
PTFE filter destruction project glove-box purchase specification

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Table of Contents

1	INTRODUCTION	4
2	Purpose	4
3	Scope of supply	4
4	General requirements	4
5	Technical specification.....	5
6	Fabrication and assembly requirements	6
6.1	Normal Working and design pressure.....	6
6.2	Proof Test Pressure.....	7
6.3	Leak Rate.....	7
6.4	Emergency Breach Flow Velocity.....	7
6.5	Flow rates	7
6.6	Corrosive and degrading atmospheres	7
6.7	Glove-box Filters	7
6.8	Heat dissipation.....	8
7	Qualification of bidder	8
8	Gove-box test.....	8
8.1	Factory Acceptance Test (FAT) at vendor's site.....	8
	Appendix A:.....	10

List of Acronyms & Abbreviations

The following acronyms and abbreviations are used in this document:

DG	Design Guide
HEPA	High Efficiency Particulate Air
HPE	High Pressure Extract
RA	Radio Active
SAPR	Self Acting Pressure Regulator
CDFS	Constant Depression Fan System
VXA	Vortex Amplifier
RIB	Resistive Air In-Bleed
Pa	Pascal
PTFE	Polytetrafluoroethylene
CCDS	Controlled Constant Depression System
RFQ	Request For Quotation

1 INTRODUCTION

Drums containing contaminated filter candles are received from storage and emptied onto a sorting table inside a glove box to remove any foreign matter. This process requires extra safety precautions since there is a high possibility of contamination. The glovebox will be kept under a 25 Pa negative pressure relative to the surrounding atmosphere. This negative pressure will be maintained by the building ventilation system, which will provide adequate suction through a set of HEPA filters. The drum containing the contaminated PTFE filters will be secured in position by a glove box iris port that seals the glove box off against the outside of the drum before removing the lid on the inside of the glovebox.

The purchase specification will be used together with tender documents, glove-box drawings and data sheet at procurement stage. RFQs will be sent to potential suppliers, who will fabricate and assemble the glove-box.

2 Purpose

The purpose of this purchase specification is to provide details of the requirements for glove box manufacture, supply, of a fully functional glove box along with all accessories. This facility is required for containing radioactive PTFE filters and it will detail the scope of supply expected to be met by suppliers.

3 Scope of supply

The scope includes the supply of one glove-box, design review and acceptance, developing a quality control plan for the fabrication and assembly of the glove-box. Sourcing materials of construction, fabricating the glove-box and assembling the glovebox in accordance to design drawings shown in Appendix A, testing of the glove-box, factory acceptance test, and delivering the glove-box to purchaser's facility.

4 General requirements

The glove-box will be operated at a slightly reduced pressure of -25Pa, to contain radioactivity and toxic components of the PTFE filters feed and thereby protecting the operating personnel.

The glove-box will be connected to the facility ventilation system, through an appropriate filter.

The glove-box will be used as primary containment system, and the ventilation of the glove-box will take precedence over the laboratory ventilation system.

5 Technical specification

Parameter	Specification
Dimension	Length =1880mm Height = 800mm Volume = 1.292 m ³ <i>Note.: Refer to Appendix A for details</i>
Material of construction	Austenitic stainless steel type 304L as per ASTM A240 for plates and ASTM A312 for pipes. Only seamless pipes shall be used during construction. Flow piping and fittings shall be of SS304L. (Mill test certificate shall be submitted)
Design Code	The glove box shall be designed by ASME Boiler and Pressure Vessel Code (B&PV Code) Section VIII, division-1
Fabrication	The fabrication of the box shall comply with requirements of Section IX of ASME B&PV Code. Inner surface of the chamber shall be electro polished for low outgassing rate.
Loading and unloading	Loading will be achieved by emptying PTFE filter drums into the glove-box. Drums will be lifted via a quarter circular rack mechanism driven by a D5 centurion gate motor, to lift drums from a vertical position to a 135 ⁰ angle, to allow easy emptying of drums into the glove-box. Non-compliant NW (liquids, non-compressible solids) will be removed. Liquid waste will be drained into a drain tank, and the solids moved by hand to a vertically positioned drum attached and sealed to the bottom of the glove-box to remove solid waste.
Hand gloves	Rubber gloves resistant to radioactivity and toxicity will be fitted, extending inside the glove-box, and sealed to the hand holes cut on transparent propylene panels.

