

Lawrence Berkeley National Laboratory University of California	Code	SPECIFICATION		Serial M938	Page 1 Of 4
Written by Craig Fong	Department Mech. Eng.	Location		Date June 28, 2000	
Title KamLAND Systems Monitoring Glove Box					

REVISION_0

CHECKED BY __CGF

DATE__06-29-00

1.0 Purpose:

This specification describes the design, fabrication, delivery and general requirements for glove box system to be used in servicing calibration devices in an underground physics experimental facility. The glove box will be delivered to Lawrence Berkeley National Laboratory, Berkeley, California where it will be assembled and commissioned in whole or in part. The system will then be disassembled and shipped to Kamioka, Japan for final installation. Background information on this project can be found at:

www.awa.tohoku.ac.jp/kamland

www-eng.lbl.gov/~luft/kam/

Look under 'Z-axis System Assembly'

2.0 Reference Documents:

The following documents form a part of this specification herein:

- 2.1 LBNL Drawing Number 21F9146 Latest Revision
- 2.3 National Electrical Code (NEC)
- 2.4 American Glove Box Society AGS-G001-1998 (reference)

3.0 Requirements:

3.1 Application – the glove box system shall be used to prepare special emitting sources used for the routine calibration and test of a photo multiplier array submerged in a liquid scintillator chamber located in the Kamiokande nickel mine near Kamioka, Japan. The glove box will provide a ergonomic interface with both the ultra-clean scintillator system and the calibration sources and also shields both stray light and radon gas from entering into the glove box interior. A combination of common mineral oil with pseudocumene comprises the scintillator liquid/vapor as descibed below. Refer to AGS-G001-1998 for additional design guidance.

3.2 Configuration – the glove box shall comply to the configuration specified by LBNL Drawing 21F9146, latest revision.

3.3 Material Compatibility/exposure environment – the glove box will reside in a controlled environment and act as the interface to the scintillator system and the detector chamber.

3.3.1 Internal Environment - the internal workspace of the glove box will be constantly exposed to the scintillator in the vapor state, with incidental and limited exposure to scintillator in the liquid state. The scintillator composition is 80% N12 (Dodecane – $\text{CH}_3(\text{CH}_2)_{10}\text{CH}_3$, 20% pseudocumene (1,2,4 – trimethylbenzene with a 1.5 g/l concentration of PPO (2,5 – diphenyloxazole).

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3.3.2 Internal Pressure – the interior of the glove box shall see a nominal operating pressure of 2 cm water positive. Under cleaning and preconditioning purge cycles, as high as 5 cm water positive.

3.3.3 External Environment – the external workspace shall be of Class 1000 cleanliness or better area, serviced with a low flow radon-free conditioned air system.

3.3.4 Temperature – under nominal operating conditions, ambient temperature shall range from 10°C to 30°C.

3.3.5 Spark Proof – though governing specifications for Japan mining operations for this hybrid application do not exist, the glove box will comply with NEMA Class 1, Division 1 for electrical spark proof application as assembled at LBNL.

3.4 Method of Construction –

3.4.1 Enclosure body - shall be manufacturer's standard. Bolted/welded hybrids of 300 series stainless sheet metal are anticipated but the Seller is open to propose alternate construction contingent on LBNL acceptance.

3.4.2 Weld Materials – shall be of general GMAW techniques proven to be free of any thorium in flux or electrodes. GTAW techniques shall be free of thorium tips or filler. Weld technique and materials shall be approved by LBNL prior to the start of fabrication.

3.4.3 Elastomer materials – LBNL's previous test and analyses indicate that to meet the scintillator vapor chemical compatibility requirements while minimizing radon diffusion into the detector chamber, DuPont's Viton appears to meet this criteria. The manufacturer is free to propose an alternate if the material is found to be better than Viton.

3.5 Material Access Load Lock – a controlled access lock for equipment and specimen entry and egress shall be provided by the Seller. Load lock will allow the passage of 20 kilograms of equipment at a maximum dimension of 12" long by 8" diameter. The load lock shall be of double hatch configuration and include purification ports.

3.6 Pressure and Volume Compensation System – Seller shall provide a glove volume/pressure compensation system that is closed to the external atmosphere. The internal gas volume shall be totally self contained. This compensation system will be an appendaged subsystem permanently located within 3 meters of the glove box through a flexible tube.

