PRINCETON PLASMA PHYSICS LABORATORY

ENG-060 - SOW - STATEMENT OF WORK

Bakeout of NSTX-U Recovery Tiles

NSTXU_1-1-1-1_SOW_102

Work Planning #: **2317**
Effective Date: **11/19/2019**
Prepared By: **Justin Bradley**

Reviewed By	Jonathan Klabacha, Cognizant Individual	11/19/2019 13:27:51 PM
Reviewed By	Justin Bradley, Preparer	11/15/2019 14:17:41 PM
Reviewed By	Steve Raftopoulos, Responsible Engineer	11/18/2019 11:22:10 AM
Reviewed By	Andres Castaneda, Quality Assurance	11/15/2019 14:06:55 PM
Reviewed By	William (Bill) Gattoni, Project Manager	11/18/2019 11:44:49 AM
Approved By	Leslie Hill, Project Manager	11/19/2019 15:22:27 PM

Statement of Work for Bakeout of NSTX-U Recovery Tiles

CAT: ☒A1 ☐A2 ☐A3

NSTXU_1-1-1-1_SOW_102

Reference Work Planning#: 2317

REVISION 0

DATED: November 14th, 2019

Prepared by: Jonathan Klabacha
Cognizant Individual
Reviewed by: Justin Bradley
Mech. Engineer
Reviewed by: Steve Raftopoulos
Responsible Engineer
Reviewed by: Andres Castaneda
Quality Assurance
Reviewed by: William Gattoni
Associate Project Manager
Approved by: Les Hill
Project Manager

PRINCETON PLASMA PHYSICS LABORATORY
P.O. BOX 451
PRINCETON, N.J. 08543

Table of Contents

1.0 Introduction & Scope

This document covers the bakeout of graphite tiles, which will be used for the Plasma Facing Components (PFCs) of the National Spherical Torus Experiment Upgrade Recovery (NSTX-U) Project. Carbon Fiber Composite (CFC) tiles, graphite (R6510, ET10, and T953) tiles, and X-Ray Photoelectron Spectroscopy (XPS) test coupons will be baked. While strict conformance to the requirements stated in this document is essential, the Subcontractor is encouraged to submit, with the proposal, suggestions to improve product quality, reduce cost, or improve schedule, subject to approval by PPPL.

2.0 Applicable Documents

2.1 The Subcontractor shall adhere to ASTM A991/A991M-17 – "Standard Test Method for Conducting Temperature Uniformity Surveys of Furnaces Used to Heat Treat Steel Products".

2.2 The subcontractor shall also adhere to ASTM E1829-14 – "Standard Guide for Handling Specimens Prior to Surface Analysis".

2.3 PPPL Attachment I – "Product Quality Certification and Shipping Release" form.

Note: Alternative procedures may be used with prior PPPL approval.

3.0 Applicable Drawings

Not Applicable.

4.0 Responsibilities

4.1 *Princeton Plasma & Physics Laboratory*

4.1.1 *PPPL Contacts*

4.1.1.1 PPPL shall designate a technical contact referred to as the Princeton Technical Representative (PTR), a Quality Assurance (QA) contact, as well as back-up contacts for each.

4.1.1.2 PPPL shall provide all materials to be baked out. The materials include graphite/CFC tiles with identifying markings (tile number and serial number) and test coupons with identifying markings (labeled 'A', 'B', and 'C'). Coupons will be provided in serialized wafer carrier trays to prevent contamination. Spare trays will be included for use after bakeout processes.

4.2 *Subcontractor*

4.2.1 *Subcontractor Contacts*

4.2.1.1 The Subcontractor shall designate and provide contact information for a primary technical contact, a Quality Assurance contact, and a back-up contact for each.

4.2.2 *Subcontractor Conformance*

4.2.2.1 The Subcontractor shall conform to all requirements of this Statement of Work. If any portion of this work is to be performed by sub-tier contractors, such plans shall be communicated to PPPL with the Contractor's proposal and shall be subject to

PPPL approval. All requirements given in this Statement of Work shall flow down to any PPPL approved sub-tier contractors.

5.0 Performance Requirements

5.1 *Bakeout Performance*

5.1.1 *Bakeout Characteristics*

The Subcontractor shall bakeout the PFC tiles and test coupons in accordance with Table 5.1.1-1. Following the bakeout process, each tile shall be inspected for damage, stored in a sealed plastic bag, and labeled with the tile drawing number and serial number following bakeout.