Vacuum System	The bidders are also requested to separately quote for the optional Gas Purification System for closed cycle operation to regulate, monitor and control oxygen and moisture, fitted with appropriate filter system, blowers and valves adoptable to the offered glove box for future upgrade. Pneumatically operated isolation valve, vent valve. Pirani gauge shall be mounted for pressure measurement. All joints shall qualify helium leak tightness better than 1×10^{-6} mbar.l/s.
Flow piping and fittings	Should be made out of stainless steel.
Surrounding environment	21 to 40 °C, and up to 80 % Relative humidity to protect the operation and control panel.
Equipment operating electrical power	Single phase 220 VAC \pm 10 % "OR" three phase line to line 380 VAC +10/-5 % 50 Hz or 60Hz \pm 2 Hz.
Essential Spares	Spare gloves: 20 pairs, Spare O Rings, seals and Gaskets: 5 each

Note: The purchaser reserves the right to ask for minor modification in specification without affecting the cost of the glove-box.

6 Fabrication and assembly requirements

The following information needs to be taken into account during fabrication and assemble of the glove-box.

6.1 Normal Working and design pressure

The glove-box will be used to handle radioactive and toxic material, and it will operating under a negative pressure of -25 Pa. The glove-box is however designed for a pressure of between +250 to -500Pa. It must be manufactured and assembled to withstand the specified design pressure.

6.2 Proof Test Pressure

This is the maximum negative and positive test pressure the glove box will be designed and tested to and it should take account of identified fault scenarios. The ventilation and any pressure relief systems should be fitted to retain the glove box within the proof test pressure with a suitable margin of safety.

6.3 Leak Rate

The normal leakage standard for the glove boxes will be either 0.05 to 0.5 % box volume leakage per hour at ± 1000 Pa.

6.4 Emergency Breach Flow Velocity.

When a glove-box suffers a breach it loses its differential pressure and has a protective flow of gas through the breach. It is recommended that the optimum design breach velocity is 1.0 m/sec through an open glove port.

6.5 Flow rates

The glove-box might be operated with moist to wet feed. The flow rate will be between 10 & 15 changes per hour to prevent condensation.

6.6 Corrosive and degrading atmospheres

Care should be taken when selecting plastic fittings and assemble material for use in a radioactive and corrosive environment. In such circumstances the component materials need to be able to withstand chemical, radiological and corrosion product attack. Proper material selection shall ensure that material resistant to radioactivity, toxicity and corrosion attack are selected and used.

6.7 Glove-box Filters

The first extract filter must be fitted after the breach flow control device, to prevent the breach flow device from becoming dirty. The open glove port inflow velocity is designed for an initial flow of 1.4 m/sec with clean filters. This will allow some filter blockage until a minimum flow of 0.5 m/sec is obtained. Filter blockage needs

to be monitored at inlet flow volumes, which by definition are much smaller than the required breach flow.

6.8 Heat dissipation

Under normal operation the expected flows through the glove box will be fairly low with the flow required to remove any significant amounts of heat. Normally heat generated within a glove box is rejected through the fabric of the glove box and not through the exhaust flow. To provide any substantial heat removal, i.e. above that which can be dissipated through the box structure, the change rate may need to be increased substantially e.g. 30 ACH or more.