3.7 Glove Port Caps and Interlocks – Seller shall provide exterior glove port caps. Options for electrical interlock protection shall be provided.

3.8 Low Point Drain – Seller shall provide a low point drain for incidental liquid scintillator drip or spills. LBNL shall provide interface plumbing. Fitting

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type to be a 1" MDC ISO KF NW25 series Kwik Flange or LBNL approved equal.

- 3.9 Glove Box Purification Interfaces – Seller shall provide ports for the purge and conditioning of the internal volume. LBNL shall provide purge interface plumbing and operating interlock controls. Fitting type to be a 1" MDC ISO KF NW25 series Kwik Flange or LBNL approved equal.
- 3.10 Window and Window Light Shield – shall provide a serviceable window per Seller's standard design. Material to be certified by Seller, then approved by LBNL. Seller shall also provide a light shield to fit over the exterior portion of the window. Provisions will be provided for interlock switches.
- 3.11 Interface Flange – Seller shall provide an interface flange to the LBNL supplied detector chamber assembly. Flange shall be a 8" OD conflat type; clearance hole, non-rotatable style, MDC no. 110031 or eql.
- 3.12 Removable Top Panel – Seller shall provide a removable roof panel. Panel can be removed by traditional mechanical fasteners and gaskets. Panel is intended to support LBNL supplied interior equipment as specified in 3.12.
- 3.13 Lighting – Seller shall provide two NEMA or NEC Class 1, Division 1 complying lighting fixtures for the interior of the glove box. Lighting fixtures can be mounted internally or externally or both and house a source of approximately 50 watts per fixture. Lighting to be 12 volt DC halogen or incandescent compliant with NEC Class 1, Division 1. LBNL will provide operational interlocks to prevent light exposure to the detector chamber.
- 3.14 Interior Equipment – a load carrying winch and signal cable and fibers will be provided by LBNL. This interior equipment shall be mounted to the removable top and bottom of the glove box and be rated for routine 100 pound loads. The power winch and cable handling subsystems shall be provided by LBNL.
- 3.15 Lifting Lugs – Seller shall provide lifting lugs in a swivel eye configuration attached to the glove box sides as shown in drawing 21F9143. The glove box structural rating shall be for 1000 kilograms in the vertical direction.
- 3.16 Finish and Delivery Cleanliness – enclosure piece parts to be finished in Seller's standard stainless steel finish. Interior surfaces to have a standard mill finish not to exceed 125. Glove box to be cleaned to a class 100 level prior to shipment, but after tests per 3.17.
- 3.17 Testing and Acceptance – Seller shall conduct the following acceptance tests at the Seller's facility prior to shipment. LBNL reserves the option to witness all tests at Seller's facility.

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3.17.1 Positive Pressure Decay – with a static base pressure of 10 cm water positive pressure interior, and using dry nitrogen, the leak rate shall not exceed 0.1% of the internal volume per hour.

3.17.2 Helium Leak Test – the maximum external to internal helium leak rate shall not exceed 1×10^{-4} cc/sec per ASTM E493, externally bagged with mass spectrometer in the interior, per Method A.

3.17.3 Light Tightness Test – the glove box, with light shield in place and all service ports plugged, shall be tested for light tightness as follows. LBNL will provide a special 8" photo multiplier tube and associated electronics. The tube will be placed inside the glove box, the background adjusted to zero and a 24 test will consist of a not to exceed value equivalent to 5 phot electrons per 24 hour period.

4 Documentation, Approval, Inspection and Delivery

- 4.1 Documentation – Seller shall provide proposal drawings with the bid response package. Seller shall provide approval drawings after receipt of order.
- 4.2 Approval – LBNL shall approve Seller provided drawings within three work days after receipt.
- 4.3 Inspection – LBNL shall have the option to perform a final technical inspection at Seller's facility prior to shipment to LBNL.
- 4.4 Weather Proof Packaging – shipped packages shall be capable of withstanding one month of outdoor storage without damage from moisture.
- 4.5 Delivery – Seller shall be responsible for shipment to Berkeley, California.

5 LBNL Procurement and Technical Contact

- 5.1 The LBNL Procurement Contact shall be that agent specified on the request for proposal bid package. The LBNL agent will administer any and all contract changes.
- 5.2 Technical Contacts – routine technical correspondence shall be directed to:

Leo Greiner – Phone: 510-486-7570; Fax: 510-486-7379; e-mail: lcgreiner@lbl.gov

Specification written by:

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