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STC-2 & -3 Shrouds Statement of Work

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Change Record

Issue	Date	Section(s) Affected	Description of Change
1.0	01-09-2018	All	First issue
2.0	25-09-2018	All	Incorporated ESA suggestions
3.0	1-10-2018	All	Incorporated ADS suggestions

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1 Introduction

RAL Space is seeking to procure thermal shrouds for integration into its two 5 m Space Test Chambers, known as STC-2 and STC-3. The shrouds are used to provide a thermal environment within the vacuum test chambers that can be adjusted as required during testing.

2 Document Scope

This document defines the activities to be performed and deliverables to be produced in the course of producing the shrouds for the STC-2 and STC-3 vacuum chambers.

Lack of mention of any task or activity within this SOW in no way absolves the Contractor from the responsibility for identification and performance of these tasks and activities where these are necessary to meet the requirements of the Contract.

2.1 Applicable Documents

- AD 1. AIV_STC2_3-RS-1004 STC-2 and -3 Shrouds Technical Requirements Definition
- AD 2. KE-0266-111 STC-2 Shroud Interface Drawing (drawings same as for STC3)
- AD 3. ISO DD R100 STC 0005 STC-5 m Number 1 Suite Description
- AD 4. KE-0266-010 STC Assembly
- AD 5. KE-0266-030 STC2 assembly files showing the chamber and the allowable volume
- AD 6. KE-0288-060 STC3 assembly files showing the chamber and the allowable volume

2.2 Reference Documents

- RD 1. ECSS-Q-ST-70-02C Thermal vacuum outgassing test for the screening of space materials
- RD 2. TEC-QT-2014-344 Analysis of bake-out monitoring data

2.3 Normative Documents

- ND 1. Pressure Equipment Directive (PED) (2014/68/EU)
- ND 2. The 'Blue Guide' on the implementation of EU product rules 2016 (2016/C 272/01)

Applicable documents, reference and normative documents can be found on the following ftp site:

FTP Site: <ftp://rsftp.stfc.ac.uk>

Username: PR18122 STC2_3

Password: BH76_Yhn*{

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2.4 Definitions and Assumptions

Both STC-2 and 3 chambers have been manufactured to accommodate thermal shrouds designed and manufactured by RAL Space. Each chamber is made up of 28 rectangular panels located in the cylindrical part of the chamber, and 18 panels located in the doors. Figure 1 shows a half section of the chamber with 14 rectangular panels located around its circumference. The other half of the chamber has shroud panel arranged in the same manner. Figure 2 shows the 9 shroud panels in one of the doors. These panels are configured so that they follow the contour depth of the door to maximise the useable volume of the chamber.