7 Qualification of bidder

The original equipment manufacturers (OEM) and their authorized representatives are eligible to participate in the bid. In case of authorized dealer, a recent and valid authorization certificate from the OEM for the supply of glove box must be attached with the offer. Essential qualification criteria for the bidder are as following:

- It is desirable that the OEM to be ISO 9001: 2008 / ISO 9001: 2015 quality management system certified or its equivalent for design and manufacture of vacuum vessel or glove boxes.
- The OEM shall have at least five years of experience in design and manufacturing of glove box.
- The bidder shall also submit the list of names of organizations where the OEM has supplied the glove boxes. Offers not meeting these requirements will be treated as technically incomplete and may be rejected.

8 Gove-box test

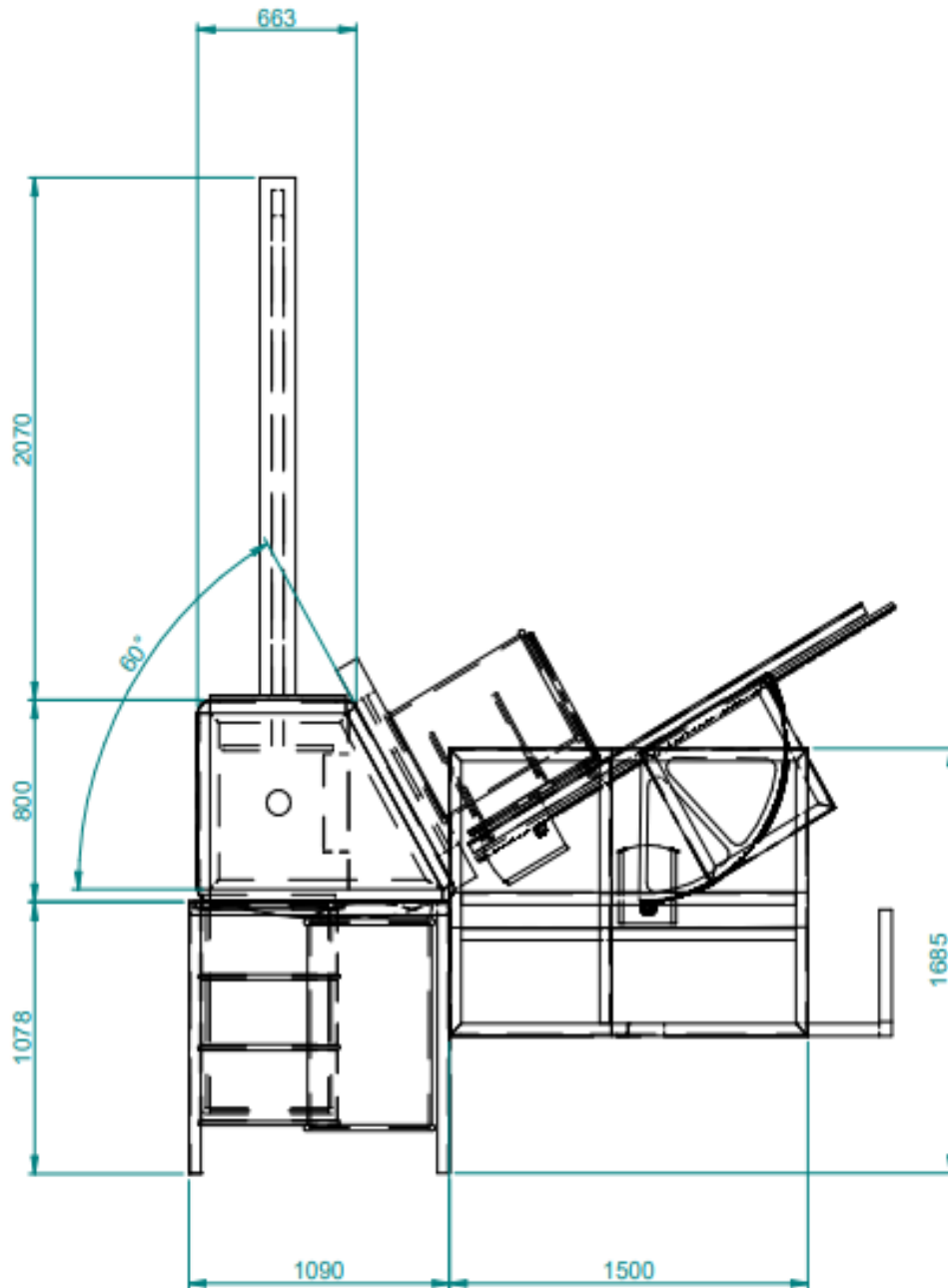
8.1 Factory Acceptance Test (FAT) at vendor's site