Table 5.1.1-1: Bakeout Time and Temperature Cycles

Temperature (°C) ± 25 °C	**Minimum Time at Temperature (Hours)**
1200	4
1100	6
1000	8

Note: During temperature ramp up steps, specified temperatures shall be considered to be achieved once the thermocouple with the lowest reading reaches the specified temperature.

During temperature ramp down steps, specified temperatures shall be considered to be achieved once the thermocouple with the highest reading reaches the specified temperature.

5.1.2 *Bakeout Operating Environment*

5.1.2.1 The Subcontractor shall clean their furnace using their preferred cleaning processes to eliminate as much potential contamination as possible prior to the trial bakeout process listed within Section 6.2.1.

5.1.2.2 The Subcontractor shall conduct a Trial Bakeout of the cleaned furnace using testing coupons provided by PPPL to verify the cleanliness of the furnace. The Subcontractor shall propose 1 of the 3 bakeout time/temperature cycles listed within Table 5.1.1-1. The Trial Bakeout process the subcontractor shall follow is detailed within Section 6.2.1.

5.1.2.3 For the Final Bakeout, thermocouple location distribution, along with the proposed tile and coupon stacking layout shall be provided with the Subcontractors proposal.

5.1.2.4 The Subcontractor shall record and provide copies of all furnace runs per the Process History requirements (Section 9.10).

5.1.3 *Design Life*

Not Applicable.

5.1.4 *Reliability*

Not Applicable.

5.1.5 *Maintainability*

Not Applicable.

5.1.6 *Human Factors*

Not Applicable.

5.1.7 *Sustainability*

Not Applicable.

5.2 *Equipment Definitions*

5.2.1 *Specifications and Standards*

5.2.1.1 ASTM A991/A991M-17 – "Standard Test Method for Conducting Temperature Uniformity Surveys of Furnaces Used to Heat Treat Steel Products ".

5.2.1.2 ASTM E1829-14 – "Standard Guide for Handling Specimens Prior to Surface Analysis".

5.2.2 *General Design Features*

Not Applicable.

5.2.3 *Materials*

Not Applicable.

5.2.4 *Electromagnetic Interference and Susceptibility*

Not Applicable.

5.2.5 *Identification & Marking*

Tiles shall arrive within serialized bags, and coupons shall arrive within serialized wafer carrier trays. The subcontractor shall maintain tile and coupon serialization through all stages of processing.

5.2.6 *Workmanship*

The Subcontractor shall follow the below guidelines for graphite handling:

5.2.6.1 Under no circumstances shall the graphite tiles or coupons (both prior, during, and after bakeout) be handled bare-handed as it will contaminate the surface.

5.2.6.2 Graphite tiles and coupons shall only be handled by personnel wearing powder-free latex gloves at all stages of production. Nitrile or Nitrile coated gloves are not acceptable and will contaminate the surface.

5.2.6.3 Under no circumstances shall the graphite stock or tiles be exposed to any type of grease, cutting fluid, oil, sealant, solvent, or any other external contaminants present within the Subcontractor's operating environment.

5.2.7 *Subcontractor Equipment Use*

Not Applicable.

6.0 Test & Inspection Requirements

6.1 *Performance Requirements*

6.1.1 Acceptable time/temperature cycles are indicated in Table 5.1.1-1.

6.1.2 The distribution of thermocouples used to monitor each furnace run shall include at least one thermocouple located at the approximate center of mass of the furnace load.

6.1.3 Final bakeout tiles shall be spaced with gaps > 1" in dimension on all sides.

6.2 *Acceptance Requirements*

6.2.1 *Trial Bakeout Process*

Following the Subcontractor's cleaning cycle, three test coupons shall be baked as follows:

6.2.1.1 Three test coupons (one each labeled 'A', 'B', and 'C') shall be shielded from line of sight of metallic components (including fixturing) in the furnace.

6.2.1.2 The test coupons shall be distributed in the furnace at the vertical and radial extents of the volume. Coupon A shall be placed at the top perimeter of the volume, coupon B shall be placed at the middle center, and coupon C shall be placed at the bottom perimeter (located at the perimeter on the opposite side from the top perimeter coupon).

6.2.1.3 The furnace shall be evacuated to less than 1.0 x 10-4 [torr].

6.2.1.4 The furnace shall be backfilled to 200 to 500 [m-torr] of dry hydrogen gas (zero grade minimum).

6.2.1.5 The furnace shall be heated to the selected process temperature (Table 5.1.1-1) and held at temperature for two hours minimum while maintaining the hydrogen pressure specified in step 4.