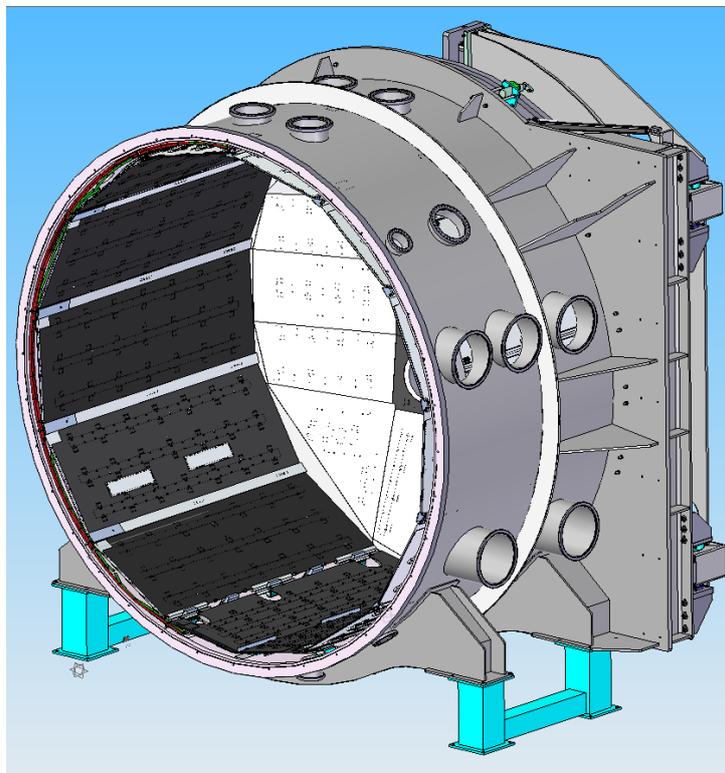


Figure 1 STC Chamber cross-section showing rectangular shroud panels in body

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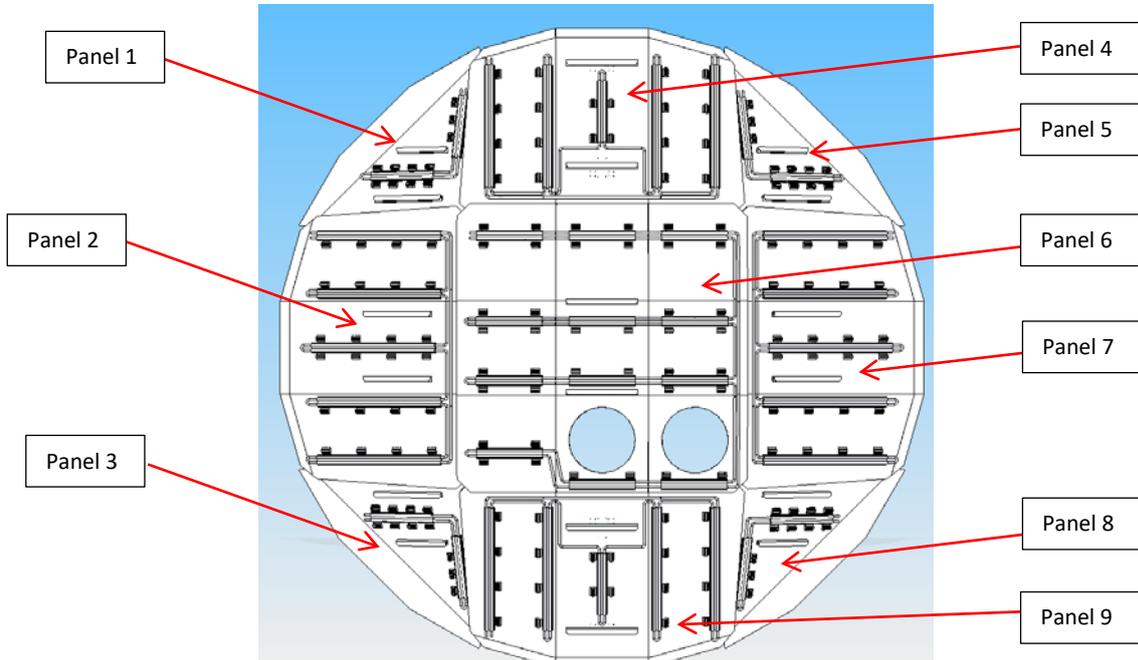


Figure 2 STC Door Shroud Panel Layout

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The Contractor is responsible for designing and manufacturing panels to replace existing panels that meet the requirements in AD 1 (and hence are compatible with existing interfaces AD 2). This includes the procurement and installation of heaters where required to help meet the thermal requirements of the panels. Appendix 8 Table 8-1 is the drawings of the existing STC2 & 3 body and door shroud panels and hence provides information on the interfaces, weight and space envelope requirements to be met as part of the tender. As the two chambers are very close to being identical in size/shape the same panel design is sometimes used for the two chambers. There are only 2 differences. The first difference is the location of the observation window in the two chambers; STC2 has its window on one side of the chamber, whilst STC3 has it on the other side. The second difference is the optical window requirements (requiring holes in the panels) in central door panels for STC2 and STC3. STC2 requires one hole in the centre of the door panel to accommodate one optical window. STC3 requires three holes (side by side) in the centre of the central panel to accommodate three optical windows.

For the panels covering the side services and Electrical Ground Support Equipment flanges of the vessel (N8-N10 and S1-S8 in AD 5) RAL space would like the supplier to consider panel designs with cutouts and cover plates to give access and/or cover these flanges. Part of the shroud procurement also requires cover strips to cover gaps between shroud panels (see Appendix 8 table 8-2 for existing cover strip panels drawing numbers). The supplier is free to incorporate/use the existing cover-strips in their design if they deem the cover-strips suitable.

2.5 Lessons Learned from RAL Space Shroud Design

The original shrouds designed by RAL Space were found to have a number of issues and it is important that the lessons learnt from this design influence the new design.

2.5.1 Aluminium Extrusion and panels cooled at different rates

A thermal filler (Hysol 1c) was used between the aluminium extrusion and the panel to improve the thermal contact between the two. However, during cooldown large gradients were measured between the extrusion and panel causing high shear stresses in the filler. The filler then fractured leading to large quantities of particulate debris being generated and a loss of thermal conductivity. Therefore, the use of thermal fillers should be avoided.

The differential contraction caused by the thermal gradients also led to localised buckling of the panel.

2.5.2 LN2 distribution around panel

The aluminium extrusion routing over the panel was insufficient leading to high thermal gradients. The new panel design should distribute the LN2 in a manner to minimise temperature gradients.

2.5.3 Integration of Shroud Panels into the Chamber

The RAL Space panels were fitted with GFRP/Tufnol pads to provide a low friction surface to assist with sliding the panels into the support brackets. However, the rubbing between the pads and aluminium brackets lead to the generation of significant amounts of particulate debris. Therefore,

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the new panels should use a different material for the pads, or use a roller system where sliding surfaces can be eliminated.

