations that exceed 179 days.

The Subcontractor will be notified by SNL Personnel Security when the uncleared Personal Identity Verification (PIV) background investigation process is required. The Subcontractor shall ensure eligible employee(s) and lower-tier Subcontractor employees comply with the PIV process which includes:

- A. Electronic fingerprinting,
- B. Two forms of identification and having a photo taken, and



C. Completion of SF85, [Questionnaire for Non-Sensitive Positions](#) and OF306, [Declaration for Federal Employment](#).

Unfavorable PIV determinations will result in immediate revocation of physical and/or cyber access, and may result in the Subcontractor and lower-tier Subcontractor employee(s) removal from performance of work under this agreement. Uncleared Subcontractor and lower-tier Subcontractor employee(s) may appeal unfavorable PIV determinations to DOE/NNSA.

Compliance with PIV procedures is required for Subcontractor and lower-tier Subcontractor employee(s) continued authorization to perform work and access to NTESS/SNL and DOE/NNSA sites and IT systems.

For any additional questions, contact SNL Security Connection at (505) 845-1321 or security@sandia.gov.

RESOURCES

FSO Toolcart (<https://www.sandia.gov/FSO/index.htm>), NTESS resource for badging, access, and security information.

3. HOMELAND SECURITY - 600HLS (3-21)

Performance of this subcontract requires physical access to facilities owned or leased by NTESS and/or Department of Energy/ National Nuclear Security Administration (DOE/NNSA).

A. Subcontractor shall ensure employees' and lower-tier Subcontractor employees' compliance with NTESS/DOE/NNSA procedures for obtaining physical access and provide accurate information on forms submitted.

B. Foreign Government-Sponsored Talent Recruitment Programs

1. Subcontractor shall affirmatively disclose employee participation in any Foreign Government-Sponsored Talent Recruitment Programs (as defined in DOE Order 486.1A) for all individuals requiring physical access to NTESS or DOE/NNSA facilities.
2. Subcontractor shall notify NTESS within seventy-two (72) hours if any employees (or lower-tier subcontractor employees) with physical access to NTESS or DOE/NNSA facilities are, or are reasonably believed to be, participants in a Foreign Government-Sponsored Talent Recruitment Program during performance of this subcontract. Notifications to ContractNotification@sandia.gov.
3. Subcontractor shall include this clause in its entirety in any lower-tier subcontracts where individuals will require physical access to NTESS and/or DOE/NNSA facilities.
4. Subcontractor employee and lower-tier employee participation in any Foreign Government-Sponsored Talent Recruitment Program of a Foreign Country of Risk (as defined in DOE Order 486.1A) is prohibited while performing work under this subcontract. Upon NTESS direction, Subcontractor shall remove any individual participating in Foreign Government-Sponsored Talent Recruitment Programs from work under this subcontract.

C. Subcontractor shall return the badge(s) or other credential(s) provided by NTESS or DOE/NNSA pursuant to this clause, granting physical access to DOE/NNSA-owned or leased facilities by Subcontractor's employee(s), upon:

1. The termination of this subcontract
2. The expiration of this subcontract
3. The removal of an individual performing work under this subcontract or any subcontractor employees performing work under this subcontract; or



4. NTESS or DOE/NNSA direction.

RESOURCE(S)

Security Toolcart (<https://www.sandia.gov/security/>), NTESS resource for badging, access, and security information.

DOE Order 486.1A (<https://www.directives.doe.gov/directives>)

4. CONTRACT SPECIFIC SAFETY - 603CSS (04-21)

In performing work under this subcontract, Subcontractor and their lower-tier subcontractors, if any, shall perform work safely, in a manner that ensures adequate protection for employees, the public, and the environment, and shall be accountable for the safe performance of work in accordance with DEAR970.5223-1, *Integration of Environment, Safety, and Health (ES&H) Into Work Planning and Execution*. Furthermore, Subcontractor shall manage and perform work in accordance with 10 CFR 851, *Worker Safety and Health Program*. These requirements operate in addition to any other specifications or requirements included elsewhere in this subcontract. NTESS is required to flow these requirements to Subcontractors at any tier.

Subcontractor shall follow the NTESS-approved Contract Specific Safety Plan (CSSP) it submitted that addresses and mitigates hazards identified by NTESS and any other hazards the Subcontractor may have determined as inherent to the statement of work (SOW). Subcontractor shall not begin any onsite work until a Pre-Job Briefing has been performed and documented, and authorization to proceed has been provided by the SDR.

Any Sandia-controlled premises work that includes installation, inspection, testing, maintenance, operating, or decommission of electronic equipment or systems requires that the Subcontractor provide current evidence (training, certifications, licensing) that the Subcontractor employees performing the electrical work are qualified. Subcontractor shall also include a statement confirming that any Subcontractor personnel performing the onsite electrical work are qualified electrical workers per the definition in NFPA70E, *Standard for Electrical Safety in the Workplace*. These documents shall be included in the CSSP.

DECLARATION OF OCCUPATIONAL MEDICINE PROVIDER

Subcontractors shall establish and provide comprehensive occupational medicine services to workers meeting the applicability criteria noted below, in accordance with 10CFR 851, *Worker Safety and Health Program*. Subcontractors that will perform any work on a Sandia-controlled premises, and that meet the applicability criteria below, shall provide the SDR a written declaration by completing form SF 4040-DOP, located at http://www.sandia.gov/resources/employees/corporate_forms/. The declaration must be completed and provided to the SDR prior to performing work. The Subcontractor shall maintain a copy of the completed declaration.

Applicability Criteria:

1. Work on a Sandia-controlled premises for more than thirty (30) days in a 12-month period

OR

2. Are enrolled for any length of time in a medical or exposure monitoring program required by the 10 CFR 851 and/or any other applicable Federal, State or local regulation, or other obligation.

EMERGENCIES

If an accident occurs on a Sandia-controlled premises that causes injury or that could adversely affect personnel or the environment during the performance of this work, the Subcontractor shall render aid and remain at the site if it is safe to do so, or evacuate if necessary to protect personnel, then report the accident immediately to SNL Emergency Management at the numbers listed below. Examples of such accidents may include injury beyond first aid, release of and exposure to hazardous gases or vapors, release of hazardous materials to floor drains or the soil, property damage.



- Sandia National Laboratories/New Mexico (SNL/NM) call 911 from a landline, or (505)844-0911 from mobile phone;
- Sandia National Laboratories/California (SNL/CA) call 911 from a landline, or (925)294-2222 from mobile phone;
- Other U.S. locations call 911.

For non-emergencies:

- At SNL/NM call 311 from a landline, or (505) 845-0311 from mobile phone;
- At SNL/CA call 311 from a landline, or (925) 294-2300 from mobile phone.

Subcontractor shall notify the SDR as soon as appropriate after emergency personnel have been notified. The SDR will notify appropriate parties, such as the responsible manager, ES&H Coordinator, project PIs, other critical project parties.

5. TOBACCO-FREE WORKPLACE - 613TFW (05-17)

NTESS is a tobacco-free workplace. This policy applies to all Members of the Workforce (MOW), and includes all NTESS employees, subcontractor and subcontractor employees at any tier, government employees, and visitors.

The use of all tobacco products, including cigarettes, cigars, cigarillos, pipes, chewing tobacco, snuff, and electronic cigarettes, is prohibited on all SNL property. SNL property includes SNL vehicles, building interiors, exteriors, entryways, walkways, parking lots, fenced areas and portions of buildings controlled by NTESS. Additionally, the policy is applicable to the interiors of personal vehicles parked on NTESS controlled property.

6. COVID-19: SAFE AND SECURE WORK PRACTICES TRAINING FOR SUBCONTRACTORS WORKING ON-SITE - 702REQ (06-20)

All Subcontractor personnel who will perform work on NTESS-controlled premises shall work in accordance with NTESS's COVID-19 Safe Work Practices as outlined in the *COVID-19: Safe & Secure Work Practices for Subcontractors Working On-Site* training and as directed by the Sandia Delegated Representative. The Subcontractor shall provide the training (available at https://prod-ng.sandia.gov/wbt/COVID19_subcontractors/intro.html) to its employees prior to accessing any NTESS-controlled premises. Additional COVID-19 safe and secure work practices information is available at https://www.sandia.gov/working_with_sandia/current_suppliers/covid-19/index.html.

