

**STATEMENT OF WORK FOR  
MPEX SUPER STRUCTURE  
MATERIAL PLASMA EXPOSURE EXPERIMENT  
(MPEX)**

Prepared by

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**Statement of Work for the MPEX Super Structure  
for the  
Material Plasma Exposure Experiment Project  
MPEX-04-SOW-203**

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**Revision History**

Revision	Date	DESCRIPTION OF CHANGE	REVISION TYPE	
			Major	Minor
0	Feb 2023	Initial Issue	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>
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**ACRONYMS**

MPEX	Material Plasma Exposure Experiment
TPO	Technical Project Officer
ISO	International Organization for Standardization
NIST	National Institute of Standards and Technology
NQA	ASME Nuclear Quality Assurance
QAP	Quality Assurance Program
SOW	Statement of Work
STEP	Standard for the Exchange of Product Data
PMI	Plasma Material Interaction
COTS	Commercial Off The Shelf
DAP	Delivered At Place
FAT	Factory Acceptance Test
POC	Point of Contact
PO	Procurement Officer
ORNL	Oak Ridge National Laboratory
CMM	Coordinate Measuring Machine
S/CI	Suspect/Counterfeit Item
VCR	Swagelok VCR® Metal Gasket Face Seal Fitting

## 1. INTRODUCTION

The Material Plasma Exposure eXperiment (MPEX), a superconducting magnet, steady-state linear plasma device, is being built at Oak Ridge National Laboratory (ORNL) to address the harsh conditions inside a fusion reactor. This device, as designed, will have the unique feature of being able to conduct accelerated lifetime tests of plasma-facing components, including those that have experienced neutron damage. The super structure supports all the utilities and components located above the main MPEX device.

## 2. SCOPE

This Statement of Work (SOW) applies to the fabrication, assembly, inspection, packaging, and delivery of the Super Structure based off the drawings identified in Table 1.

**Table 1**

<i>Document</i>	<i>MPEX Drawing Number</i>	<i>MPEX Drawing Package</i>
<i>Superstructure</i>	<i>MPEX-04-DES-00-A131</i>	<i>MPEX-04-PKG-303</i>
<i>Superstructure 3D Model</i>	<i>MPEX-04-DES-00-A141</i>	<i>MPEX-04-PKG-304</i>

## 3. APPLICABLE DOCUMENTS

<i>Document</i>	<i>Revision</i>
<i>Quality Assurance Plan for the MATERIAL PLASMA EXPOSURE EXPERIMENT [1]</i>	0

## 4. PERFORMANCE REQUIREMENTS

### 4.1 TASK 1: QUALITY PLAN AND PROJECT SCHEDULE

The Seller shall prepare a quality plan and a project schedule for the detailing, fabrication, assembly, inspection, and delivery of the Super Structure. The quality plan shall address how the Seller's Quality Program will be applied to the work in this SOW, and identify procedures and other documentation for all special processes, measurements, etc. The quality plan shall also identify the planned work to be outsourced, list the planned or expected subcontractors and Suppliers, and address how the quality requirements of this SOW will be flowed down to these subcontractors and Suppliers.

The project schedule shall contain sufficient detail so that ORNL may track procurement, fabrication, assembly, inspection, and shipping activities. The Seller shall propose milestones for tracking progress and payments including at a minimum those listed in Section 5.4.

For this task, the Seller shall provide the ORNL with:

- Quality plan
- Project Schedule
- Factory Acceptance Plan

#### **4.2 TASK 2: DRAWING AND SPECIFICATION REVIEW**

The Seller shall review the MPEX drawings identified by the drawing number awarded to the seller in Table 1 and the quality requirements outlined in [1]. The Seller can propose deviations or changes to these specifications. ORNL will review these change requests.

Proprietary Seller fabricating processes that are different than drawing specifications or requirements of [1] shall be identified and reviewed with ORNL. The seller is responsible for documenting any deviation from the drawings supplied in Table 1.

Any deviation request shall be submitted by the Seller and approved by ORNL for all process or specification deviations then must be maintained under revision control after ORNL approval. The seller shall provide ORNL with all released documents.

#### **4.3 TASK 3: DETAILED DRAWING AND FABRICATING REVIEW**

With the completion of Task 2 and with authorization from ORNL, the Seller shall prepare a detailed drawing package and fabricating plan to demonstrate how the design specifications given in the drawings and requirements of [1] will be satisfied. The Seller shall prepare a report and participate in a fabricating review. The Fabricating review will be held by videoconferencing or at the Seller's site based on agreement between the Seller and ORNL. The Seller shall prepare written meeting minutes and submit them to ORNL for review within 3 working days after the meeting. Completion of the Fabricating review and closure of all action items shall constitute a project milestone.