2.5.4 Panel Handling

The existing panels do not have handles to assist with installation. Therefore, the new panels should include handles or alternative features to assist with handling and installation. The existing panels do include holes to accommodate lifting eyes and these should be retained in new design.

2.5.5 Panel Stiffness

The existing panels did not have sufficient stiffness to remain engaged in the support rails so additional stiffeners had to be added. This limited the installation flexibility (for STC-2 panels can only be loaded inwards from the outside doors due to a clash in middle of chamber whereas for STC-3 they can be loaded fully from either end).

2.5.6 Cut-outs in Lower Body Panels

The four bottom body panels include cut-outs. These cutouts are included to provide access during shroud installation and allow connection of shroud panel LN2 pipework fittings with vessel LN2 pipework interface fittings. T-piece cover strips, to cover these cut-outs are installed after shroud panel installation and LN2 fixture connections and ensure a full lining of the vessel. The existing cover strips shape and design is flimsy and hinders installation. The new design should look at improving these cut-outs sections.

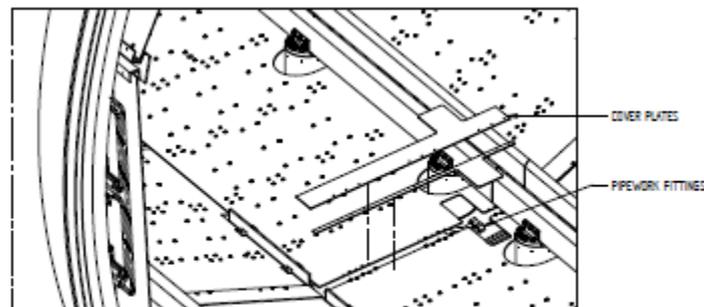


Figure 3- Lower Body Panel Cut-outs

2.5.7 Door Panel LN2 Connections

The existing door panel LN2 input and output pipework location made it hard to connect the LN2 pipework after installation of the panel. RAL Space requests that the door panel LN2 input and output pipework be extended (wherever possible) past the edges of the panels. This will assist with installation. Extended pipework will need coordination with RAL space as the door curvature of the door will limit extension possible. AD1 provides information on existing LN2 pipework and available envelope.

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2.5.8 Fixings through Panels

The existing design had screwed fasteners to attach the extrusion to the panels. The heads of these fasteners were located on the painted side of the panels and during cooldown these moved causing the Z306 paint to flake away. Therefore, fixings through the panels should be avoided, kept to a minimum or panels should be masked to paint in the immediate vicinity of the screw heads.

2.5.9 Contamination from Shroud Heat shrink

RAL directed the shroud contractors to use RW-175 heat shrink tubing on shroud Heater and Thermocouple terminated ends. After several temperatures cycling of the chamber, the heat shrink was found to have become brittle in places and broken off becoming a source of contamination in the chamber. It was deemed that the heat shrink was not rated for the lower operating temperatures of the chamber. The wiring had to be re-accomplished so that new heat shrink (rated for the full operational range of the vessel) could be applied.

2.6 Product Assurance & Quality Management

The Contractor shall have a quality management system certified to ISO 9001 or equivalent internationally recognised quality management system certification and a dedicated Quality Assurance representative shall be assigned to the project. The contractor shall provide a Product Assurance plan as a deliverable.

The Contractor shall implement a non-conformance (NC) reporting procedure during the development and manufacturing phase to formally record any problems that arise. These non-compliances must be reported to STFC-RAL within 5 working days of them occurring. The disposition of these non-compliances must be agreed by STFC-RAL if they change the form or function of the shroud panel assembly. In the event of a NC, the contractor shall schedule a meeting with STFC-RAL, take ownership of the NC and take all necessary measures until the NC has been addressed to STFC-RAL satisfaction. If the Contractor is any doubt about the non-conformance and its rectification, then he should contact STFC-RAL to discuss what further action is necessary. The contractor shall implement a request for deviations and waiver reporting procedure and no departure from the requirements will be accepted unless an associated request for deviation or waiver has been approved by STFC-RAL.

2.7 Delivery

Delivery of the shroud panels is required by the dates given in section 7 of this document. Shroud transportation boxes need to be unloadable via forklift truck and be able to fit through door width of 5 metres.

2.8 Shipping

The Contractor shall be responsible for delivering the panels to STFC-RAL. The Contractor is responsible for ensuring that the panels are adequately protected during shipping so that no damage occurs to any of the external faces or pipework. The shipping container(s) shall be designed to protect the panels from the weather during transport. The container shall be capable of being transported by the use of a fork lift truck.

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As the panels are required to be baked before delivery to achieve the outgassing requirement it is the contractors responsibility to package the panels to ensure the panels are kept clean until arrival at RAL.

There is no requirement for the panels to be temperature controlled during shipping.