7. NTESS NORMAL WORKWEEK, WORK HOURS AND HOLIDAYS - 921SWH (12-21)

NTESS normal work hours are:

SNL, Albuquerque, NM, normal work hours are:

8:00 AM to 4:30 PM Mountain Standard Time (MST), Monday through Friday

SNL, Livermore, CA, normal work hours are:

7:30 AM to 4:00 PM Pacific Standard Time (PST), Monday through Friday

NTESS also permits its employees to work a compressed workweek schedule, or 9/80 schedule, which is a work schedule involving 80 hours of work in 9 workdays. A second but less common compressed workweek permits 40 hours in 4 workdays. At the request of the SDR, and with the approval of the Subcontractor, any Subcontractor employee(s) who work onsite at SNL may work one of the above compressed workweek schedules as necessary to facilitate the performance of the subcontract requirements. NTESS shall not be responsible (or liable) for overtime premium payments incurred as a result of Subcontractor employee(s) working a compressed work schedule. In the absence of such a request from the SDR and Subcontractor approval, the normal work hours shall apply.

Per the Fair Labor Standards Act, the Subcontractor shall be cognizant that if their employees work a 9/80 or other non-standard schedule that they must abide by overtime laws designated in the state where work is performed.

Due to NTESS' observance of the below listed holidays, no work will be available onsite at SNL for the Subcontractor's employees under this subcontract on those days:

1. Memorial Day



2. Juneteenth
3. Independence Day
4. Labor Day
5. Thanksgiving Day
6. The six working days encompassing Christmas/New Year holidays

Normally, when a holiday falls on a scheduled day off it is observed on the nearest scheduled workday.

Hazard Assessment

Summary: Set-up and installation of the Deep Reactive Ion Etch (DRIE) tool will occur at the Center for Integrated Nanotechnologies (CINT), suite 1500. The CINT is a property protection area. Properly badged US persons can perform installation tasks without the need of an L or Q cleared escort.

Description of on-site work: This subcontract outlines installation and training activities that shall be provided by the Subcontractor of the RIBE/DRIE. The duration of the work is anticipated to take 3 months. Utility connections will be in place and facilities modification are not required of the Subcontractor. Facilities will be prepared according to the Subcontractors site preparation instructions. Original Equipment Manufacturer (OEM) field engineers shall supply their own tools. Hot work (welding/cutting/grinding) will not need to take place. Energized electrical work (open access/modification/troubleshooting) or circuits above 49V is not permitted without NTESS Senior Manager approval.

Summary of lab hazards and mitigations: Hazards present in the lab include chemical, pressure, electrical, and thermal hazards. During the installation of the RIBE/DRIE, nearby work in the rest of suite 1500 will be paused. Systems will be maintained in standard configurations so hazards will not impact the work described here. A pre-job brief with the on-site ES&H Coordinator and tool owner will take place prior to installation. Subcontract personnel will be informed of actual near-by hazards on the day(s) of installation and will be required to detail the activities they plan to perform to the ES&H coordinator and tool owner.

**BROOKHAVEN SCIENCE ASSOCIATES, LLC
GENERAL TERMS AND CONDITIONS
FOR NONCOMMERCIAL ITEMS
AT
BROOKHAVEN NATIONAL LABORATORY**

Table of Contents

Article 1	DEFINITIONS.....	3
Article 2	ORDER OF PRECEDENCE	3
Article 3	ACCEPTANCE OF AGREEMENT, SURVIVABILITY	4
Article 4	COMPLETE AGREEMENT.....	4
Article 5	UNAUTHORIZED OBLIGATION	4
Article 6	RESPECTFUL WORKPLACE POLICY.....	4
Article 7	REPORTING ENVIRONMENTAL, SAFETY, HEALTH AND TECHNICAL CONCERNS	4
Article 8	ASSIGNMENT.....	5
Article 9	DISPUTES.....	5
Article 10	NOTICE REGARDING LATE PERFORMANCE.....	6
Article 11	WAIVER	6
Article 12	NEW MATERIALS.....	7
Article 13	HAZARDOUS MATERIALS IDENTIFICATION AND SAFETY DATA SHEETS	7
Article 14	EXCUSABLE DELAYS	7
Article 15	TERMINATION FOR CONVENIENCE.....	7
Article 16	TERMINATION FOR DEFAULT	8
Article 17	PAYMENT	8
Article 18	CHANGES	8
Article 19	INSPECTION AND ACCEPTANCE	9
Article 20	TAXES	10
Article 21	TITLE AND RISK OF LOSS	10
Article 22	WARRANTY	10
Article 23	EXTRAS.....	11
Article 24	LIMITATION OF LIABILITY	11
Article 25	COMPLIANCE WITH LAWS.....	11
Article 26	COMPLIANCE WITH INTERNET PROTOCOL VERSION 6 (IPv6) IN ACQUIRING INFORMATION TECHNOLOGY	11
Article 27	AUTHORIZATION AND CONSENT.....	12
Article 28	PATENT INDEMNITY-SUPPLIES AND SERVICES	12
Article 29	REPORTING OF ROYALTIES.....	12
Article 30	NOTICE AND ASSISTANCE REGARDING PATENT AND COPYRIGHT INFRINGEMENT	13
Article 31	SUSPECT/ COUNTERFEIT ITEMS	13
Article 32	APPLICABLE LAW	14
Article 33	SUSPENSION OF WORK	14
Article 34	BANKRUPTCY	15
Article 35	WALSH-HEALY PUBLIC CONTRACTS ACT.....	15
Article 36	INTELLECTUAL PROPERTY INDEMNITY	15
Article 37	INDEMNITY FOR DEFECTIVE COST OR PRICING DATA	15
Article 38	LIABILITY WITH RESPECT TO COST ACCOUNTING STANDARDS	16
Article 39	WHISTLEBLOWER PROTECTION FOR CONTRACTOR EMPLOYEES	16
Article 40	PRESS RELEASES AND OTHER PUBLIC DISSEMINATION OF CONTRACT INFORMATION	16

Article 41	REPORTING EXECUTIVE COMPENSATION (Agreements valued at \$30,000 or more).....	16
Article 42	IDENTIFICATION OF EMPLOYEES	17
Article 43	CLAUSES INCORPORATED BY REFERENCE.....	18

Article 1 DEFINITIONS

The following terms shall have the meanings below:

- (a) "Agreement" means the contract; or purchase order; or Basic Ordering Agreement (BOA); or Task Agreement, and any modifications thereto, including all contract documents (Contract Documents). The Agreement includes without limitation the specifications, drawings, General Terms and Conditions and any special or supplemental terms and conditions, when incorporated into this Agreement by reference or otherwise.
- (b) "BSA" means Brookhaven Science Associates, LLC acting under a Prime Contract between BSA and the United States Government (Government) for the operation of Brookhaven National Laboratory (referred to as Brookhaven, BNL, or Laboratory), and includes the successor to, or any duly authorized representative of BSA. BSA authorized representatives and their roles are listed in the contract document.
- (c) "Brookhaven", "BNL", or "the Laboratory" refers to the Brookhaven National Laboratory site at Upton, New York.
- (d) "BSA's PPM Division" means the BSA Procurement and Property Management Division (PPM).
- (e) "Contract" is the document (including but not limited to contract; or purchase order; or Basic Ordering Agreement (BOA); or Task Agreement) that is executed by both BSA and the Contractor that creates the Agreement.
- (f) "Contract Documents" means all documents that comprise this Agreement including without limitation, the specifications, drawings, the General Terms and Conditions and any special or supplemental terms and conditions, when incorporated into this Agreement by reference or otherwise. This Agreement does not bind nor purport to bind the Government.
- (g) "Contractor" means any person or organization that has entered into this Agreement with BSA.
- (h) "Government" means the United States of America including the U.S. Department of Energy (DOE) or any duly authorized representative(s) thereof.
- (i) "Prime Contract" means the contract between BSA and the Government.
- (j) The clause at FAR 52.202-1, Definitions, is incorporated herein by reference.