6.2.1.6 After two hours, the furnace shall be evacuated to less than 2.0 x 10-4 [torr].

6.2.1.7 The furnace shall be held at temperature and under vacuum for the time selected from Table 5.1.1-1 based on the selected temperature.

6.2.1.8 The test coupons shall be allowed to cool in vacuum until the temperature is ≤ 300 deg C.

6.2.1.9 The furnace shall be vented to nitrogen gas (zero grade minimum) or argon gas (zero grade minimum) and cooled to ≤ 80°C before the test coupons are exposed to air.

6.2.1.10 Immediately after the furnace is opened, the test coupons shall be placed in new wafer carrier trays, maintaining the original serialization, and moved to a clean area.

Note: Powder-free latex gloves shall be worn to prevent contamination of the coupons. The coupons shall be gripped by their sides or edges, contact with the top or bottom surfaces shall be avoided at all times.

6.2.1.11 A seal will be affixed to the furnace until completion of test coupon evaluation. The furnace shall not be used for other purposes prior to the final tile bakeout run.

6.2.1.12 The packaged test coupons shall be provided to an independent laboratory specified by PPPL for surface analysis by X-Ray Photoelectron Spectroscopy (under a separate PPPL contract).

Note: This is a Supplier Hold Point per Section 6.3.2.

6.2.1.13 The presence of any elements of $Z \geq 20$ in concentrations $\geq 3\%$ atomic percentage of the sample area in the results of the X-Ray Photoelectron Spectroscopy (noted in step 13 above) shall be cause for rejection. This will require re-cleaning of the furnace and fixtures (Section 5.1.2.1) and the trial bakeout (Section 6.2.1) repeated with a new set of test coupons.

6.2.2 *Tile Bakeout Process*

Based on acceptability of the test coupons, PPPL will direct the Subcontractor to process the graphite tiles as follows:

6.2.2.1 Tiles shall be placed in the furnace, shielded from line of sight of metallic components in the furnace. Tiles shall be stacked allowing for gaps > 1” in dimension on all sides. This spacing between tile surfaces is paramount for adequate vacuum conductance during bakeout.

6.2.2.2 A second set of three test coupons shall be positioned amongst the tiles shielded from line of sight of metallic components (including fixturing) in the furnace. The coupons shall be distributed in the furnace at the vertical and radial extents of the volume. Coupon A shall be placed at the top perimeter of the volume, coupon B shall be placed at the middle center, and coupon C shall be placed at the bottom perimeter (located at the perimeter on the opposite side from the top perimeter coupon).

6.2.2.3 The furnace shall be evacuated to less than 2.0 x 10-4 [torr].

6.2.2.4 The furnace shall be backfilled to 200 to 500 [m-torr] of dry hydrogen gas (zero grade minimum).

6.2.2.5 The furnace shall be heated to the selected process temperature (Table 5.1.1-1) and held at temperature for two hours minimum while maintaining the hydrogen pressure specified in step 4.

6.2.2.6 After two hours, the furnace shall be evacuated to less than 2.0 x 10-4 [torr].

6.2.2.7 The furnace temperature and pressure shall be maintained for the duration of the selected bakeout time (Table 5.1.1-1).

6.2.2.8 The furnace shall be cooled under vacuum conditions to less than 300 deg C.

6.2.2.9 The furnace shall be vented to nitrogen gas (zero grade minimum) or argon gas (zero grade minimum) and cooled to $\leq 80°C$ before the tiles are exposed to air.

6.2.2.10 The bakeout cycle shall be recorded on a furnace chart and supplied to PPPL. Each furnace chart shall include the tile drawing numbers and serial numbers of the components within the run being recorded.

6.2.2.11 Immediately after the furnace is opened, the test coupons shall be placed in new wafer carrier trays, maintaining the original serialization, and moved to a clean area.

Note: Powder-free latex gloves shall be worn to prevent contamination of the coupons.

6.2.2.12 Immediately after bakeout, tiles shall be moved to a clean area, taking care to avoid damage or contamination.

6.2.2.13 Each tile shall be individually supplied in a sealed polyethylene bag with a thickness of at least 6 mils (which has been flushed with argon or nitrogen gas, zero grade minimum) and marked with the tile drawing number and serial number. The original bags shall be discarded.

6.2.2.14 After bagging, subsequent handling and packaging of the bagged tiles shall be performed in such a manner to prevent puncture of the bags and/or damage to the tiles.