2.9 Storage of Shroud Panels

Shroud panels that are not installed in the R100 Laboratory shall be stored in a container that will protect these parts from the elements. In particular, the internal surface of the shroud panels shall be protected from contamination that is likely to be detrimental to achieving a high vacuum.

The container shall be fitted with a waterproof cover to protect it during movement to and from the storage area.

2.10 Panel lifting & install plan

The panels will need to be installed inside the chamber. RAL space requires the proposed lifting plan for handling and installation of all panels to include details of proposed lifting equipment.

2.11 Acceptance Tests

The Contractor shall be responsible for providing all the equipment needed to perform the quality assurance tests on the panels carried out at the contractor facility to prove that requirements have been met. Results of the tests will be part of technical file delivery for the shroud panels

2.12 Sample Panels

The Contractor shall provide an example of a previously manufactured panel (if possible) to prove how STFC-RAL requirements can be met and so that it's thermal characteristics can be tested by STFC-RAL as soon as possible after contract award.

The contractor shall produce one body panel in its entirety (the "demonstration panel") for inspection and testing before committing to the procurement of the rest. This panel shall be made available for inspection and testing no later than 4 weeks after PDR. The panel can be inspected and tested on the Contractors premises to minimise any delays in shipping, and avoid any shipping costs. The test will be conducted by the contractor under STFC-RAL supervision.

The contractor shall provide information on how they intend to test and provide evidence to STFC-RAL to show how the panels meet the required thermal characteristics.

The inspection team will identify any problems with the panel, and will work closely with the Contractor to identify solutions to ameliorate them. Only when this process has been completed can the Contractor proceed with the manufacture of the remaining panels.

2.13 Sample Paint Panel

For each batch of panels, a plate of the same stock sheet (and of minimum size 100 x 300 mm) shall be (where applicable for Aluminium panels) alodyned coated and painted at the same time, under

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the same conditions. For example, if all panels are alodyned in a single batch but painted in 6 batches then 6 sample paint panels (or more) shall be alodyned and painted (in separate batches).

The paint shall be on a single side of the panel only. The paint shall demonstrate compliance in terms of emissivity specs and it will be inspected by STFC for specification purposes upon delivery of the first batch.

All sample paint panels shall be delivered at the same time as their equivalent batch and shall be marked with individual serial numbers on the unpainted side.

2.14 Inspections

STFC-RAL shall be free to make on-site inspections at various points during the manufacture, at least, the following points:

- After manufacture of the sample panel
- After delivery of materials
- To witness the first pressure/leak test – mandatory inspection point, STFC-RAL must be present
- To witness pressure/leak tests, as required
- To witness thermal testing of panels
- After completion of first panel

Minimum of 1 week notice should be given by the contractor if STFC-RAL is required to visit the contractor. Inspection dates will be agreed between RAL space and contractor at the Kick Off meeting.

To help potential bidders better understand shroud and/or interface requirements, a contractor's site visit can be arranged for the 25th October 2018.

3 Work to Be Conducted

3.1 Work Logic

The work to be performed under the contract consists of:-

- Assessment of shroud requirements and design constraints. This might include metrology of the as built 5m chambers.
- Design of the shrouds for two 5m chambers to meet the requirements and applicable standards.
- Verify the shroud design by analysis and through prototype testing as required.
- Manufacture the shrouds, including installation of sensors and heaters.

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- Procure/manufacture shroud installation equipment as required.
- Procure/manufacture shroud transport containers.
- Test the shrouds to demonstrate compliance with requirements and applicable standards (to include leak testing IAW Appendix).
- Clean and vacuum bake the shrouds.
- Deliver the shrouds to RAL Space.
- Support RAL Space to install the shrouds into the two 5m chambers.
- Support RAL Space to commission the shrouds.

The work is divided into the following Work Packages:-

- *WP1000 Project Management and Product Assurance*
- *WP2000 Design and Analysis*
- *WP3000 Procurement*
- *WP4000 Assembly, Testing and Delivery*
- *WP5000 Installation and Commissioning Support*

The following reviews shall be held with the customer:-

- *PDR – Preliminary Design Review*
- *CDR – Critical Design Review*
- *MRR – Manufacturing Readiness Review*
- *TRR – Test Readiness Reviews*
- *IRR- (Shroud) Integration (Installation) Readiness Reviews*
- *AR – Acceptance Review*

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3.2 Work Package Descriptions