Article 2 ORDER OF PRECEDENCE

In the event of an inconsistency among provisions of this Agreement, the inconsistency shall be resolved by giving precedence in the following order:

- (a) Contract,
- (b) Special terms and conditions included in or incorporated by reference in the Contract,
- (c) Supplemental Terms and Conditions,
- (d) General Terms and Conditions,
- (e) Statement of Work,
- (f) Specifications and
- (g) Drawings, if any, incorporated in this Agreement by reference or otherwise.

Article 3 ACCEPTANCE OF AGREEMENT, SURVIVABILITY

- (a) By signing this Contract, delivering the supplies, or performing the requirements indicated herein, the Contractor agrees to comply with all the terms and conditions and all specifications and other documents incorporated in this Agreement by reference or otherwise. Notwithstanding the above, this Agreement shall become a binding contractual commitment within 10 days after the Contractor receives it unless the Contractor furnishes written notice of objection to BSA within said 10 days.
- (b) An attempted acknowledgment or acceptance which contains provisions conflicting with or additional to these Terms and Conditions or which varies any terms or conditions shall have no force or effect.
- (c) All rights and obligations of the parties shall survive final performance of this Agreement.

Article 4 COMPLETE AGREEMENT

This Agreement expresses the entire agreement and understanding of the parties with respect to the subject matter hereof and supersedes any prior oral and written agreements between the parties. It may only be modified in writing executed by both BSA and the Contractor except as otherwise stated herein.

Article 5 UNAUTHORIZED OBLIGATION

When any supply or service acquired under this contract is subject to any End Use License Agreement (EULA), Terms of Service (TOS), or similar legal instrument or agreement, that includes any clause requiring BSA or the Government to indemnify the Contractor or any person or entity for damages, costs, fees, or any other loss or liability, the following shall govern:

- (i) Any such clause is unenforceable against BSA and the Government unless separately and specifically agreed to.
- (ii) Neither BSA nor any BSA authorized end user shall be deemed to have agreed to such clause by virtue of it appearing in the EULA, TOS, or similar legal instrument or agreement.
- (iii) Any such clause is deemed to be stricken from the EULA, TOS, or similar legal instrument or agreement.

Article 6 RESPECTFUL WORKPLACE POLICY

BSA is committed to providing a safe work environment for employees, contractors, guests and visitors, that is based on courtesy, civility and respectful communication. Acts or threats of violence, obscene or harassing telephone calls, verbal abuse, and any behavior meant to intimidate others are examples of actions that are prohibited on site at any time. Violators of this policy will be subject to disciplinary action up to and including discharge, debarment from site, or criminal arrest and prosecution.

Article 7 REPORTING ENVIRONMENTAL, SAFETY, HEALTH AND TECHNICAL CONCERNS

The Contractor will ensure that all Contractor employees are notified quarterly that they have the right to report environment, safety, health and technical concerns that have not

been resolved through routine work processes through the Department of Energy Differing Professional Opinion (DPO) process ((the DOE DPO process can be found in Attachment 2 to DOE O 442.2 Chg 1 (PgChg) and at http://www.directives.doe.gov/directives-documents/400-series/0442.2-BOrder-chg1-pgchg/@_images/file). The notification must provide points of contact (name, phone number and email addresses of DPO Managers) as listed on the DOE DPO web page, as well as the DOE DPO web page address.

Article 8 ASSIGNMENT

Neither this Agreement nor any interest therein nor claim there under shall be assigned or transferred by the Contractor except as expressly authorized in writing by BSA, provided that the Contractor or its assignee's rights to be paid amounts due as a result of performance of this Agreement may be assigned to a bank, trust company or other financing institution, including any federal lending institution. This Agreement is assignable by BSA to the Government or to a successor contractor for the operation of Brookhaven. The Contractor agrees to look solely to the Government or to such successor contractor for payment of the part so assigned, and to execute a novation agreement so recognizing the successor contractor if requested to do so by BSA.

Article 9 DISPUTES

- (a) Good Faith Negotiation. The parties agree that they will attempt in good faith to resolve through negotiation any dispute, claim or controversy arising out of or relating to this Agreement. Either party may initiate negotiations by providing written notice in letter form to the other party, setting forth the subject of the dispute and the relief requested. The recipient of such notice agrees to respond in writing within five days with a statement of its position on and recommended solution to the dispute. If the dispute is not resolved by this exchange of correspondence, then representatives of each party with full settlement authority will meet at a mutually agreeable time and place within fifteen days of the date of the initial notice in order to exchange relevant information and perspectives, and to attempt to resolve the dispute. If the dispute is not resolved by these negotiations, the matter will be submitted to Judicial Arbitration and Mediation Services (JAMS), or its successor, for mediation, following the procedure described in Subparagraph B, below. Pending settlement or a final judgment, the Contractor will proceed diligently with performance of this Agreement according to the instructions of BSA's contractual representative.
- (b) Mediation. Except as provided in this Agreement, the parties agree that neither will commence any civil action with respect to any dispute, claim or controversy arising out of or relating to this Agreement until the matter has been submitted to JAMS (45 Broadway, 28th Floor, New York, NY 10006, 212-751-2700), its successor, for mediation and that process has been completed. Either party may commence mediation by providing to JAMS and the other party a written request for mediation, setting forth the subject of the dispute and the relief requested. The parties agree to cooperate with JAMS and with one another in selecting a mediator from JAMS panel of neutrals, and in scheduling the mediation proceedings. The parties covenant that they will participate in the mediation in

good faith, and that they will share equally in its costs. The parties further agree that they will treat as confidential all offers, promises, conduct and statements, whether oral or written, made in the course of the mediation by any of the parties, their agents, employees, experts and attorneys, and by the mediator and any JAMS employees. The parties also agree that they will treat any such communications as privileged and inadmissible for any purpose, including impeachment, in any litigation or other proceeding involving the parties, provided that evidence that is otherwise admissible or discoverable will not be rendered inadmissible or non-discoverable as a result of its use in the mediation. Either party may seek equitable relief prior to the mediation to preserve the status quo pending the completion of that process. Except for such an action to obtain equitable relief, neither party may commence a civil action with respect to the matters submitted to mediation until after the completion of the initial mediation session, or forty-five (45) days after the date of filing the written request for mediation, whichever occurs first. Mediation may continue after the commencement of a civil action, if the parties so desire. The provisions of this Article may be enforced by any court of competent jurisdiction, and the party seeking enforcement will be entitled to an award of all costs, fees and expenses, including attorney's fees, to be paid by the party against whom enforcement is ordered.

- (c) Waiver of Right to Litigate in Court Before Completing Negotiation and Mediation and Waiver of Right to Jury Trial and Designation of Court Sitting in the State of New York. The Contractor agrees to submit all disputes, claims or controversies arising out of or relating to this Agreement to negotiation and then mediation as described above before bringing any action in court. The Contractor further acknowledges that, in the event it brings any such action in court, it will bring that action in a court sitting in the State of New York, and it further acknowledges that it is hereby waiving any right that it might possess to demand a jury trial for the litigation of that action. The Contractor further acknowledges that it is giving up any rights to judicial remedies and procedures to the extent that this agreement does not specifically provide for them. The Contractor further acknowledges that its agreement to the provision for this Agreement is voluntary.

Article 10 NOTICE REGARDING LATE PERFORMANCE

If the Contractor encounters difficulty in meeting performance requirements, or anticipates difficulty in complying with the delivery schedule or date, the Contractor shall immediately notify BSA's Procurement and Property Management Division (PPM) in writing, giving pertinent details, including the date by which it expects to complete performance or make delivery. This notice shall be informational only, and BSA's receipt of this notice shall not be construed as a waiver of any schedule or date, or any rights or remedies provided by law or under this Agreement.