The Detailed Drawing and Fabricating Review and Report shall include:

- Detailed drawings for the super structure
- Component fabrication plan, including all purchased and outsourced components
- Review of materials and processes to be used for super structure fabrication
- A project plan summary of how compliance with all MPEX requirements and specifications will be achieved.



#### **4.4 TASK 4: SUPER STRUCTURE FABRICATION**

After completion of Task 3 and with approval of ORNL, the Seller shall provide an updated fabricating schedule and begin construction. The Seller and ORNL shall establish a recurring fabrication update meeting not to exceed 1 month between meetings. The Seller shall prepare a current fabricating status report and identify any fabrication issues or logistics that will affect the agreed upon delivery date. ORNL will review and generate actionable items for the Seller or ORNL. Action item status shall be reviewed at all fabrication status meetings. Fabrication status meetings shall be held by videoconferencing or at the Seller's site based on agreement between the Seller and ORNL. The Seller shall prepare written meeting minutes and submit them to ORNL for review within 3 working days after each meeting. Meeting minutes can be used to supplement the monthly reporting requirements of Section 5.

At a minimum, the meeting minutes shall include:

- Project schedule update
  - Component fabrication status
  - Assembly and Weldment fabrication status
  - Delivery status
- Quality plan update
  - Quality Control Inspection reports
  - Non-conformance reports
- Status of old action items
- New action items
- Report any variances or deviations from the agreed upon specifications
- Summary of main discussion topics
- Summary of decisions and agreements between the Seller and ORNL.

#### **4.5 TASK 5: DELIVER SUPER STRUCTURE**

Upon successful completion of Task 4 and with an approved Delivery Plan authorization of ORNL, the Seller shall perform factory acceptance testing, generate quality plan compliance documentation, and deliver the Super Structure in accordance with the approved approach from Section 7.

Final acceptance of the Super Structure will occur upon successful completion of the site acceptance tests at ORNL's facility.

### **5. PROJECT MANAGEMENT**

#### **5.1 LANGUAGE**

All communications and documentation shall be in English.

## 5.2 COMMUNICATIONS PROTOCOL

The Seller shall designate an official single Point of Contact (POC) to interface with ORNL. The interface will be made via ORNL's designated Technical Project Officer (TPO).

Only ORNL's Procurement Officer (PO) can authorize changes to the price, statement of work, or work scope.

Problems encountered or anticipated shall be communicated as soon as practical.

## 5.3 KICKOFF MEETING

The kickoff meeting will be scheduled at a mutually agreed time as soon as practical after award of the subcontract. The Seller is responsible for recording meeting minutes and submitting them to ORNL within 3 working days after the meeting.

The primary purpose for the kickoff meeting is to confirm that the project participants understand the terms and conditions of the subcontract, SOW, specifications, and work activities.

The following topics will be discussed:

1. Flow down of requirements.
2. Work activities, schedules, and deliverables
3. Expectations for satisfying quality standards and documentation

The seller should be prepared to review Tasks 1 and 2 during the kickoff meeting.

## 5.4 SCHEDULE AND MILESTONES

At a minimum, the schedule shall include the following activities or milestones:

- Kickoff meeting
- Seller's Quality Plan Review
- Detailed Drawing and Fabricating Plan Review
- Resolution of deviation requests and approval for construction
- Materials ordered or fabrication started
- Structure Fabrication complete
- Factory Acceptance Tests
- Delivery Plan approval
- Prepare for shipment
- Customer onsite final acceptance tests
- Complete and submit final documentation

## **5.5 MONTHLY REPORTS**

Monthly reports shall be submitted by the third calendar day of each month or on the Seller's usual reporting schedule as mutually agreed between ORNL and the Seller's POC.

Monthly report data shall include actual schedule progress, milestones reached, corrective actions needed, display of the present critical path for the Seller's work, and a brief narrative describing the status of work, significant accomplishments, actual and potential problems and risk mitigations or corrective actions.

## **5.6 VARIANCE REPORTING**

The Seller shall notify ORNL (TPO and PO) immediately in writing when it is determined the actual cost may exceed the Agreement price. In no case shall the Seller continue work without authorized funding if it is determined that actual cost may exceed the Agreement price.

## **5.7 PERIODIC COMMUNICATIONS**

The Seller shall participate in a bi-weekly (every other week) meeting (or as agreed to in 5.3) to be held with ORNL to discuss any technical issues and schedule, personnel, and any other items pertinent to the work activities. The bi-weekly phone conference will serve as a mechanism to get early visibility of potential problems and issues arising during the performance of this subcontract. The Seller shall prepare written meeting minutes and submit these to ORNL within 3 working days after the meeting.