3.2.1 WP1000 Project Management and Product Assurance

WP Title	WP1000 Project Management and Product Assurance
Start Event	Kick Off
End Event	Acceptance Review
Inputs	<ul style="list-style-type: none"> ○ Contract ○ Requirements ○ UK and European regulations and standards
Tasks	<ul style="list-style-type: none"> ○ Nominate a Project Manager responsible for the managing the project (including any subcontractors) and to act as point of contact with customer. ○ Nominate a Quality Assurance manager responsible for all quality and product assurance activities on the project. ○ Create a Product Assurance and Safety Plan describing the overall approach to completing the project with the required quality, reliability, maintainability and safety. ○ Implement a configuration management programme for the project. ○ Implement a documentation control programme for the project, including a master documentation list. ○ Manage the work undertaken. ○ Report and manage any non-conformances arising during the project. ○ Report any deviation from requirements throughout the project, seeking customer approval for any deviation. ○ Report progress to the customer at monthly intervals, via progress report and schedule update. ○ Manage the certification of the shrouds as required by regulations, including CE Marking, and compile a technical file for delivery. ○ Document inspections of procured and manufactured parts. ○ Compile Declared Processes, Materials and Parts List
Outputs	<ul style="list-style-type: none"> ○ Nominated Project Manager ○ Nominated Quality Assurance Manager ○ DD-1 Project Management Plan (update of proposal section) ○ DD-2 Progress Reports ○ DD-3 Schedule ○ DD-4 Product Assurance and Safety Plan ○ DD-5 Master Document List ○ DD-6 Non-Conformance Reports ○ DD-7 Requests for Deviation/Waiver ○ DD-8 Processes, Materials and Parts List ○ DD-9 Compliance Matrix ○ DD-10 Final Report ○ DD-11 MIPs/KIPs Report ○ DD-24 CE Declaration of Conformity

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3.2.2 WP2000 Design and Analysis

WP Title	WP2000 Design and Analysis
Start Event	Kick Off
End Event	Acceptance Review
Inputs	<ul style="list-style-type: none"> ○ Contract ○ Requirements ○ UK and European regulations and standards
Tasks	<ul style="list-style-type: none"> ○ Produce a preliminary design for the shrouds according to applicable regulations and standards ○ Analyse the preliminary design to demonstrate compliance with requirements ○ Design and analyse the demonstration panel ○ Produce manufacturing information for the demonstration panel ○ Present the preliminary design at PDR ○ Develop the design and analysis ○ Write assembly procedures ○ Write test procedures ○ Write installation and commissioning procedures ○ Identify and support any testing required to confirm the suitability of the design ○ Present the detailed design at CDR ○ Produce all documentation required for manufacture ○ Present the documentation at MRR ○ Support the manufacture and procurement activities ○ Define the tests required to demonstrate conformance with requirements and applicable standards ○ Support testing activities on manufactured shrouds ○ Design transport container(s) ○ Provide technical input to progress reports throughout the project
Outputs	<ul style="list-style-type: none"> ○ Input to progress reports ○ Manufacturing information for the demonstration panel ○ DD-12 Design Description ○ DD-13 3D-CAD Model ○ DD-14 Mechanical Analysis Report ○ DD-15 Finite Element Model ○ DD-16 Thermal Analysis Report ○ DD-17 Thermal Model ○ DD-18 Electrical Design Description ○ DD-19 Drawing Pack ○ DD-20 Assembly Procedures ○ DD-21 Test Procedures ○ DD-27 Installation and Commissioning Procedure ○ DD-28 Operation and Maintenance Manual

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3.2.3 WP3000 Procurement, Manufacturing and Testing

WP Title	<i>WP3000 Procurement, Manufacturing and Testing</i>
Start Event	Manufacturing Readiness Review
End Event	Assembly of STC (-2 &-3) shroud
Inputs	<ul style="list-style-type: none"> ○ Test plans supporting Design and Analysis activities ○ Manufacturing information for the demonstration panel ○ MRR Data Pack (for shrouds, transport containers and integration equipment)
Tasks	<ul style="list-style-type: none"> ○ Manufacture/procure the demonstration panel components ○ Testing/measurements of single shrouds at contractor's premises or RAL ○ Procure test items in accordance with test plans generated by the Design and Analysis activities to support the verification of the shroud design ○ Procure the STC-3 and STC-2 shrouds (including surface treatment sample panels) ○ Procurement of thermocouples/sensors, heaters and associated wiring ○ Procure the transport container(s) - one set required for STC-3 delivery and a second set for STC-2 delivery ○ Procure the installation equipment
Outputs	<ul style="list-style-type: none"> ○ Demonstration panel components ○ Shroud components (including surface treatment sample panels) ○ Transport container components ○ Integration equipment components ○ HD-8 Surface Treatment Samples ○ DD-22 Manufacturing Documentation Pack

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3.2.4 WP4000 Assembly, Testing and Delivery