Article 11 WAIVER

BSA's acceptance of the goods or services delivered hereunder and its subsequent use thereof shall not constitute a waiver of any improper materials or workmanship, or BSA's rights and remedies with respect to them. BSA's acceptance and its subsequent use of

goods or services delivered after the agreed upon delivery date shall not constitute a waiver by BSA of any rights arising from said late delivery.

Article 12 NEW MATERIALS

Unless otherwise specified in this Agreement, all supplies delivered hereunder shall consist of new materials. “New” is defined as previously unused which may include residual inventory or unused former Government surplus property. This does not exclude use of recycled or recovered material as defined by the Environmental Protection Agency in 40 CFR 247 Comprehensive Procurement Guideline For Products Containing Recovered Materials - Code of Federal Regulations (ecfr.io).

Article 13 HAZARDOUS MATERIALS IDENTIFICATION AND SAFETY DATA SHEETS

With or before each delivery, the Contractor shall submit a Safety Data Sheet, as prescribed in 29 CFR 1910.1200 and the latest version of Federal Standard No. 313, for all hazardous material delivered under this Agreement which will involve exposure to hazardous materials or items containing these materials, whether or not it is listed in Appendix A of the Standard. As used in this Article, “hazardous material” is as defined in the latest version of Federal Standard No. 313, including revisions adopted during the term of this Agreement.

Article 14 EXCUSABLE DELAYS

The Contractor shall be liable for default unless nonperformance is caused by an occurrence beyond the reasonable control of the Contractor and without its fault or negligence such as acts of God or the public enemy, acts of BSA, acts of the Government in either its sovereign or contractual capacity, fires, floods, epidemics, quarantine restrictions, strikes, unusually severe weather, and delays of common carriers. The Contractor shall notify BSA in writing as soon as it is reasonably possible after the commencement of any excusable delay, setting forth the full particulars in connection therewith, shall remedy such occurrence with all reasonable dispatch, and shall promptly give written notice to BSA of the cessation of such occurrence.

Article 15 TERMINATION FOR CONVENIENCE

BSA reserves the right to terminate this Agreement, or any part hereof, for its convenience or that of the Government. In the event of such termination, BSA’s Procurement and Property Management Division (PPM) shall deliver a notice specifying the extent of the termination and its effective date. The Contractor shall immediately stop all work so terminated and shall immediately cause any and all of its affected suppliers and subcontractors to cease work. Subject to the terms of this Agreement, BSA shall be liable only for payment under the payment provisions of this Agreement for services rendered prior to the notice of termination, plus reasonable charges that the Contractor can demonstrate to BSA’s satisfaction using its standard record keeping system, have resulted from the termination. The Contractor shall not be paid for any work performed or costs incurred which reasonably could have been avoided. In no event shall the agreed amount exceed the total price of the Agreement.

Article 16 TERMINATION FOR DEFAULT

- (a) Ten days after giving the Contractor written notice of its intent, BSA may terminate this Agreement for default, in whole or in part, if the Contractor fails to comply with any of the terms of this Agreement, fails to make progress so as to endanger performance of this Agreement or fails to provide adequate assurance of future performance. In this event, BSA shall not be liable for any services or supplies not accepted.
- (b) If this Agreement is terminated for default, BSA may require the Contractor to deliver any supplies and materials, manufacturing materials, and manufacturing drawings that the Contractor has specifically produced or acquired for the terminated portion of this Agreement. BSA shall pay the agreed-upon price for services performed and accepted in addition to completed supplies delivered and accepted. BSA and the Contractor shall agree on the amount of payment for all other deliverables.
- (c) BSA's rights and remedies under this Article are in addition to any other rights and remedies provided by law or under this Agreement.

Article 17 PAYMENT

- (a) BSA shall make payment for accepted services performed and/or items that have been delivered to the destination(s) set forth in this Agreement. Unless otherwise provided, terms of payment shall be net 30 days from submission of the Contractor's proper invoice (unless BSA does not approve such invoice). Invoices submitted by the Contractor anywhere other than to Account Payable, Bldg. 400, unless otherwise specified in this Agreement, are not deemed to have been officially received for payment term purposes. Any offered discount shall be taken if payment is made within the discount period indicated by the Contractor. Payments may be made either by check or electronic funds transfer, at BSA's option. Payment shall be deemed to have been made as of the date of mailing or the date on which the electronic funds transfer was made. Unless otherwise specified in this Agreement, BSA may make payment on partial deliveries which it accepts.
- (b) If the Contractor becomes aware of a duplicate contract financing or invoice payment or that BSA has otherwise overpaid on a contract financing or invoice payment, the Contractor shall remit the overpayment amount to the payment office cited in the Contract along with a description of the overpayment.

Article 18 CHANGES

- (a) At any time, BSA may, by written notice, make changes within the general scope of this Agreement, in any or all of the following:
 - (i) scope of work to be performed,
 - (ii) method and manner of performance,
 - (iii) place of performance,
 - (iv) drawings, designs or specifications if the Agreement calls for delivery of supplies specially manufactured for BSA,
 - (v) method of shipping or packing the supplies, and
 - (vi) place of delivery.

- If any such change causes an increase or decrease in the price or estimated cost of or the time required for performance of any part of the work hereunder, whether or not changed by the order, or otherwise affects any other terms and conditions of this Agreement, BSA shall make an equitable adjustment in the price or estimated cost and/or performance schedule and other affected terms and shall modify the agreement accordingly. Such adjustment shall be made by written amendment to this Agreement signed by both parties. The Contractor must assert any claim for adjustment within 30 days from the date it receives BSA's change notice; however, BSA may, in its sole discretion, receive and act on any claim for adjustment at any time before final payment. Failure to agree to any adjustment shall be settled in accordance with the Disputes article of these General Terms and Conditions. Nothing in this clause, including any disagreement with BSA about the equitable adjustment, shall excuse the Contractor from proceeding with work hereunder, as changed.
- (b) Only BSA's Procurement and Property Management Division (PPM) is authorized to issue changes, whether formal or informal, on BSA's behalf. If the Contractor considers that any direction or instruction by BSA's technical personnel constitutes a change, the Contractor shall not rely on such direction or instruction without obtaining written confirmation from BSA's PPM Division.
 - (c) When costs are a factor in any determination of a price adjustment pursuant to this clause or any provision of this Agreement, such cost shall be in accordance with the cost principles and procedures in FAR Subpart 31 and DEAR Subpart 931.

Article 19 INSPECTION AND ACCEPTANCE

- (a) BSA has the right to inspect and test all items and services (including, but not limited to, raw materials, components, intermediate assemblies and end products) to the extent practicable at all times and places including the period of manufacture, and in any event prior to acceptance. BSA shall perform inspections and tests in a manner that will not unduly delay the work. If BSA performs tests or inspections on the contractor's premises or that of a subcontractor, the Contractor shall furnish, or cause to be furnished, all reasonable facilities and assistance for the safe and convenient performance of these duties at no additional cost to BSA. BSA assumes no contractual obligation to perform any test or inspection for the Contractor's benefit unless specifically set forth elsewhere in this Agreement. BSA's failure to inspect the items and services shall not relieve the Contractor from responsibility, nor impose liability on BSA, for nonconformity.
- (b) If BSA specifies an inspection system elsewhere in this Agreement, the Contractor shall provide and maintain such inspection system and deliver only those items and services that have been found to conform to the requirements of this Agreement. The Contractor shall maintain complete records of all inspections and make them available to BSA during performance and for as long as this Agreement requires.
- (c) If BSA finds the materials or work to be defective, the Contractor shall promptly repair or replace such materials or work as directed by BSA at no increase in the agreement price. The Contractor shall bear the transportation cost. If the

Contractor fails to act as directed within 10 days from BSA's written notice, BSA may repair or replace such materials or work by contract or otherwise and assess the Contractor the excess cost it incurred as a result and/or terminate the Contractor for default. If the Contractor is not ready for inspection or if prior rejection makes reinspection or retest necessary, BSA may charge the Contractor the additional cost of test and/or inspection. The Contractor shall not tender for acceptance corrected or rejected items or services without disclosing the former rejection or requirement for correction and shall disclose the corrective action taken.