6.2.2.15 The test coupons shall each be wrapped in clean, non-coated aluminum foil, taking care to minimize contact between the foil and the top surface of the coupon. The wrapped coupons shall be provided to an independent laboratory specified by PPPL for surface analysis by X-Ray Photoelectron Spectroscopy (under a separate PPPL contract).

Note: This is a Supplier Hold Point per Section 6.3.3.

6.2.2.16 The presence of any elements of $Z \geq 20$ in concentrations $\geq 3\%$ atomic percentage of the sample area in the results of the X-Ray Photoelectron Spectroscopy (noted in step 14 above) shall be cause for rejection and shall require re-cleaning of the furnace and fixtures (Section 5.1.2.1), and bakeout repeated (Section 6.2.2).

6.2.2.17 After confirmation that the coupons meet the requirements in step 6.2.2.16 above, PPPL will authorize the tiles to be packed (or repacked, if necessary) in preparation for shipping to PPPL's facility.

6.3 ***Supplier Hold Points***

The supplier shall hold further work for PPPL approval to continue work at the following points:

6.3.1 As applicable, upon any identified non-conformance pending PPPL approved disposition.

6.3.2 Following the Bakeout Trial run per Section 6.2.1, pending coupon evaluation (per Section 6.2.1.13).

6.3.3 Following the Tile Bakeout run per Section 6.2.2, pending coupon evaluation (per Section 6.2.2.16).

6.3.4 Prior to shipment pending a review of the Process History Documentation (per Section 9.10) and provision of signed Release for Shipment Form (per Section 9.8).

7.0 Qualifications, Inspection, & Acceptance

7.1 *Equipment Qualifications*

The Subcontractor's furnace used will be evaluated per ASTM A991 (or equivalent agreed to procedure) and shown to be capable of maintaining temperature uniformity to within ± 25°C.

7.2 *Inspection & Acceptance*

7.2.1 The Subcontractor shall inspect the tiles upon receipt and notify PPPL of any damage prior to the bakeout operations.

7.2.2 After bakeout, the Subcontractor shall inspect each tile to confirm the cleanliness and integrity of the tiles.

7.2.3 All chips, nicks, pits, or other surface imperfections shall be recorded on a Quality Control inspection sheet and reported to PPPL.

7.2.4 Acceptance of a batch of tiles is based upon adherence to this Statement of Work and the results of Coupon Evaluation as noted per Sections 6.2.1.13 and 6.2.2.16.

8.0 Environment, Safety, and Health

8.1 PPPL may request information deemed necessary to evaluate the Subcontractor's safety record at any time.

8.2 The Subcontractor shall comply with all OSHA regulations to ensure the safety of any potential PPPL visitors to the Subcontractor's facility. The Subcontractor shall provide all PPPL visitors with the requisite training and PPE to insure their safety.

9.0 Quality Assurance Requirements

9.1 *Inspection/Surveillance/Audit by PPPL*

Authorized representatives of PPPL and the U. S. Government shall have the right at all reasonable times to visit the Subcontractor's premises and those of Subcontractor's suppliers during the performance of the procurement for the purposes of inspection, surveillance, audit and/or obtaining any required information as may be necessary to assure that items or services are being furnished in accordance with specified requirements.

Such visits shall be coordinated with the Subcontractor's personnel to minimize interference with the normal operations of said premises. The Subcontractor shall make available records and documentation necessary for this function and shall provide all reasonable facilities and assistance for the safety and convenience of PPPL and/or U. S. Government representatives in the performance of their duties.

PPPL and the U. S. Government recognize the Subcontractor's right to withhold information concerning proprietary processes. The Subcontractor agrees to insert the paragraph above in each lower tier procurement issued hereunder.

9.2 *Subcontractor's Responsibility for Conformance*

Neither PPPL's review and/or approval of the Subcontractor's documents nor PPPL's inspection of the Subcontractor's items or services shall relieve the Subcontractor of responsibility for full

compliance with requirements of the purchase order/contract. The Subcontractor is responsible for assuring that all requirements and restrictions are imposed on any sub-tier suppliers.

9.3 ***Subcontractor's Quality Assurance Program***

The Subcontractor shall establish and maintain an effective Quality Assurance Program to assure that the Subcontractor's work meets the required level of quality and is performed in accordance with contractual requirements.

9.3.1 The Subcontractor's quality assurance function shall be actively involved in the planning, processing, oversight, problem resolution, and determination of the acceptability of all work covered under this sow.

