

STATEMENT OF WORK (SOW)

for the

sPHENIX TPC GEM FRAMES

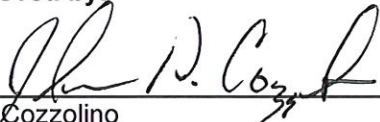
QA Category: A-3

The State University of New York at Stony Brook
Brookhaven National Laboratory

Version 2
January 22, 2020


sPHENIX Project

Approved by:



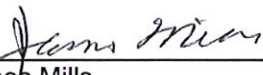
John Cozzolino
sPHENIX TPC Project Engineer
Brookhaven National Laboratory

Date 1/22/20




Russel Feder
sPHENIX Chief Mechanical Engineer
Brookhaven National Laboratory

Date 1/23/20



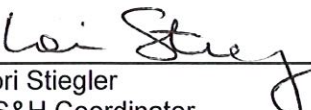
James Mills
sPHENIX Project Engineer
Brookhaven National Laboratory

Date 1/23/20



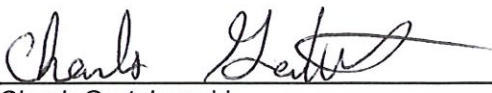
Edward O'Brien
sPHENIX Project Director
Brookhaven National Laboratory

Date 1/23/20



Lori Stiegler
ES&H Coordinator
Brookhaven National Laboratory

Date 1/23/20



Chuck Gortakowski
sPHENIX Quality Assurance Representative
Brookhaven National Laboratory

Date 1-23-20

VERSION CONTROL SHEET

VERSION	DESCRIPTION	DATE	AUTHOR	APPROVED BY
1	Draft	01/22/2020	J. Cozzolino	See cover page.
2	Initial release version	01/22/2020	J. Cozzolino	See cover page.
3	Revised			See cover page

TABLE OF CONTENTS

1	SCOPE	4
1.1	Background	4
2	APPLICABLE DOCUMENTS	4
3	REQUIREMENTS.....	5
3.1	Contractor Responsibilities	5
3.1.1	Tooling/Fixtures/Test Equipment	5
3.1.2	Engineering Drawings and 3-D Model Files	5
3.2	Packaging, Crating, and Shipment.....	6
3.2.1	Authorization to Ship	6
3.2.2	Shipping Crate	6
4	QUALITY ASSURANCE	6
4.1	Quality Assurance Requirements	6
4.2	Material	6
4.2.1	Certification	6
4.2.2	Stock Size	6
4.3	Inspection Requirements	7
4.3.1	First Article Submittal followed by a Pause in Production	7
4.3.2	Dimensional Inspection of First Articles	7
4.3.3	Resumption of Production	7
5	SUBMITTALS	7
6	APPENDIX A Contractor Quality Assurance Requirements	8-11

1 SCOPE

This Statement of Work (SOW) will be the basis for procurement of 720 (120/ea of six P/N's) sPHENIX GEM Frames for the State University of New York at Stony Brook (referred to herein as "SUSB" or the "Buyer") and Brookhaven National Laboratory (BNL). These items are an important part of the Gas Electron Multiplier (GEM) detectors used in the Time Projection Chamber (TPC). It is an important component that maintains the shape, tension, flatness, electrical isolation, and stack spacing of the active foil surfaces in the detector. These critical parts must be fabricated to exacting standards and tight manufacturing tolerances. The TPC with its state-of-the-art GEM detectors is an experimental apparatus which will be used to upgrade the tracking capabilities of experimental equipment at the Relativistic Heavy Ion Collider (RHIC) at BNL. This document outlines the Contractor's responsibilities and obligations necessary for completing the requirements as set forth herein.

1.1 Background

The sPHENIX experimental concept includes the design, construction, installation, and commissioning of hardware, civil construction, and facilities required to produce upgraded experimental equipment with new detection capabilities. The concept includes several detector subsystems and a superconducting solenoid magnet which will track and characterize properties of particles generated by heavy ion and/or polarized proton collisions. These include Hadron and Electro-Mechanical Calorimeters, Silicon tracking detectors, event trigger detectors and the TPC, a component of which is the subject of this SOW.

2 APPLICABLE DOCUMENTS

In the event of a conflict between the Technical Drawings and the SOW, the Contractor shall immediately notify the SUSB Contractual Representative who shall in each instance determine which document takes precedence and advise the Contractor accordingly. Failure to notify SUSB 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 unless stated otherwise herein:

Document Number	Document Title
205-0300-0050	GEM Frame R1 Front
205-0300-0051	GEM Frame R1 Back
205-0300-0052	GEM Frame R2 Front
205-0300-0053	GEM Frame R2 Back
205-0300-0054	GEM Frame R3 Front
205-0300-0055	GEM Frame R3 Back
205-0300-0050.ipt, through 205-0300-0055.ipt	Corresponding Autodesk Inventor 3-D Solid Model Files for the GEM frames*

- * Other accepted industry standard formats such as STEP, ACIS, Parasolid, etc., shall be made available to the Contractor upon request.

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 purchase of all materials, build to print manufacturing, inspection, and delivery of the GEM frames per BNL engineering drawing No's 205-0300-0050 through 205-0300-055.

3.1 Contractor Responsibilities

3.1.1 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 fabricate the GEM frames.

3.1.2 Engineering Drawings and 3-D Solid Model Files

The 3-D Solid Model Files may be used by the Contractor to greatly facilitate NC programming and as well as inspection tasks. The Contractor shall inform the Customer (SUSB) in writing,

email or fax, their agreement that the Solid Model Files accurately represent the nominal geometry of the items as set forth in their applicable engineering drawings before commencing production.