- (d) BSA shall affect acceptance of all materials and services ordered hereunder within a reasonable time after delivery. Except as otherwise provided for in this Agreement, acceptance shall be conclusive except as regards latent defects, fraud, or such gross mistakes as amount to fraud.

Article 20 TAXES

The Agreement price includes all applicable federal, state, and local taxes and duties. In determining the applicability of any tax or duty, due consideration shall be given to the relationship of the subject matter of this Agreement to the Government, and the fact that BSA is exempt from New York State and local sales and use taxes under Exempt Organization Certificate No. EX-216880.

Article 21 TITLE AND RISK OF LOSS

Unless specified elsewhere in this Agreement, title to items furnished under this Agreement shall pass to the Government upon acceptance, regardless of when or where BSA takes physical possession. If BSA makes partial or progress payments, title shall pass to the Government for the items covered by the payment. Unless the Agreement specifically provides otherwise, risk of loss or damage to the items provided under this Agreement shall remain with the Contractor until delivery of the items to the destination specified in the Agreement.

Article 22 WARRANTY

Notwithstanding inspection and acceptance by BSA under any provision of this Agreement, the Contractor warrants that the material, supplies and/or equipment delivered (hereinafter called "the goods") and any services performed hereunder, shall be of first-class quality and shall accord in every respect with the description, specifications, drawings, and/or samples elsewhere identified in this Agreement. The Contractor also warrants that all goods delivered hereunder shall be free from defects in design (unless the design is furnished by the Buyer), material and workmanship. The warranty shall begin on acceptance and extend for a period of one year or the manufacturer's warranty period, whichever is longer. If any nonconformity appears within that time, BSA, in addition to any other rights and remedies provided by law, or under other provisions of this Agreement, may require the Contractor to

- (a) replace or repair the goods and/or reperform the services at no increase in price or
- (b) reduce the Agreement price to reflect the reduced value of the Contractor's performance.

When supplies are returned, the Contractor shall bear the risk of loss and transportation cost. If the Contractor fails to replace or repair the goods or reperform the services within 10 days of BSA's written notice to do so, BSA shall have the right by contract or otherwise to replace or repair the goods or reperform the services, and charge the Contractor the cost occasioned thereby. Furthermore, the warranties provided for in this paragraph shall be in addition to such other warranties as may be specifically provided for elsewhere in this Agreement.

Article 23 EXTRAS

Except as otherwise provided in this Agreement, BSA shall not pay for extras unless authorized in writing by BSA.

Article 24 LIMITATION OF LIABILITY

Except as otherwise provided by an express or implied warranty, the Contractor will not be liable to BSA for consequential damages resulting from any defect or deficiencies in accepted items.

Article 25 COMPLIANCE WITH LAWS

- (a) The Contractor shall comply with all applicable federal, state, local laws and ordinances, executive orders, all pertinent lawful orders, rules and regulations, including those applicable by reason of the fact that this Agreement is issued under the Prime Contract and such compliance shall be a material requirement of this Agreement. If the Contractor is required to obtain licenses and/or permits to comply with this Article, it will do so without additional expense to BSA.
- (b) The Contractor warrants that each chemical substance constituting or contained in items furnished by this Agreement is on the list of substances published by the Administrator of the Environmental Protection Agency pursuant to the Toxic Substances Control Act, as amended. With each delivery the Contractor shall provide BSA any applicable Safety Data Sheet as required by the Occupational Safety and Health Act and applicable regulations including, without exception, 29 CFR 1910.1200.
- (c) The Contractor shall perform work under this Agreement in a manner that is safe, healthy and environmentally acceptable, and shall develop and manage a comprehensive program in support of these objectives. Specific requirements may be included in special or supplemental terms to this Agreement.
- (d) The Contractor shall include this clause in all subcontracts, at any tier, involving performance of this Agreement.

Article 26 COMPLIANCE WITH INTERNET PROTOCOL VERSION 6 (IPv6) IN ACQUIRING INFORMATION TECHNOLOGY

This clause is applicable if this contract involves the acquisition of Information Technology (IT) that uses Internet Protocol (IP) technology. The Contractor agrees that

- (a) all deliverables that involve (IT) that uses (IP) (products, services, software, etc.) comply with IPv6 standards and interoperate with both IPv6 and IPv4 systems and products; and

- (b) it has IPv6 technical support for fielded product management, development and implementation available.

If the Contractor plans to offer a deliverable that offers IT that is not initially compliant, the Contractor agrees to

- (c) obtain BSA's approval before starting work on the deliverable; and
- (d) have IPv6 technical support for fielded product management, development and implementation available.

Should the Contractor find that the Statement of Work or specifications of this contract do not conform to IPv6 standards, it must notify BSA of such nonconformance and act in accordance with BSA's instructions.

Article 27 AUTHORIZATION AND CONSENT

The Government has given its authorization and consent for all use and manufacture of any invention described in and covered by a patent of the United States in the performance of this Agreement or any part hereof or any amendment hereto or any subcontract hereunder (including any lower-tier subcontract) which is expected to exceed \$100,000.

Article 28 PATENT INDEMNITY-SUPPLIES AND SERVICES

If the amount of this Agreement is in excess of \$10,000, the Contractor shall indemnify BSA, the Government, and their officers, agents, and employees against liability, including costs, for infringement of any United States letters patent (except U.S. letters patent issued upon an application which is now or may hereafter be kept secret or otherwise withheld from issue by order of the Government) arising out of the manufacture or delivery of supplies or out of construction, alteration, modification, or repair of real property (hereinafter referred to as "construction work") under this Agreement, or out of the use or disposal by or for the account of the Government or BSA of such supplies or construction work. The foregoing indemnity shall not apply unless the Contractor shall have been informed as soon as practicable by the Government (with notice to BSA) of the suit or action alleging such infringement, and shall have been given such opportunity as is afforded by applicable laws, rules, or regulations to participate in the defense thereof, and further, such indemnity shall not apply to:

- (a) An infringement resulting from compliance with specific written instructions of BSA or the Government directing a change in the supplies to be delivered or in the materials or equipment to be used or directing a manner of performance of the Agreement not normally used by the Contractor.
- (b) An infringement resulting from addition to, or change in, such supplies or components furnished, or construction work performed which addition or change was made subsequent to delivery or performance by the Contractor, or
- (c) A claimed infringement which is settled without the consent of the Contractor, unless required by final decree of a court of competent jurisdiction.

Article 29 REPORTING OF ROYALTIES

If this Agreement is in an amount which exceeds \$10,000 and if any royalty payments totaling more than \$250 are directly involved in the Agreement or are reflected in the

Agreement price to BSA, the Contractor agrees to report in writing to the Government through BSA during the performance of this Agreement and prior to its completion or final settlement the amount of any royalties or other payments paid or to be paid by it directly to others in connection with the performance of this Agreement together with the names and addresses of licensors to whom such payments are made and either the patent numbers involved or such other information as will permit identification of the patents or other basis on which royalties are to be paid. The approval of DOE or BSA of any individual payments or royalties shall not stop the Government at any time from contesting the enforceability, validity or scope of, or title to, any patent under which a royalty or payments are made.

Article 30 NOTICE AND ASSISTANCE REGARDING PATENT AND COPYRIGHT INFRINGEMENT

The provisions of this clause shall be applicable only if the amount of this Agreement exceeds \$100,000.

- (a) The Contractor shall report to the Government through BSA promptly and in reasonable written detail, each notice or claim of patent or copyright infringement based on the performance of this Agreement of which the Contractor has knowledge.
- (b) In the event of any claim or suit against the Government on account of any alleged patent or copyright infringement arising out of the performance of this Agreement or out of the use of any supplies furnished or work or services performed hereunder, the Contractor shall furnish to the Government when requested by the Government or BSA, all evidence and information in possession of the Contractor pertaining to such suit or claim. Such evidence and information shall be furnished at the expense of the Government except where the Contractor has agreed to indemnify the Government or BSA.
- (c) This clause shall be included in all subcontracts.