WP Title	WP4000 Assembly, Testing and Delivery
Start Event	Kick Off
End Event	Delivery to RAL Space
Inputs	<ul style="list-style-type: none"> ○ Manufacturing Inspection Reports ○ Assembly procedures ○ Test procedures ○ Cleaning procedures ○ Demonstration panel components ○ Shroud components ○ Integration equipment components ○ Transport container components
Tasks	<ul style="list-style-type: none"> ○ Prepare the demonstration panel for testing and inspection by RAL Space, at contractors premises ○ Assemble the two set of shrouds (Panel Set C&D) ○ Fitting of thermocouples and heaters, and their associated harnesses and connectors. ○ Assemble the integration equipment ○ Assemble the transport containers ○ Test the two set of shrouds (Panel Set C&D) ○ Test the integration equipment ○ Test the two set of shrouds (Panel Set C&D) transport containers ○ Clean the two set of shrouds (Panel Set C&D) (including vacuum bakeout) IAW RD01 ○ Clean the integration equipment ○ Clean the two set of shrouds (Panel Set C&D) transport containers ○ Prepare shrouds and integration equipment for shipping ○ Deliver items to RAL Space
Outputs	<ul style="list-style-type: none"> ○ HD-1 Demonstration Panel ○ HD-2 Panel Set C (STC-3) Shroud ○ HD-3 Panel Set D (STC-2) Shroud ○ HD-4 Integration Equipment ○ HD-5 Transport Containers for Panel Set C Shroud ○ HD-6 Transport Containers for Panel Set D Shroud ○ HD-7 Transport Containers for Integration Equipment ○ DD-23 Test Reports ○ DD-24 Shipping Documentation ○ DD-25 Certificates of Conformity ○ DD-26 CE Declaration of Conformity

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3.2.5 WP5000 Installation and Commissioning Support

WP Title	WP5000 Installation and Commissioning Support
Start Event	Delivery to RAL Space
End Event	Acceptance Review
Inputs	<ul style="list-style-type: none"> ○ Installation procedures ○ Commissioning procedures ○ Shrouds ○ Integration equipment ○ Transport containers
Tasks	<ul style="list-style-type: none"> ○ Perform incoming inspection of shrouds, transport containers and installation equipment at RAL Space ○ Support RAL Space to install shrouds into STC-3 and STC-2 ○ Support RAL Space to commission the shrouds
Outputs	<ul style="list-style-type: none"> ○ Shrouds installed and commissioned in STC -2 and -3 ○ Commissioning report (RAL Space to produce with input from Contractor)

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4 Warranty

The Contractor shall provide a minimum 24 month warranty on all hardware and workmanship supplied under the contract.

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5 Management, Reporting, Meetings and Reviews

5.1 Management

The contractor's nominated Project Manager shall be the point of contact between the contractor and the customer. STFC RAL Space shall be notified in writing at the earliest opportunity if the nominated Project Manager changes during the course of the project.

5.2 Reporting

The contractor shall report progress every month, in the form of electronic progress reports. These reports shall contain at least the following information:-

- *Progress made in the reporting period*
- *Identification of any problems encountered and the anticipated effect on the schedule*
- *Proposed methods to recover schedule*
- *List and status summary of non-conformances*
- *Updated schedule*
- *Action list and status summary*

5.3 Meetings

Regular face-to-face meetings are not anticipated. Meetings shall be arranged as required to discuss technical issues and any concerns regarding progress.

5.4 Design Reviews

The following reviews shall be held at the contractor's premises. Review dates proposed below are tentative and to be agreed at KO meeting. Data pack contents are detailed in Section 6.3:-

5.4.1.1 PDR – Preliminary Design Review (KO +6wks)

Input: Preliminary Design Review Data Package

Objective: Demonstrate that the proposed design meets the technical requirements and schedule, with sufficient maturity to proceed with detailed design.

Output: Risks and long-lead items identified.
Agreement to proceed with detailed design.

5.4.1.2 CDR – Critical Design Review (KO +14wks)

Input: Critical Design Review Data Package

Objective: Demonstrate that the completed design fully meets the technical requirements (supported by results from demonstration panel testing) and schedule, with sufficient maturity to proceed with manufacture.

Output: Agreement to proceed with final preparation for manufacture.

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5.4.1.3 MRR – Manufacturing Readiness Review (as required, prior to manufacture of components)

Input: Drawings and design information necessary for manufacture

Objective: Confirm that the manufacturing information is adequate to proceed with manufacture.

Output: Agreement to proceed with manufacture.

5.4.1.4 TRR – Test Readiness Reviews (as required, prior to individual tests)

Input: Test procedures and test equipment status

Objective: Confirm that the test hardware and procedure are acceptable for testing to proceed.

Output: Agreement to proceed with testing.

5.4.1.5 AR – Acceptance Review

Input: Acceptance Review Data Pack

Objective: Confirm that the completed design meets the technical requirements as demonstrated by the completed test plan.

Output: Acceptance of delivered items.

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6 Deliverable Items

6.1 Hardware

HD-0 Previously manufactured sample panel (Optional)

If the contractor has a previously manufactured panel, RAL space requests that the contractor make it available to RAL space to demonstrate thermal performance previously achieved. This panel will be returned upon delivery of demonstration panel.

