RADIONUCLIDE LABORATORY CONTAINER SPECIFICATION

Section 1 Container Construction

1.0 General

The container is to be a standard 20' x 8' x 8' 6" high shipping container to ISO specification conforming to American Bureau of Shipping TIR and IMCO approval capable of 9 high stacking and UIC and CSC registration plate.

Container is to have a standard pair of fork lift lifting pockets totally enclosed on all sides as the floor is to be insulated. The underside of the container is to be fully plated with 3 mm thick minimum steel plate, fully welded to container to retain the floor insulation.

1.1 Floor

Container is to have a fire retardant plywood floor 25mm thick (plywood to comply with BS476 Part 7). The floor cavities are to be insulated with fire retardant insulation material to achieve an insulation value of 0.4W/m²K.

1.2 Ceiling

Roof shall be a standard corrugated construction and have 75 by 50 by 6 RSA cross members welded internally to the corrugated skin at all contact points. Cross members to be positioned at 1200mm centres maximum to support the ceiling structure. Ceiling is to be from fire retardant 12 mm thick plywood (plywood to comply with BS476 Part 7). Ceiling cavity is to be insulated with fire retardant insulation material to achieve an insulation value of 0.4W/m²K.

1.3 Walls

Container sides to have 75mm by 50mm by 6mm RSA horizontal rails welded internally to the corrugated skin at all contact points at centres to support internal Stauff rails. Walls are to be from fire retardant 12 mm thick plywood (plywood to comply with BS476 Part 7). Wall cavities to be insulated with fire retardant insulation material to achieve an insulation value of 0.4W/m²K.

Four heavy duty 316 stainless steel Stauff rails suitable for M10 fixings are to be installed along the inside of both side walls for securing of benches, fume cupboard and scientific equipment as required. The rails are to be continuous apart from in front of window openings and have suitable “cut outs” to accommodate insertion of stauff nuts at either end of each rail. The rails are to be at 275mm, 725mm, 1300mm and 2075mm centres above finished floor level.

1.4 Doors

The container shall have two single, outward opening access doors with a 900mm opening width minimum, positioned centrally, one on each end of the container. The doors are to be a lightweight aluminium construction, flange mounted onto the container structure to enable easy replacement. They are to be fitted so that no part of the door or door furniture projects beyond outer face of the container body. Each door is to be insulated to achieve an insulation value of 0.4W/m²K and have fully watertight seals suitable for withstanding the extreme weather conditions on the deck of a ship. Doors are to be fitted with 316 stainless steel hinges and lockable door furniture suitable for a marine environment. All hinges must be heavy duty and fitted with grease points to allow for lubrication. Doors to be fitted with a heavy duty stay to prevent opening beyond 100 degrees.

A drip rail is to be welded to the container above each door. The rail must not project beyond the outer face of the container body.

Push button exit rather than conventional door handles to be fitted to the two external doors. The push button exits will be on the inside with the door opening outwards from the container.

1.5 Internal Bulkhead

The container is to have a services lobby constructed at one end to house the air conditioning unit and electrical switchboards. The bulkhead is to be constructed from a timber framework with plywood covering and insulation as per the walls. The bulkhead is to have a centrally positioned personnel door with window fitted with toughened glass. The lobby width should be no more than 1500mm otherwise the lobby area will take up too much space within the container.

1.6 Escape hatch

Each side of the container shall have an escape hatch, the minimum size of 600 x 800mm.

Escape hatches are to be installed into framed openings in the container sides such that any leakage in the window frame or seals is drained externally.

All hatches to be fitted with an external hinged cover plate to prevent damage during freighting. The covers are to be lockable in either the open (flat against the container side) or closed position by heavy duty clips. Hinges and clips are to be from 316 stainless steel suitable for use in a marine environment. When in the closed position, no part of the cover or securing clips are to project beyond the outer face of the container sides.