9.3.2 The Subcontractor's quality assurance function shall be organized to have sufficient authority and independence to identify quality problems, verify conformance of supplied items or services to specified requirements and obtain satisfactory resolution of conflicts involving quality.

9.3.3 The Subcontractor shall perform planned, periodic audits of the various aspects of its QA program by persons not directly responsible for the area being audited. Written reports of these audits shall be made available to PPPL upon request.

9.3.4 The Subcontractor shall submit with the proposal, a copy of its quality assurance program manual, describing the subcontractor's quality capability and general approach to quality assurance. The manual shall be subject to PPPL's review and acceptance prior to contract award.

9.4 ***Document Traceability & Records***

The Subcontractor shall maintain a system of documentation whereby objective evidence of required operations, examinations, and tests is systematically compiled, indexed and stored. Such objective evidence may include "travelers", certification, examination, and discrepancy reports, which shall be complete, legible, and validated by responsible personnel and shall be traceable to subject items.

9.5 ***Control of Special Processes***

Subcontractor shall use trained and qualified personnel and qualified written procedures in accordance with specified requirements for the performance of certain special processes, including but not limited to, soldering, electronic assembly, brazing, welding, plating, heat treatment, nondestructive examination, etc. Copies of special process procedures and qualifications shall be available for review by PPPL and submitted to PPPL for acceptance if requested.

9.6 ***Non-Conformances & Corrective Actions***

The Subcontractor shall promptly identify and control non-conforming items or services. Non-conforming items or services shall be positively identified, and segregated where possible, to prevent use. The Subcontractor shall document each non-conformance.

The written approval of PPPL is required prior to the use of a non-conforming item or service. The Subcontractor's system shall provide not only for the timely resolution of non-

conformances, but also for the analysis of non- conformances to determine root causes and to implement appropriate and effective corrective actions.

9.7 ***Calibration of Test and Measuring Equipment***

Inspections and tests shall be performed using properly calibrated measuring and test equipment. Calibration standards shall be traceable to the National Institute for Standards and Technology (NIST) or equivalent. Reference standards shall only be used for calibration and verification unless it is demonstrated that their performance as reference standards has not been invalidated. Records of calibration of equipment to be used to fulfil the requirements of this SOW shall be provided to PPPL with the Subcontractor's proposal.

9.8 ***Submittal of Product Quality Certification & Shipping Release***

Subcontractor shall not ship without a "Product Quality Certification and Shipping Release" Form (Attachment I) signed by PPPL's Representative. Subcontractor shall complete and sign the certification section, fax or email the form to PPPL's Quality Assurance (QA) Representative, along with the Process History, and hold shipment until PPPL signs and returns the form, authorizing shipment. A copy of the fully executed form shall accompany each full or partial shipment.

Note: The Subcontractor shall provide internal and external pictures of their packaging with the Shipping release form for the tiles subject to PPPL review, approval, and modification if deemed necessary.

9.9 ***Submittal of Manufacturing/Inspection/Test (MIT) Plan***

Not Applicable.

9.10 ***Process History***

The Subcontractor shall provide PPPL, along with the completed "Product Quality Certification and Shipping Release" (per Section 9.8), a digital copy of the Process History. The Process History is a compilation of documents, detailing the objective evidence of the acceptability of the work performed, and shall include as a minimum the following:

9.10.1 *Certificate of Conformance*

The Subcontractor's shall submit a C of C, stating that the work performed conforms in every respect to the physical configuration and functional inspection/test requirements. The Subcontractor's Quality Assurance (QA) Manager shall sign the C of C. Where the Subcontractor has used PPPL-furnished material, such certification shall also include the statement: "Material furnished by PPPL has been inspected by the Subcontractor and used by the Subcontractor as specified by PPPL with no unauthorized substitutions".

9.10.2 *Bakeout/Furnace Records*

The Subcontractor shall submit copies of bakeout/furnace charts and/or reports depicting the actual temperature and pressure versus time plots. The furnace that was used, and the tiles included in each furnace run shall be identified on the charts or reports.

9.10.3 *Inspection & Test Reports*

The Subcontractor shall submit the post-bakeout inspection records to PPPL per Section 7.2.

9.10.4 *Non-Conformance Reports*

The Subcontractor shall submit copies of resolved discrepancy non-conformance reports, including those affecting form, fit or function.