Article 31 SUSPECT/ COUNTERFEIT ITEMS

- (a) "Suspect Items" are items, for which there is an indication by visual inspection, testing, or other information that it may not conform to established Government- or industry-accepted specifications or national consensus standards. "Counterfeit Items" are suspect items that are a copy or substitute without legal authority to do so or whose material, performance, or characteristics are knowingly misrepresented by the supplier, distributor, or manufacturer. Forms of misrepresentation include, but are not limited to, the following:
 - (b) Falsified product sources (counterfeits);
 - (c) Falsified or modified quality assurance records;
 - (d) False marking as to class, type, or grade;
 - (e) Mixing of unmarked materials with marked materials;
 - (f) False labeling as to qualification or acceptance by testing/certifying organizations
 - (g) Used and/or refurbished products misrepresented as new products.
 - (h) Types of materials, parts, and components, known to have been misrepresented include, but are not limited to:
 - (i) Lifting materials such as slings, hooks, cables, and shackles;

- (j) Threaded fasteners fraudulently marked as high-strength bolts;
- (k) Refurbished electrical circuit breakers sold under false certifications;
- (l) Valves;
- (m) Piping and piping components;
- (n) Electrical devices;
- (o) Channel members, plate, bar, and flanges;
- (p) Other structural items.
 - (i) See the BNL Suspect / Counterfeit Items, Subject Area. The link can be found on the PPM Terms and Conditions Listing (<https://www.bnl.gov/ppm/T-Cs/t-c.asp>) under SBMS External Site – All Documents. S/CIs may pose immediate and potential threats to the safety of DOE and contractor workers, the public, and the environment. Failure of a safety or mission critical system due to an S/CI could also have security implications at DOE facilities.
- (q) Items furnished to BSA under this Agreement shall not include suspect/counterfeit parts nor shall such parts be used in performing any work under this Agreement whether on or off the Laboratory site.
- (r) If suspect/counterfeit parts are furnished under this Agreement and are found on the Laboratory site, such parts shall be impounded by BSA or they shall be removed by the Contractor as directed by BSA. The Contractor shall promptly replace such parts with supplies acceptable to BSA and the Contractor shall be liable for all costs relating to impoundment, removal, and replacement. BSA may turn such parts over to the U.S. Office of the Inspector General for investigation and reserves the right to withhold payment pending the outcome of any investigation.
- (s) The rights of BSA in this clause are in addition to any other rights provided by law or under this Agreement.

Article 32 APPLICABLE LAW

The parties agree that the federal common law of government contracts will govern the construction and interpretation of this Agreement and all claims arising under or related to this Agreement or work performed under this Agreement or claims of breach of this Agreement, regardless of the forum in which any party to this Agreement brings action. For purposes of this Agreement, the federal common law of government contracts will consist of the interpretation of contract clauses and the law enunciated and applied to government contracts by the Boards of Contract Appeals, the Comptroller General (CG), and Federal Courts having jurisdiction over the Boards or the CG. The term "Board of Contract Appeals" means those established under the Contract Disputes Act of 1978, 41 U.S.C. 607(a)(1), and successor bodies.

Article 33 SUSPENSION OF WORK

- (a) At any time, BSA may, by written notice to the Contractor, require the Contractor to suspend, delay or interrupt all or any portion of the work called for by this Agreement for a period of up to 90 days after the notice is delivered to the Contractor, or for any other period to which the parties may agree. On receipt of this notice, the Contractor shall immediately comply with its provisions and take

all reasonable steps to minimize the incurrence of costs associated with such suspension as directed by BSA.

- (b) Prior the expiration of the suspension notice, BSA shall either:
- (i) Cancel or extend the notice; or
 - (ii) Terminate the work covered by the notice as provided in the Termination Articles of these General Provisions. If the suspension is canceled or allowed to expire, the Contractor shall resume work. Any claim by the Contractor resulting from a Suspension of Work Notice shall be governed by the Changes Article of these General Provisions.

Article 34 BANKRUPTCY

If the Contractor enters into any proceeding relating to bankruptcy, it shall give written notice to BSA's Procurement and Property Management Division (PPM) via certified mail with five (5) days of initiating the proceedings. The notification shall include the date on which the proceeding was filed, the identity and location of the court and a listing, by Contract number, of all BSA agreements for which final payment has not been made.

Article 35 WALSH-HEALY PUBLIC CONTRACTS ACT

If this Contract is for the manufacture or furnishing of materials, supplies, articles, or equipment in an amount which exceeds or may exceed \$15,000 and is otherwise subject to the Walsh-Healy Public Contracts Act, as amended (41 USC 35-45), there are hereby incorporated by reference all regulations issued thereunder by the Secretary of Labor, such representations and stipulations being subject to all applicable rulings and interpretations of the Secretary of Labor which are now or may hereafter be in effect.

Article 36 INTELLECTUAL PROPERTY INDEMNITY

The Contractor shall indemnify BSA and the Government and their officers, agents, and employees against alleged or actual liability, including costs of any nature whatsoever, for the Contractor's infringement or misappropriation of third party intellectual property, including, but not limited to, patents, copyrights, trademarks, or trade secrets that the Contractor has used, included, or embodied in its performance of the Contract. The Contractor will promptly notify BSA in the event it is notified that it has infringed or misappropriated a third party's intellectual property; in the event that infringement or misappropriation has occurred, in addition to the indemnification and at BSA's sole option, the Contractor will either procure the rights for BSA and the Government to use the intellectual property or BSA will terminate the Contract for cause.

Article 37 INDEMNITY FOR DEFECTIVE COST OR PRICING DATA

The Contractor hereby indemnifies and agrees to hold BSA harmless from any and all price or cost reductions made pursuant to the FAR 52.215-10 "Price Reduction for Defective Certified Cost or Pricing Data" clause or the FAR 52.215-11 "Price Reduction for Defective Certified Cost or Pricing Data - Modifications" clause, or any other provisions of the prime contract under which this Agreement is issued, and from and against any and all cost disallowances or non-recognitions of costs under such prime

contract, if such price or cost reduction, cost disallowance or non-recognition of costs arises or results directly or indirectly because:

- (a) Contractor, or any of Contractor's subcontractor or prospective subcontractor at any tier hereunder, furnished cost or pricing data that were not complete, accurate and current as certified in Contractor's Certificate of Current Cost or Pricing Data; or
- (b) Contractor, or any of Contractor's subcontractor or prospective subcontractor at any tier hereunder, furnished data of any description that were not accurate.

Accordingly, without limitation of the foregoing, the price of this Agreement shall be reduced and the Agreement shall be modified in writing as necessary to reflect the full amount of any and all such price or cost reductions and any and all such cost disallowances or non-recognitions of costs. The rights and remedies of BSA under or pursuant to this indemnity shall be cumulative and additional to any other or further rights and remedies provided under this Agreement or at law or in equity.

Article 38 LIABILITY WITH RESPECT TO COST ACCOUNTING STANDARDS

The Contractor shall be liable to the Government for increased costs or interest resulting from the Contractor's failure to comply with the Cost Accounting Standards and related clauses, if these clauses are incorporated in this Agreement.

Article 39 WHISTLEBLOWER PROTECTION FOR CONTRACTOR EMPLOYEES

- (a) The Contractor shall comply with the requirements of "DOE Contractor Employee Protection Program" at 10 CFR Part 708 for work performed on behalf of DOE directly related to activities at DOE owned or leased sites.
- (b) The Contractor shall insert or have inserted the substance of this clause, including this paragraph (b) in subcontracts, at all tiers, for subcontracts involving work performed on behalf of DOE directly related to activities at DOE owned or leased sites.

Article 40 PRESS RELEASES AND OTHER PUBLIC DISSEMINATION OF CONTRACT INFORMATION

Press releases through print, broadcast or other media concerning the award, performance, results or conclusions from the work under this Contract shall not be made or otherwise distributed to the public without prior written consent by BSA. Any material proposed to be released shall be submitted to the BSA Contractual Representative no later than two weeks prior to the intended press release.