1.7 Services

Service entries are to be accommodated in a recess situated at lobby end of the container, to the right-hand side of the door at base level. The recess is to be approx 900mm high and 500mm deep and manufactured from 3mm plate fully welded in, sitting on the top edge of the container bottom rail. The bottom of the recess is to have a fall of 25mm to the outside of the container to allow for drainage.

The recess is to have a hinged cover plate to the same specification as the windows.

A 316 stainless steel earthing boss, 25mm diameter x 25mm long, drilled and tapped M12 shall be fully welded in the base of the box.

Service entry recess is to accommodate: -

Non toxic sea water supply – ABS hose tail to suit ½" bore hose.
Fresh water supplies (hot and cold) - 316 stainless steel hose tails to suit ½" bore hose.
Air conditioning plant cooling water and drain connections (316 stainless steel hose tails - size to be determined by supplier).

Sink unit waste discharge – 1" o.d. PVC hose tail.

All water connections are to be fully labelled with traffolyte labels.

440V three phase IP67 rated appliance inlet.

10 way socket for fire alarm and communications connection to ship.

Lycab gland assembly size approx. 120 mm x 160 mm for gas pipe/cable entries. Three of these, one at each end of the container and one connecting the main lab to the lobby area.

1.8 Air Intake Penetration

A penetration is to be formed in the container shell at the opposite end to the services lobby at high level on the right hand side when viewed from outside. The size of the penetration is to be determined by the supplier to suit the fresh air fan. The penetration should be framed with a suitable sized RHS section and be constructed so that a recessed weather louvre can be fitted. The opening is to be fitted with an external hinged cover plate to prevent damage during freighting. The covers are to be lockable in either the open (flat against the container side) or closed position by heavy duty clips. Hinges and clips are to be from 316 stainless steel suitable for use in a marine environment. When in the closed position, no part of the cover or securing clips are to project beyond the outer face of the container sides. Air intake is on the right and section 1.9 fume hood is on the left.

1.9 Fume Hood Exhaust Duct Penetration

A penetration is to be formed in the container shell at the opposite end to the services lobby at high level on the left hand side when viewed from outside. Position and size to be determined by the supplier to suit the position and size of the fume cupboard exhaust duct. The construction of the penetration is to be identical to the air intake penetration.

Air exhaust fume hoods are interlocked with main container extractor fan. Fume hood is on the same size/bench as the sink.

1.10 Painting

Container to be finished to the following specification or equivalent:-

Top and sides

Surfaces to be shot blasted to SAE. 2.5
Apply first coat of Temishield EPY 672 HB
Epoxy Micaceous Iron Oxide to 174 microns of dry film thickness.
Apply second coat of Temishield ERV series.
Apply coat white epoxy intermediate coat to 125 microns of dry film thickness.
Apply final coat of white vinyl container paint to 75 microns dry film thickness.

Underside

Surfaces to be shot blasted to SAE. 2.5
Apply first coat Temishield EPY 672 HB
Epoxy Micaceous Iron Oxide to 175 microns of dry film thickness.
Apply second coat Temishield Coal tar and epoxy to 300 microns.

1.11 Container Markings

Container is to be fully marked in accordance with ISO regulations to include the owners mark "BASU – XXX XXX X**"** (number to be confirmed). Container is to be fitted with CSC Safety approval plate. A company manages the BAS numbering of containers. Details will be provided when required.

Section 2 Interior Coatings

2.0 Floors, Walls, Ceiling and Doors

All internal wall surfaces, ceiling, floors and doors should have a fully sealed non-absorbent and easily cleanable finish to comply with the requirements of the Environment Agency, Radio Substances Act - guidance for inspectors' chapter 4 Generic issues. Walls, ceilings, floors and internal door surfaces are to be covered with a 2 mm thick light grey specialist vinyl covering with continuous heat welded seams. All corner junctions to be coved for easy cleaning.

Walkway is to have a 1000 mm wide non slip vinyl flooring to the same specification. Covering material is to comply with BS476 Part 7 fire regulations.

No wood and minimal exposed metal surfaces. Stauff rails to be powder coated (as per ultraclean).