3.2 Packaging, Crating, and Shipment

3.2.1 Authorization to Ship

The Contractor shall not ship prior to obtaining written authorization from SUSB to do so. See paragraph 4.3 below for further details

3.2.2 Shipping Crate

For the purposes of transport, items shall be packed into a sturdy crate that ensures adequate protection against, shock, abrasion, crushing, bending, or twisting of each GEM frame contained within. No stick tape or sticky film shall be used in any GEM frame packaging.

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 be in general conformance with the requirements of the ISO-9001 Standard, "Quality Management System Requirements" or equivalent acceptable to SUSB's QA management. The Contractor shall supply the necessary documentation to demonstrate this.

4.1 Quality Assurance Requirements

The Contractor shall meet the QA requirements stated in this paragraph as well as the general requirements set forth in Appendix A.

4.2 Material

4.2.1 Certification

Upon purchase of the material to make the GEM frames, the Contractor shall promptly forward a copy of the Material Certification Report to SUSB.

4.2.2 Stock Size

The material (NEMA G11\FR5) shall be purchased at a nominal stock size of 0.062 inch. This thickness or surface finish shall not be altered during the production process.

4.3 Inspection Requirements

4.3.1 First Article Submittal followed by a Pause in Production

The Contractor shall first submit ten first articles for each of the six P/N's to SUSB. He/She shall then halt production awaiting written authorization from SUSB to proceed with the order. The duration of this pause may be up to two months. During this period, SUSB is required to run extensive tests on the integrated system which includes these first articles. In the unlikely event that some design changes to the GEM frames are required, the Contractor shall have the opportunity to update their cost estimate accordingly.

4.3.2 Dimensional Inspection of First Articles

The Contractor shall be responsible for performing a 100% dimensional inspection on twelve out of the sixty completed GEM frame first articles (two of each of the six P/N's) . This document shall accompany the first article delivery. All drawing dimensions shall be explicitly listed with their respected measured values. The inspected first articles should be bagged and labeled accordingly.

4.3.3 Resumption of Production

The Contractor shall resume production only after permission is granted by SUSB in writing. The Contractor shall first submit one first article along with a 100 percent dimensional inspection report for that article. SUSB shall review this article in short order (less than one business week ARO) after which permission to complete the balance of the order should be granted. Note: The Contractor can submit any one of the six GEM frame configurations as first article in this instance.

5 SUBMITTALS

The Contractor shall submit to SUSB the proposed fabrication schedule, material certification, inspection reports, and shipping details.

6 APPENDIX A

CONTRACTOR QUALITY ASSURANCE REQUIREMENTS

3.0 GENERAL REQUIREMENTS

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

3.1 Contractor's Quality System and Quality Requirements

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

3.1.2 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 Contractor'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.

3.2 Assessment by Buyer

The Contractor's quality system is subject to assessments by the Buyer's Representative(s) for conformance with the requirements of the PO. Contractor or Distributor shall allow SUSB representatives and regulatory agencies right of entry into the Contractor'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 Contractor to impose applicable quality assurance requirements upon their subcontractors. Additionally, the Buyer reserves the right to disapprove, in writing, any subcontractor.

3.5 Responsibility for Conformance

The Contractor 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 Contractor' 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 Contractor is responsible for notifying the Buyer of any recalls or alerts associated with this PO.

3.6 Protection of Material and Equipment

The Contractor 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 Contractor 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 Contractor 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 Contractor 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 Contractor shall flow this requirement down to all sub-tier Contractors 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:
<http://www.hss.energy.gov/sesa/corporatesafety/sci/>

3.12 Marking of Outer Package and Hoisting & Rigging Services

Each shipping container (transport package) with a gross weight equal to or greater than 400 pounds (180 kilograms) must be marked with the center of gravity location and gross weight on at least one side, or end panel in addition to meeting the requirements of the latest revision of ASTM Standard D 3951, Standard Practice for Commercial Packaging. Due to weight, size, and/or volume parameters of the end item(s) requiring special material handling/rigging by SUSB's personnel; advanced notice of delivery of 3 business days minimum shall be provided by the Contractor or shipper to SUSB's Receiving department both by telephone and via email. The Contractor or shipper must obtain documented acknowledgement from SUSB that delivery notification was received.

3.21 Age/Shelf Life and Storage Control

The Contractor 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

Any and all product recall alerts should be communicated to SUSB immediately. Provide the Purchase Order Number(s) and names of purchasers with notification to assist SUSB in locating and identifying the subject recall 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 Contractor shall submit a copy of their Quality Assurance Program or Manual with their proposal for review and evaluation.

4.2 Configuration Control System

The Contractor 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 Contractor 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 Contractor 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:

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

4.5 "Witness" Points

The Buyer reserves the right to designate selected manufacturing, inspection, and/or test operations as "witness" points. The Contractor 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.

4.7 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:

4.7.3 Qualification of Procedures, Facilities, Equipment and Personnel

The Contractor 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.

4.10 End-Item Documentation Package

The Contractor 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 Contractor's authorized personnel.

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

4.16 Certificate of Conformance (C of C)

With each shipment, per the procurement documentation, 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 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 Contractor 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 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 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 Contractor's applicable cleaning procedures.

4.19 Notification of Change to Design, Methods, or Processes

The Contractor 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 Contractor at time of Contractor's quotation or offer to the Buyer, which resulted in the PO.

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.

4.39 Records

The Contractor 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.