10.0 Shipping, Storage, and Packaging

The Subcontractor shall control items during shipping, handling, and storage. Release from storage shall be controlled to prevent accidental or inadvertent use of incorrect or unacceptable items. The Subcontractor shall, at minimum, conform to the following shipping and packaging requirements:

10.1 All parts are to be packaged in such a way that the parts cannot freely move and potentially incur damage while in-transit. This can be achieved through the Subcontractor's preferred methods. Methods may include but are not limited to: metal-tension banding, clear plastic wrap, or movement restrictive packaging. PPPL reserves the right to review the Subcontractor's packaging method during the Release for Shipment process (per Section 9.8).

10.2 Graphite is an inherently brittle material which can easily chip or crack when subject to impacts, thus special packaging considerations shall be made by the Subcontractor to prevent the potential of impact damage affecting the shipment while in-transit.

10.3 A copy of the Process History (per Section 9.10) and the "Product Quality Certification and Shipping Release" (per Section 9.8) shall be enclosed within a weather safe shipping label accompanying the shipment.

Note: The Subcontractor's planned shipping method and packaging shall be detailed within their "Product Quality Certification and Shipping Release" submitted to PPPL for approval. PPPL will approve or revise the Subcontractor's recommended shipping method and packaging to ensure conformance with the above requirements.

11.0 Warranty

Not Applicable.

12.0 Attachments

12.1 Deliverables Checklist.

12.2 PPPL Attachment I – "Product Quality Certification and Shipping Release" form.

13.0 Documentation and Deliverables

PO / Subcontract / BOA / BPA #:_____

#	Physical Deliverables Required	When Deliverable Is Required	Deliverable Received (✓)
1	Baked-Out Graphite Tiles	At conclusion of bakeout of all tiles	
Exceptions (Add justification for any missing physical deliverables that will not be received):			

#	Document Deliverables Required	When Deliverable Is Required	Deliverable format (paper, electronic, etc.)	Storage Location for Deliverable	Deliverable Received (✓)
1	Quality Assurance Program (Section 9.3)	With Proposal	Electronic	Ops	
2	Furnace Run Charts (Section 9.10.2)	Within 10 days of award	Electronic	Ops	
3	Calibration Documentation of Test and Measuring Equipment (Section 9.7)	With Proposal	Electronic	Ops	
4	Process History (Section 9.10)	Prior to Shipment(s)	Electronic	Ops	
5	Product Quality Certification and Shipping Release Form (Section 9.8)	Prior to Shipment(s)	Electronic	Ops	
Exceptions (Add justification for any missing document deliverables that will not be received):					

Princeton Technical Representative/COG:

_____

(Sign and provide to the Operations Center when job is completed and deliverables are dispositioned and placed/filed in the Operations Center (or other Project, Department or Division designated file center).

PRINCETON PLASMA PHYSICS LABORATORY—PPPL
PRODUCT QUALITY CERTIFICATION & SHIPPING RELEASE

To be completed by supplier and submitted to PPPL with the Documentation package.
Shipment (full or partial) is not authorized until PPPL returns this form signed.

Completed by Sup			
	PPPL SUBCONTRACT/ ORDER #	ITEM #(s)	QUANTITY SHIPPED
	ITEM DESCRIPTION	SUPPLIER REFERENCE #	SHIPMENT #

SUPPLIER'S CERTIFICATION

This is to certify that the products and services identified herein have been produced under a controlled quality assurance program and are in conformance with the procurement requirements including applicable codes, standards and specifications as identified in the above-referenced documents unless noted below. Any supporting documentation will be retained in accordance with the procurement requirements.

SIGNED: _____ DATE: _____

TITLE: _____ COMPANY: _____

Completed, signed, and returned by PPPL before shipment

PPPL (AUTHORIZED REPRESENTATIVE) SHIPPING RELEASE

This is to certify that evidence supporting the above Supplier's Certification statement has been reviewed and no product/service nonconformances from procurement requirements have been identified unless noted below. This product/service is hereby released for shipment.

This section serves as the Quality Assurance release for the above described product for shipment. It does not constitute an acceptance thereof and does not relieve the Supplier, Manufacturer or Contractor of any and all responsibility or obligation imposed by the purchase contract. It does not waive any rights the Purchaser may have under the purchase contract, including the Purchaser's right to reject the above described material upon discovery of any deviations from requirements of the purchase contract, drawings and specifications.

NONCONFORMANCES FROM PROCUREMENT QUALITY REQUIREMENTS:

REMARKS/PRODUCT SERIAL NUMBERS:

BY PPPL QA REPRESENTATIVE (OR DESIGNEE)	DATE

Rev. 1 November 15, 2010