Section 3 Electrical Services

3.0 Design and Installation Standard

The design and installation standard of the electrical services shall conform fully to *BS 7671: Requirements for Electrical Installation and the Regulation and Recommendations for the Electrical and Electronic Equipment of Ships* and *IEE 17th edition.*

The container floor should be considered a wet area and therefore all electrical components and wiring should be installed at high level.

Lighting and power circuits are to be wired in single core silicone rubber cable contained within high impact PVC conduit.

3.1 Electrical Supply

The electrical supply to the container will be 440V 60Hz 63A 3 phase and will be provided by the vessel.

The incoming supply is to be connected to the container via an appliance inlet socket arrangement located in the services compartment. The appliance inlet is to be 4 pin (3P + E), IP67, rated for 440V 60Hz 63A to IEC-EN60309-2

The appliance inlet is to be wired to a 440V isolation transformer suitable for powering all electrical equipment installed in the container and the two ring mains. It is to be mounted in the lobby at high level in a suitable waterproof enclosure.

A distribution panel is to be installed at high level in the lobby. The panel is to be fitted with mains isolator and residual current device to protect all circuits.
The panel is to be fitted with power conditioning unit(s) suitably sized to supply the two ring main circuits (see below).

Double pole miniature circuit breakers are to be provided for the following circuits:-

Lighting circuit.

One 240V ring main circuits 60Hz (comprising 6 sockets)
Two 240V ring main circuit 50Hz clean
Two 110V 60Hz sockets.

Fresh air ventilation fan.

Fire alarm panel.

Air conditioning unit

Spare

Section 4 Electrical Installations

4.0 Lighting

The main laboratory is to be lit by corrosion resistant LED light fittings with covers to IP56 or above.

The wattage and quantity of LEDs is to be determined to achieve an average illuminance of 500 lux in the working plane.

Two emergency light units to IP56 or above are to be positioned evenly spaced over walkway. These lights are to have external battery isolation switches fitted.

Entrance lobby area is to be lit by a single corrosion resistant LED lighting to IP56 or above.

Local switching is to be provided at either end of the container, adjacent to the doors using two way double pole light switches to IP56 or above.

4.1 Ring Mains

Two 240V “clean” 50Hz ring mains are to be installed, one to serve each side of the container working space. Ring mains are to be fed via power conditioning unit(s) to ensure scientific equipment is supplied with clean power. Each ring main to comprise of nine 13A three pin double pole switched outlets to IP56 spaced evenly along the length and installed at high level above the benches.

One 240V ring main circuit 60Hz to cover both sides of container (as per 3.1)

4.2 Fresh Air Supply Fan

A variable speed ventilation fan and controller are to be installed at the non lobby end of the container (refer to sect. 1.8 – Air intake penetration). The fan should be rated to give a flow rate of 1.2 cubic metres per minute. The fan is to be fitted with a filter to prevent the ingress of dust and an internal PVC grill.

Discussion with Fume cabinet company. Number of changes per hour.

4.3 Fire Alarm / Communications

A suitable junction box with terminal connections to be provided by the allow connection of the container systems to the ship. The junction box to be rated to IP66.

The following items will be wired in:

Two smoke / heat detectors compatible with the ships fire detection system.
Two fire alarm call points.
One alarm sounder.
One loud speaker compatible with the ships P.A. system.
One telephone compatible with the ships telephone system.

Audible alarm for the fridge freezer.

4.4 LAN Installation

The container will require a Local Area network both for internal use, and to connect the container to existing ship networks.

Provision must be made in the design for connection to the ship’s main LAN via a flying lead (or leads) through a waterproof (IP67) gland.

The main network infrastructure should be based on Category 7 copper wire terminated in Category 7 GG45 connectors. Shielded cable should be used throughout to support 1 Gbps data transfer rates at workstations. The backbone links of the network should be fibre with transmission capability of at least 10Gbps. These backbone links will need to be duplicated to provide redundancy in event of failure. All cable and connectors used should have "Type Approval Certification" from either Lloyds Register or Det Norske Veritas.