HD-1. Demonstration Panel

One complete demonstration panel similar to the Panel Set C & D shroud panels (including cooling, heating and temperature monitoring systems). This panel shall demonstrate the suitability of the proposed design prior to customer approval to manufacture the remainder.

HD-2. STC-3 Shrouds

Fully assembled shroud panels for STC-3 (including 2 spare body panels) plus components to attach the shrouds to the inside of the chamber (if needed).

HD-3. STC-2 Shrouds

Fully assembled shroud panels for STC-2 (including 2 spare body panels) plus components to attach the shrouds to the inside of the chamber (if needed).

HD-4. Integration Equipment

All necessary equipment required for the installation and connection of the shrouds within STC-3 and STC-2. This equipment shall be compatible with the cleanroom environment.

Note: The cleanrooms at either end of the chambers are equipped with a gantry crane of capacity 5 tonnes.

HD-5. Transport Containers for STC-3 Shroud

Transport containers to be used for the transportation of the STC-3 shroud, and for storage in the required clean conditions at RAL Space premises.

HD-6. Transport Containers for STC-2 Shroud

Transport containers to be used for the transportation of the STC-2 shroud, and for storage in the required clean conditions at RAL Space premises.

HD-7. Transport Containers for Integration Equipment

Transport containers to be used for the transportation of integration equipment, and for storage in the required clean conditions at RAL Space premises.

HD-8. Surface Treatment Samples

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Samples of the surface treatment(s) applied to the shrouds shall be supplied. These shall be manufactured from the same raw material as the shroud, with the surface treatment(s) applied at the same time and conditions as the shroud. Samples are required for each surface treatment application. Samples shall measure a minimum of 100 mm x 300 mm.

6.2 Documentation

6.2.1 *Project Management and Product Assurance*

DD-1. Project Plan

DD-2. Progress Reports

Progress reports shall be supplied in electronic format (MS Word or PDF) to the customer by e-mail at the end of each month.

DD-3. Schedule

The schedule shall be maintained by the contractor's project manager and an updated file in electronic format (MS Project) sent to the customer with the monthly progress reports.

DD-4. Product Assurance and Safety Plan

DD-5. Master Document List

DD-6. Non-Conformance Reports

DD-7. Requests for Deviation/Waiver

DD-8. Processes, Materials and Parts List

DD-9. Compliance Matrix

DD-10. Final Report

DD-11. MIP/KIPs Report

6.2.2 *Technical File (for Demonstration Panel, STC-3 Shroud, STC-2 Shroud, Installation Equipment, Transport Containers)*

DD-12. Design Description

DD-13. 3D-CAD Model

DD-14. Mechanical Analysis Report

DD-15. Finite Element Model

DD-16. Thermal Analysis Report

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- DD-17. *Thermal Model*
- DD-18. *Electrical Design Description*
- DD-19. *Drawing Pack*
- DD-20. *Assembly Procedures*
- DD-21. *Test Procedures*
- DD-22. *Manufacturing Documentation Pack*
- DD-23. *Test Reports*
- DD-24. *Shipping Documentation*
- DD-25. *Certificates of Conformity*
- DD-26. *CE Declaration of Conformity*

6.2.3 Installation and Commissioning

- DD-27. *Installation(lifting) and Commissioning Procedure*
- DD-28. *Operation and Maintenance Manual*
- DD-29. *Inputs to Commissioning Report*

6.3 Review Datapack Contents

Document Ref	Document Title	Review				
		PDR – Preliminary Design Review (KO +4wks)	CDR – Critical Design Review	MRR – Manufacturing Readiness Review	TRR – Test Readiness Reviews	AR – Acceptance Review
DD-1	Project Plan	✓				
DD-2	Progress Reports	✓	✓			✓
DD-3	Schedule	✓	✓			✓
DD-4	Quality Assurance and Safety Plan	✓	✓			✓
DD-5	Master Document List		✓			✓
DD-6	Non-Conformance Reports		✓		✓	✓
DD-7	Requests for Deviation/Waiver		✓			✓
DD-8	Processes, Materials and Parts List	✓	✓			✓
DD-9	Compliance Matrix	✓	✓			✓
DD-10	Final Report					✓

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Document Ref	Document Title	Review				
		PDR – Preliminary Design Review (KO +4wks)	CDR – Critical Design Review	MRR – Manufacturing Readiness Review	TRR – Test Readiness Reviews	AR – Acceptance Review
DD-11	MIP/KIPs	✓				
DD-12	Design Description	✓	✓			✓
DD-13	3D-CAD Model	✓	✓			✓
DD-14	Mechanical Analysis Report	✓	✓			✓
DD-15	Finite Element Model	✓	✓			✓
DD-16	Thermal Analysis Report	✓	✓			✓
DD-17	Thermal Model	✓	✓			✓
DD-18	Electrical Design Description	✓	✓	✓		✓
DD-19	Drawing Pack	✓	✓	✓		✓
DD-20	Assembly Procedures	✓	✓		✓	✓
DD-21	Test Procedures	✓	✓		✓	✓
DD-22	Manufacturing Documentation Pack				✓	✓
DD-23	Test Reports	✓				✓
DD-24	Shipping Documentation					✓
DD-25	Certificates of Conformity					✓
DD-26	CE Declaration of Conformity	✓	✓			✓
DD-27	Installation and Commissioning Procedure	✓	✓			✓
DD-28	Operation and Maintenance Manual	✓	✓			✓
DD-29	Inputs to commissioning report					✓