Article 41 REPORTING EXECUTIVE COMPENSATION (Agreements valued at \$30,000 or more)

In accordance with FAR 52.204-10, Reporting Executive Compensation and First-Tier Subcontract Awards, and as a condition of award of this Agreement, the Contractor will be required to provide to the BSA's PPM Division information relative to executive total compensation as directed below. This requirement does not apply to Agreements with individuals.

For purposes of this Article, “executive” means officers, managing partners, or any other employees in management positions. “Total Compensation” means the cash and noncash dollar value earned by the executive during the Contractor’s preceding fiscal year and includes the following (for more information see 17 CFR 229.402(c)(2)):

- (a) Salary and bonus.
- (b) Awards of stock, stock options, and stock appreciation rights. Use the dollar amount recognized for financial statement reporting purposes with respect to the fiscal year in accordance with the Statement of Financial Accounting Standards No. 123 (Revised 2004) (FAS 123R), Shared Based Payments.
- (c) Earnings for services under non-equity incentive plans. This does not include group life, health, hospitalization or medical reimbursement plans that do not discriminate in favor of executives and are available generally to all salaried employees.
- (d) Change in pension value. This is the change in present value of defined benefit and actuarial pension plans.
- (e) Above-market earnings on deferred compensation which is not tax-qualified.
- (f) Other compensation, if the aggregate value of all such other compensation (e.g., severance, termination payments, value of life insurance paid on behalf of the employee, perquisites or property) for the executive exceeds \$10,000.

The Contractor agrees to report, by the end of the month following award of the Agreement, and annually thereafter, the names and total compensation of each of the five most highly compensated executives for the Contractor’s preceding completed fiscal year, if—

- (a) In the Contractor’s preceding fiscal year, the Contractor received—
 - (i) 80 percent or more of its annual gross revenues from Federal contracts (and subcontracts), loans, grants (and subgrants) and cooperative agreements; and
 - (ii) \$25,000,000 or more in annual gross revenues from Federal contracts (and subcontracts), loans, grants (and subgrants) and cooperative agreements; and
- (b) The public does not have access to information about the compensation of the executives through periodic reports filed under section 13(a) or 15(d) of the Securities Exchange Act of 1934 (15 U.S.C. 78m(a), 78o(d)) or section 6104 of the Internal Revenue Code of 1986.

Article 42 IDENTIFICATION OF EMPLOYEES

FAR 52.222-54 Employment Eligibility Verification, which is included in this Agreement, requires the Contractor to use an electronic Employment Eligibility Verification (E-Verify) system designated by the Secretary of Homeland Security to verify the eligibility of:

- (a) all persons hired during the Agreement term by the Contractor to perform duties within the United States; and
- (b) all persons assigned by the Contractor to perform work within the United States on the Federal Contract.

The Contractor agrees to incorporate FAR 52.222-54 and the substance of this clause in all lower subcontracts issued under this Agreement.

Article 43 CLAUSES INCORPORATED BY REFERENCE

This Agreement incorporates the following Federal Acquisition Regulation (FAR) and Department of Energy Acquisition Regulation (DEAR) clauses by reference, as they exist on the effective date of this Agreement, with the same force and effect as if they were in full text. The FAR and DEAR clauses are available at [Acquisition.GOV | www.acquisition.gov](https://www.acquisition.gov) or they may be obtained from [Electronic Code of Federal Regulations \(eCFR\)](https://www.ecfr.gov). When an alternate or deviation is included a link will be provided to the BSA Prime Contract for the full text of the clause. Whenever necessary to make the context of the clauses applicable to this Agreement, the term “Contractor” shall mean the Contractor, the term “Contract” shall mean this Agreement, and where noted or where necessary to derive proper meaning in a subcontract situation the terms “DOE”, “Government” and “Contracting Officer” shall mean BSA, except the terms “DOE”, “Government” and “Contracting Officer” do not change:

- (a) in the phrases “Government Property”, “Government-Furnished Property”, “Government Equipment” and “Government-Owned Equipment”, or, where otherwise intended that title, ownership or rights are to remain with the Government; or
- (b) where statute or regulation vests authority exclusively in specific agencies or officials; or
- (c) where otherwise specifically modified in this Agreement.

However, except in clauses:

FAR 52.227-1, “Authorization and Consent”,

FAR 52.227-14, “Rights in Data-General”,

FAR 52.227-16, “Additional Data Requirements”,

FAR 52.227-23, “Rights to Proposal Data (Technical)”,

DEAR 952.227-11, “Patent Rights Ownership by the Contractor (Short Form)”,

DEAR 952.227-13, “Patent Rights Acquisition by the Government”,

DEAR 970.5227-1, “Rights in Data-Facilities”,

DEAR 970.5227-4, “Authorization and Consent”,

DEAR 970.5227-5, “Notice and Assistance Regarding Patent and Copyright Infringement”,

in which clauses “Government” shall mean the U. S. Government and “Contracting Officer” shall mean the DOE Contracting Officer for the Prime Contract with Brookhaven Science Associates, LLC., (BSA).

Article	Title of Clause	FAR Ref.
Article 44	Certification and Disclosure Regarding Payments to Influence Certain Federal Transactions (Jun 2020)	52.203-11
Article 45	Limitation on Payments to Influence Certain Federal Transactions (Jun 2020) (agreements greater than \$150,000)	52.203-12

Article 46	Contractor Employee Whistleblower Rights and Requirement to Inform Employees of Whistleblower Rights (Jun 2020)	52.203-17
Article 47	Prohibition on Requiring Certain Internal Confidentiality Agreements or Statements (Jan 2017)	52.203-19
Article 48	Personal Identity Verification of Contractor Personnel (Jan 2011)	52.204-9
Article 49	Basic Safeguarding of covered contractor Information Systems (Jun 2016)	52.204-21
Article 50	Prohibition on Contracting for Hardware, Software, and Services Developed or Provided by Kaspersky Lab and Other Covered Entities (Nov 2021)	52.204-23
Article 51	Prohibition on Contracting for Certain Telecommunications and Video Surveillance Services or Equipment (Nov 2021)	52.204-25
Article 52	Required Sources for Helium and Helium Usage Data (Aug 2018) (SC Alternate) (Apr 2018) <u>BSA Prime Contract Clause I.18</u> (agreements involving a major helium requirement)	52.208-8
Article 53	Protecting the Government's Interest When Subcontracting with Contractors Debarred, Suspended or Proposed for Debarment (Jun 2020) (agreements greater than \$35,000)	52.209-6
Article 54	Pension Adjustments and Asset Reversions (Oct 2010)	52.215-15
Article 55	Utilization of Small Business Concerns (Oct 2018)	52.219-8
Article 56	Contract Work Hours and Safety Standards Act – Overtime Compensation (May 2018)	52.222-4
Article 57	Child Labor – Cooperation with Authorities and Remedies (Jan 2020) (agreements greater than \$25,000)	52.222-19
Article 58	Contracts for Materials, Supplies, Articles and Equipment (Jun 2020) Exceeding \$15,000	52.222-20
Article 59	Prohibition of Segregated Facilities (Apr 2015)	52.222-21
Article 60	Equal Opportunity (Sep 2016)	52.222-26
Article 61	Notification of Visa Denial (Apr 2015)	52.222-29
Article 62	Equal Opportunity for Veterans (Jun 2020) (agreements of \$150,000 or more)	52.222-35
Article 63	Equal Opportunity for Workers with Disabilities (Jun 2020) (agreements greater than \$15,000)	52.222-36
Article 64	Employment Reports on Veterans (Jun 2020) (agreements of \$150,000 or more)	52.222-37