Section 5 Temperature Control / Environment

5.0 Design Criteria

Required range for a set temperature inside the container to be between 10°C and 25°C.

Normal control range 18/25°C +/- 2K.

Ambient temperatures range from -20°C (saturated) to +35°C (80% RH).

Air infiltration 1.2m³/min

Three occupants (light bench work)

Heat load needs to be calculated based on the equipment provided by supplier.

Maximum fresh water temperature (cooling water) is 32°C.

Cooling duty is to be calculated to allow for the discharge of air by the installed fume cupboard.

Container insulated to 0.4W/m²K

Ensure that the specification for the Air Handling System and Insulation properties of the container meets the requirements for a polar environment.

5.1 Air Conditioning Unit

The air conditioning unit is to be installed in the lobby space and sized to suit the above design criteria. It must be suitable for use in a marine environment and be able to be cooled by both seawater and fresh water. The unit is to be powered by 440V 60Hz 3 phase supply.

The air is to be ducted to all parts of the container working area via a duct or fabric "sock" arrangement thus reducing draught and unifying temperature throughout.

Cooling water and drain(s) are to be piped to discharge through services compartment. Pipes are to terminate in 316 stainless steel hose tails for connection to the Ship by flexible hoses. Water connections in services compartment to be fully marked with traffolyte labels.

The air conditioning unit is to be supplied with a full set of manufacturer recommended spares.

5.2 Electrical cable

25m Long hook up cable suitable for connecting to ships supply to be supplied. Cable to be flexible braided style suitable for use on a ships' deck. Fitted IP67 plug / sockets either end.

Section 6 Furniture and Major Fittings

6.0 General

All furniture and fittings are to comply with the requirements of the Environment Agency Radioactive Substances Act Guidance Chapter 4 – Generic Issues December 2005 see http://publications.environment-agency.gov.uk/pdf/PMHO1205BKHR-e-e.pdf.

6.1 Benches

The laboratory area is to be fitted with modular bench units the full length of the walls to butt up to the fume cupboard and sink unit. The maximum length of a module is to be 2000mm. Each module is to be fixed to the two lower wall mounted Stauff rails and is to be easily removable as a single unit to allow flexibility in the layout of the laboratory.

The bench tops are to be fabricated from fully welded 4.5mm thick white PVC to form a trough section 60mm deep to contain any spills and be easily cleanable. The design is to incorporate full length rails to front and back of trough section to enable tying down of equipment.

The PVC bench tops should be mounted onto a plywood sheet fixed to polyester powder coated stainless steel box section frames. The frames are to be fitted with suitable brackets for fixing to Stauff rails.

Benches: 3 x benches (one with sink). Each bench to have one “open” area under bench as kneehole to allow seated work. Each bench also to have one cupboard/drawer unit. Remaining space under bench free for portable aluminium boxes (Zarge type) or plastic crates box storage. Exception is bench where space required for waste storage spill tank and sink drain (see below).

Previous generations of RN containers have suffered with metal on the benches rusting away [Reason for problem: metal surfaces and rust absorbs radiation from spills]. Contractor to provide a solution to this problem.

6.2 Sink Unit

A single lab sink unit to a similar specification to the benches is to be fabricated from 4.5mm thick PVC sheet and installed at the lobby end of the laboratory. The sink unit is to have a drainage area which slopes into the sink. The lab sink to have two taps, one for fresh water and one for hot water.

In bench next to sink/drainage area, place, a cut out in the bench to allow for waste chemicals to be poured into a 25 litre carboy held within an underbench tank to retain spills . The carboy to meet UN standards. The carboys would then be stored after use in either the science hold or science hangar. Insert to the cut out should be provided so that the bench can be used when waste chemicals not being decanted in the carboy. Alternatively, an arrangement designed to allow spillage tank and carboy to be slid out from under the bench when needed.

As per attached drawing for waste chemical handling, under the bench.