## **6. QUALITY ASSURANCE**

### **6.1 QUALITY PROGRAM**

The Seller shall have a Quality Assurance Program (QAP) that, at a minimum, is ISO 9001 certified, but preferably compliant with NQA-1 2008/2009a or equivalent. The prospective supplier shall have an established, documented, and effectively implemented quality assurance program describing controls for work processes, personnel training and qualification, document and records control, design, procurement, inspection, and testing; including the use of measuring and test equipment when used, corrective action, and issues management.

The Seller's quality assurance program shall be implemented and sufficient to ensure that the quality of items produced, or services provided will meet all the requirements as stated in this document and as contracted. Changes to the program that could affect the items or services must be approved by the ORNL in advance.

Prior to subcontract award, the seller's QAP shall be evaluated to determine the degree of effective implementation of the quality program. Deficiencies, if any, identified during the evaluation shall be addressed and corrected to the satisfaction of ORNL and shall occur prior to award.

All suppliers/sub-suppliers, subcontractors, and fabricators (as applicable) shall have a Quality Assurance Program that meets or exceeds the requirements listed above.

## **6.2 ACCESS FOR SOURCE SURVEILLANCE INSPECTIONS**

As part of the ORNL's quality assurance program, ORNL reserves the right to perform source surveillance activities and may be conducted at the Seller's facility or any sub-tier seller facility that the ORNL determines necessary to ensure that quality objectives are met.

## **6.3 SUSPECT/COUNTERFEIT ITEMS PREVENTION**

The Seller's QAP must include a Suspect/Counterfeit Item (S/CI) Program that is compliant with DOE O 414.1D, Quality Assurance or approved equivalent.

## **6.4 SELLER REQUESTED DEVIATIONS**

The Seller shall propose any deviations to the specifications, drawings, or other technical requirements during the Review of Specifications per Section 4.2 and obtain ORNL's approval prior to invoking the deviation. Any Deviation Requests arising from the fabrication phase shall adhere to the Seller's Quality Program procedure and must be approved by ORNL.

## **6.5 NON-CONFORMANCES**

When a nonconformance is identified, the Seller shall notify ORNL to determine what actions are required and document the nonconformance following the Seller's Quality Program procedure. All nonconformances shall be summarized in the Final Report. Items that do not conform to specified requirements shall be controlled to prevent inadvertent installation or use. Controls shall provide for identification, documentation, evaluation, segregation when practical, disposition of the nonconforming items, and for notification to ORNL.

## **6.6 MEASUREMENT AND TEST EQUIPMENT**

Tools, gages, instruments, and other measurement and test equipment used for activities affecting quality shall be controlled, calibrated at specified periods, adjusted, and maintained to required accuracy limits.

Measurement and test equipment used by the Seller to perform work under this Statement of Work must be calibrated and traceable to NIST standards. Calibrations must be current. Calibration records must be provided to ORNL.

## **7. TRANSPORTATION**

The equipment shall be packaged in a manner that protects the equipment from damage and facilitates movement, loading, and unloading by fork truck or crane. Any special lifting fixtures or related hardware that are required to move, load, or unload the equipment shall be considered part

of the equipment. A delivery plan addressing these requirements shall be developed by the supplier and approved by ORNL prior to shipment. Incoterms: Delivered at Place (DAP) (ORNL Facility – Oak Ridge TN).

## 8. DELIVERABLES

The Seller shall supply the following:

Deliverable 1 – Within 2 weeks of subcontract award, provide to ORNL the Seller's Quality Assurance Program documentation and a project specific Quality Plan.

Deliverable 2 – At the kickoff meeting defined by 5.3, the seller shall provide to ORNL a list of proposed deviations to any specifications required by the awarded super structure assemblies or governed by MPEX documents [1].

Deliverable 3 – Fabricating review shall be held no more than 8 weeks after subcontract award and shall include the following documents:

- Fabricating review report
- Presentation slides and documents
- Action item resolution documentation
- Fabrication samples for all weld processes
- Fabrication procedures for all weld processes including weld maps and Welding Procedure Specifications (WPS).

Deliverable 4 – Prior to delivery, seller shall provide for ORNL review:

- Quality inspection data required for all components
- Completed factory acceptance test report shall include as a minimum
  - o Material certifications
  - o Weld certifications
  - o Critical dimension report

Deliverable 5 – Super Structure shall be delivered to ORNL site no more than 20 Weeks after contract award.

Deliverable 6 – The following spare parts are to be provided:

- Any consumable components that are not COTS components shall have spares provided. Required spare quantities will be reviewed on a case by case basis.

Deliverable 7 – On Site acceptance testing shall be performed to verify FAT at ORNL site. The Seller shall have a representative available as necessary to support on site testing outlined in the On Site Acceptance Test Plan.

## REFERENCES

- [1] MPEX-12-PLAN-001 *Quality Assurance Plan for the MATERIAL PLASMA EXPOSURE EXPERIMENT*