Article 65	Notification of Employee Rights Under the National Labor Relations Act (Dec 2010) (agreements greater than \$10,000)	52.222-40
Article 66	Service Contract Labor Standards (Aug 2018) (agreements greater than \$2,500 and as designated in the agreement)	52.222-41
Article 67	Combating Trafficking in Persons (Oct 2020)	52.222-50
Article 68	Minimum Wages Under (Dec 2015) (E.O. 13658)	52.222-55
Article 69	Affirmative Procurement of Bio-based Products Under Service and Construction Contracts (Sep 2013)	52.223-2
Article 70	Hazardous Material Identification and Material Safety Data (Feb 2021) (Alternate I) (Jul 1995)	52.223-3
Article 71	Acquisition of EPEAT® – Registered Imaging Equipment (Jun 2014) (Alternate I) (Oct 2015)	52.223-13
Article 72	Acquisition of EPEAT® – Registered Televisions (Jun 2014) (Alternate I)	52.223-14
Article 73	Energy Efficiency in Energy Consuming Products (May 2020)	52.223-15
Article 74	Acquisition of EPEAT® - Registered Personal Computer Products (Oct 2015) (Alternate I) (Jun 2014)	52.223-16
Article 75	Encouraging Contractor Policies to Ban Text Messaging While Driving (Jun 2020)	52.223-18
Article 76	Privacy Training (Jan 2017)	52.224-3
Article 77	Buy American – Supplies (Jan 2021); Modified By DEAR 970.2570 (Nov 2010)	52.225-1
Article 78	Duty-Free Entry (Oct 2010)	52.225-8
Article 79	Restrictions on Certain Foreign Purchases (Feb 2021)	52.225-13
Article 80	Authorization and Consent (Jun 2020)	52.227-1
Article 81	Patent Indemnity (Apr 1984)	52.227-3
Article 82	Rights in Data-General with Alternate V and DEAR 927.409(a) and (d)(3). (Alternate II is applicable if limited rights in data is required. Alternate III is applicable if delivery is for restricted computer software) (May 2014)	52.227-14
Article 83	Additional Data Requirements (Jun 1987)	52.227-16
Article 84	Rights to Proposal Data (Technical) (Jun 1987)	52.227-23
Article 85	Taxes - Foreign Cost-Reimbursement Contracts (Mar 1990)	52.229-8
Article 86	Unenforceability of Unauthorized Obligations (Jun 2013)	52.232-39
Article 87	Providing Accelerated Payments to Small Business Subcontractors (Dec 2013)	52.232-40
Article 88	Preference for U.S. Flag Air Carriers (Jun 2003)	52.247-63

Article 89	Preference for Privately-Owned U.S. Flag Commercial Vessels (Feb 2006)	52.247-64
Article 90	Termination (Cost Reimbursement) (May 2004) Modified by DEAR 970.4905-1	52.249-6
Article 91	Excusable Delays (Apr 1984)	52.249-14
		DEAR. Ref
Article 92	Whistleblower Protection for Contractor Employees (Dec 2000)	952.203-70
Article 93	Security Requirements (agreements involving or are likely to involve classified information or special nuclear material)	952.204-2
Article 94	Classification/Declassification (Sep 1997) (agreements involving or are likely to involve classified information)	952.204-70
Article 95	Facility Clearance (Aug 2016)	952.204-73
Article 96	Computer Security (Aug 2006) (agreements that may provide access to computers owned, leased or operated on behalf of the DOE)	952.204-77
Article 97	Reserved	
Article 98	Patent Rights-Retention by the Contractor (Short Form) (Mar 1995) (agreements to small business for experimental, research & development, demonstration, or design work)	952.227-11
Article 99	Patent Rights-Acquisition by the Government (Sep 1997) (agreements to other than small business for experimental, research & development, demonstration, or design work)	952.227-13
Article 100	Research Misconduct (Jul 2005) (agreements involving research)	952.235-71
Article 101	Laws, Regulations, and DOE Directives (SC Deviation) <u>BSA Prime Contract Clause I.122</u>	970.5204-2
Article 102	Access to and Ownership of Records (Oct 2014) (Deviation per Policy Flash 2015-23) (Applicable to contracts that contain the Integration of Environment, Safety and Health into Work Planning and Execution clause at 952.223-71 or, the Radiation Protection and Nuclear Criticality clause at 952.223-72.)	970.5204-3
Article 103	Sustainable Acquisition Program (SC Alternate) <u>BSA Prime Contract Clause I.134</u>	970.5223-7
Article 104	Rights in Data-Facilities (Dec 2000) (agreements for design or operation of plants or facilities or specially designed equipment for plants or facilities)	970.5227-1
Article 105	Technology Transfer Mission (SC Alternate 1) <u>BSA Prime Contract Clause I.139</u>	970.5227-3

Article 106	Authorization and Consent (Aug 2002) (Deviation) (Sep 2021) (paragraph (a) only; agreements for research and development greater than the simplified acquisition threshold)	970.5227-4
Article 107	Refund of Royalties (Aug 2002)	970.5227-8
Article 108	Accounts, Records, and Inspection (Dec 2010)	970.5232-3
Article 109	Property (Aug 2016) (Alternate I) (Dec 2000)(Deviation)	970.5245-1

The following clauses are applicable to agreements over the Simplified Acquisition Threshold:

Article	Title of Clause	FAR Ref.
Article 110	Gratuities (Apr 1984)	52.203-3
Article 111	Covenant against Contingent Fees (May 2014)	52.203-5
Article 112	Restrictions on Subcontractor Sales to the Government (Jun 2020)	52.203-6
Article 113	Anti-Kickback Procedures (Jun 2020) (except subparagraph c (1))	52.203-7
Article 114	Limitation on Payments to Influence Certain Federal Transactions (Jun 2020)	52. 203-12
Article 115	Contractor Employee Whistleblower Rights and Requirement to Inform Employees of Whistleblower Rights (Jun 2020)	52.203-17
Article 116	Service Contract Reporting Requirements (Oct 2016) (Fixed Price agreements or for Cost Reimbursable, Time and Material, or Labor-Hour for agreements greater than \$500,000)	52.204-14
Article 117	Integrity of Unit Prices (Jun 2020) (except paragraph (b))	52.215-14
Article 118	Limitations on Pass-Through Charges (Jun 2020) (Cost Reimbursable agreements)	52.215-23
Article 119	Interest (May 2014)	52.232-17
		DEAR. Ref
Article 120	Organizational Conflicts of Interest and Alternate I (Aug 2009)	952.209-72
Article 121	Notice and Assistance Regarding Patent and Copyright Infringement (Dec 2000) (Alternate) (Sep 2021)	970.5227-5

The following clauses are applicable to agreements over \$500,000:

Article	Title of Clause	DEAR. Ref
Article 122	Workforce Restructuring under Section 3161 of the National Defense Authorization Act for Fiscal Year 1993 (Dec 2000)	970.5226-2

Article	Title of Clause	FAR Ref.
Article 123	Contractor Code of Business Ethics and Conduct (Jun 2020) (agreements greater than \$6,000,000)	52.203-13
Article 124	Display of Hotline Poster(s) (Jun 2020) (agreements greater than \$6,000,000)	52.203-14
Article 125	Price Reduction for Defective Certified Cost or Pricing Data (Aug 2011) (agreements greater than \$2,000,000)	52.215-10
Article 126	Price Reduction for Defective Certified Cost or Pricing Data – Modifications (Jun 2020) (agreements greater than \$2,000,000)	52.215-11
Article 127	Subcontractor Certified Cost or Pricing Data (Jun 2020) (agreements greater than \$2,000,000)	52.215-12
Article 128	Subcontractor Cost or Pricing Data – Modifications (Jun 2020) (agreements greater than \$2,000,000)	52.215-13
Article 129	Small Business Subcontracting Plan (Sep 2021) (Alt IV) (agreements to large business greater than \$750,000)	52.219-9
Article 130	Liquidated Damages – Subcontracting Plan (Sep 2021) (agreements to large business greater than \$750,000)	52.219-16
Article 131	Reserved	
Article 132	Cost Accounting Standards (Jun 2020) (except Paragraph (b); negotiated agreements to large business)	52.230-2
Article 133	Disclosure and Consistency of Cost Accounting Practices (Jun 2020) (agreements greater than \$2,000,000) (negotiated agreements to large business)	52.230-3
Article 134	Disclosure and Consistency of Cost Accounting Practices--Foreign Concerns (Jun 2020) (agreements greater than \$2,000,000)	52.230-4
Article 135	Administration of Cost Accounting Standards (Jun 2010) (agreements greater than \$2,000,000) (negotiated agreements to large business)	52.230-6