The right hand sink should be fitted with three laboratory style taps and a standard waste outlet. Hot & cold fresh water and a plastic lined tap for the provision of non toxic water (seawater). The taps are to be lever operated for hands free operation. Each tap is to be labelled with a traffolyte label.

Underneath the sink a bypass valve is fitted which will have two positions.

1) Direct the waste from the sink into a 25 litre carboy.
2) Direct the waste from the sink into a waste outlet from container.

The taps and sink waste are to be hard piped through the lobby to the services compartment using non corrosive pipe work and fittings. The non toxic pipe work is to be non metallic throughout. All pipes to be fully bracketed to walls.

The cold fresh water pipework to be fitted with a tee piece for future connection of Millipore water purifier and is to terminate in a stainless steel isolation valve and ½" o.d. stainless steel hose tail. Tee piece to be located under sink area.

A small hand wash sink to be placed in the lobby, this will also have a bypass valve. This sink will have lever-type taps to allow hands free use.

Underneath the sink a bypass valve is fitted which will have two positions.

1) Direct the waste from the sink into a 25litre carboy.
2) Direct the waste from the sink into a waste outlet from container.

Please refer to attached document SDA Radioisotope Container Waste Chemical Area for further details regarding the handling of waste chemicals within the container.

6.3 Fume Cabinet

A Monmouth D1200
http://monmouthscientific.co.uk/fume-cupboards/ducted-fume-cupboards/ductaire-ducted-fume-cupboards-with-hinged-sa is to be provided. It must conform to BS758 and BSEN14175 fume cupboard is to be installed at the non lobby end of the laboratory space. The unit is to be ducted to discharge through the penetration as specified in section 1.9. The unit is to be mounted on a polyester powder coated stainless steel box section frame attached to the wall mounted Stauff rails. A set of manufacturers recommended spares is to be supplied with the unit. In presence of radioactive dust particles, the Fume Hood should be provided with HEPA filters, but if radioactive source is more volatile, activated charcoal filters should be introduced in the filtration system. For this reason is advisable to use a triple filtration system: antiparticles, HEPA and activated charcoal filter.

Provision to tie and store items in the fume hoods whilst at sea.
It should be noted that previously rusting has occurred around the edges of the fume cupboard where the filters are held, contractor to provide solution to prevent this.

6.4 Fridge Freezer

An upright lockable fridge / freezer unit is to be installed in the lobby area. The unit is to be secured to the container to prevent movement in rough sea conditions. Fridge freezer is to be raised off the floor by a polyester powder coated stainless steel frame to protect unit against corrosion. Needs to have an alarm, needs to spark free.

6.5 Lobby Area

Geiger counters (and spill kit) to be stored in lobby area thus small storage area to be provided. Lobby area to have coat hanging and shoe storage provision. This way outdoor clothes / footwear remain outside of the main lab. Inner lab to have coat hangers for lab coats.

6.5 Fire Extinguishers

Two fire extinguishers of type: dry powder - 6.0kg to be located, one at either end of the container.

6.6 Sliding Door

Sliding door between lobby and main lab ease space in lobby area (assuming it can be made secure and easy to operate with ships movement). Otherwise a standard door opening from the lobby into the lab will suffice.

6.7 Remote Displays

2 x VESA mounts to be provided along with power and network connections to allow for Remote displays to be setup and configured in the labs. Each display will be 23”

6.8 MilliQ

Small MilliQ system to be provided (specific details will be provided in due course).

Section 7 Documentation

7.0 Manuals

Five copies of a detailed operation and maintenance manual are to be supplied with the container. This is to include full manufacturer’s information on the fume cupboard, air conditioning unit, door furniture, full manufacture drawings and spares listings.

7.1 Certification

Certification is to include: - Container CSC, paint finish, electrical tests and commissioning tests.

Section 8 Standards

8.1 Standards

A mix of International and British standards have been used throughout this specification, it should be noted that these do not always fully equate with equivalent European classifications. Should a Contractor utilise an alternative standard they are asked to confirm and justify that the equivalence for the particular material or procedure is either equivalent or superior to the quoted standard.