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7 Schedule

Anticipating a contract start date of 9th January 2019, the shroud panels are required to be delivered, in their entirety, to STFC-RAL by 10th June 2019 for first set (Panel Set C (for STC-3)) and by 15th Nov 2019 for second set (Panel Set D (for STC-2)). Delivery must be no later than 5th October 2019 for (Panel Set C (for STC-3)) and 7th March 2020 for (Panel Set D (for STC-2))

The Contractor shall indicate in his bid submission the earliest delivery date achievable, details of each delivery phase i.e. quantity and date and the earliest date that the full complement of panels can be delivered. A high level Work Breakdown structure for the work to be done must also be provided.

The following staggered delivery order and delivery dates are proposed for the first set (Panel Set C) (numbers of panels per batch are only suggestions as numbers are dependent on number of panels proposed by contractor):

1. Body or door panels delivered in batches of 6-8 every 2 weeks with final delivery of 10th June 2019.

The second set is requested by 15th Nov 2019; a similar staggered delivery could be foreseen.

Project milestones will be decided at the project kick off meeting. The bidder is invited to propose a milestone payment plan for the kick off meeting. It would be expected no less than 20% of the contract value at final delivery and acceptance of the hardware.

8 Appendix

8.1 STC2 &3 Existing Panels Drawings

Document Title	Document Number
CURRENT SHROUD PANEL ASSEMBLY	KE-0288-410
SHROUD PANEL ASM2	KE-0288-415
SHROUD WITH CUTOUT ASSEMBLY	KE-0288-421
SHROUD WITH CUTOUT ASM2	KE-0288-422
BOTTOM SHROUD PANEL ASM1	KE-0288-460
BOTTOM SHROUD PANEL ASM 2	KE-0288-470
SHROUD COVER STRIP	KE-0266-417
SHROUD CUTOUT COVER	KE-0266-418
CORNER 1	KE-0288-520
CORNER 2	KE-0288-525

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Document Title	Document Number
CORNER 3	KE-0288-526
CORNER 4	KE-0288-527
SIDE 1	KE-0288-530
SIDE 2	KE-0288-535
SIDE 3	KE-0288-536
SIDE 4	KE-0288-537
DOOR PORT SHROUD	KE-0288-540
DOOR PORT SHROUD- STC2 OPTICAL WINDOW	KE-0266-750
DOOR PORT SHROUD- STC3 OPTICAL WINDOW	KE-0291-750
BODY SHROUD- STC2 OBSERVATION WINDOW	KE-264-600
BODY SHROUD- STC3 OBSERVATION WINDOW	KE-0291-740
DOOR SHROUD CHANNEL	KE-0288-501
PANEL COVER STRIPS	KE-0266-416
MOUNTING BRACKET BODY	KE-0266-481
MOUNTING BRACKET DOOR	KE-0266-501
DOOR SHROUD ASSEMBLY	KE-0266-500
STC2 ASSEMBLY	KE-0266-001

Note data pack includes high level drawings listed above down to component level drawings.

8.2 STC2 &3 Existing Panel Drawings for the Body and Door (includes spares)

Body Shroud Panel List

Shroud Panel Name/Title	Drawing Number	Quantity
SHROUD PANEL ASSEMBLY	KE-0288-410	11
SHROUD PANEL ASM2	KE-0288-415	11
SHROUD WITH CUTOUT ASSEMBLY	KE-0288-421	2
SHROUD WITH CUTOUT ASM2	KE-0288-422	2

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Shroud Panel Name/Title	Drawing Number	Quantity
BOTTOM SHROUD PANEL ASM1	KE-0266-460	3
BOTTOM SHROUD PANEL ASM 2	KE-0266-470	3
	Total	32

Door Shroud Panel List

Shroud Panel Name/Title	Drawing Number	Quantity
CORNER 1	KE-0288-520	2
CORNER 2	KE-0288-525	2
CORNER 3	KE-0288-526	2
CORNER 4	KE-0288-527	2
SIDE 1	KE-0288-530	2
SIDE 2	KE-0288-535	2
SIDE 3	KE-0288-536	2
SIDE 4	KE-0288-537	2
BLANK DOOR PORT SHROUD	KE-0288-540	2
	Total	18

Cover strips

Shroud Panel Name/Title	Drawing Number	Quantity
COVER STRIP	KE-0266-417	As Required