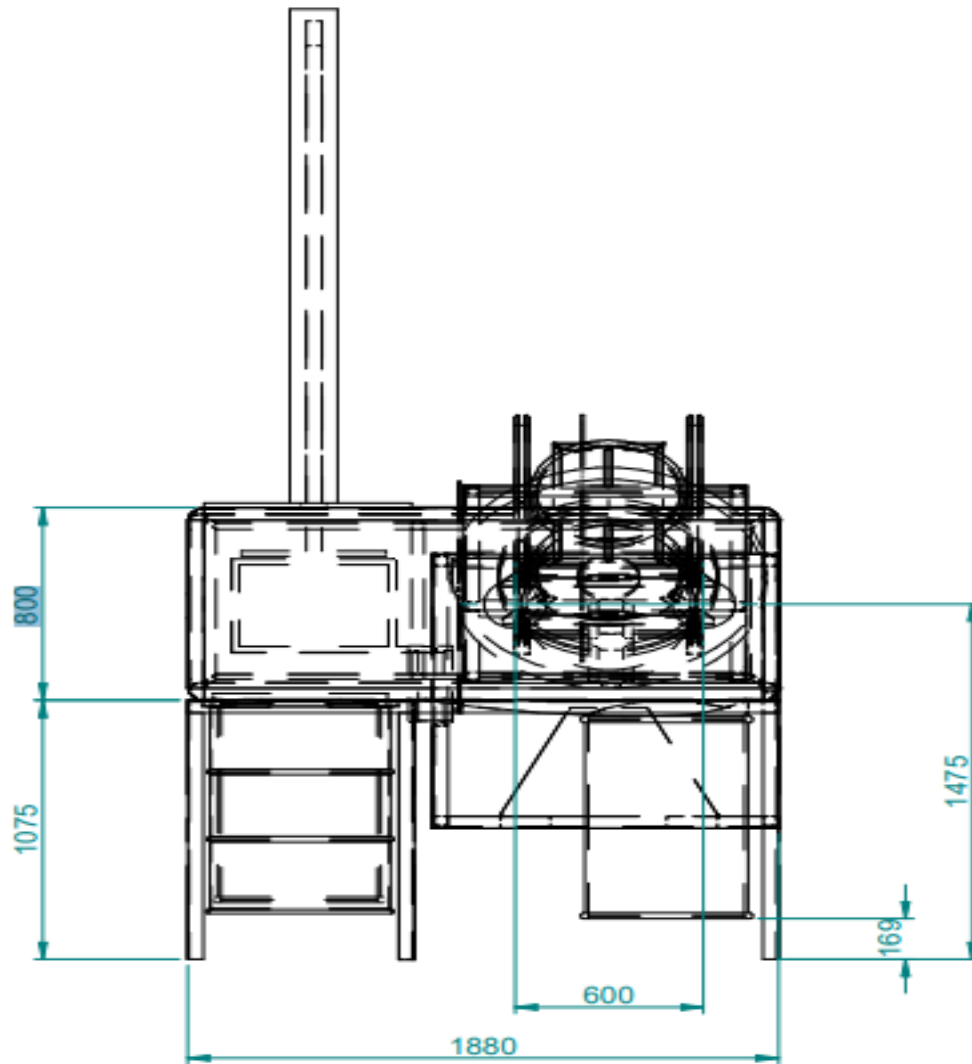
A pre dispatch factory acceptance test will be carried out in presence of purchaser's engineers as follows:

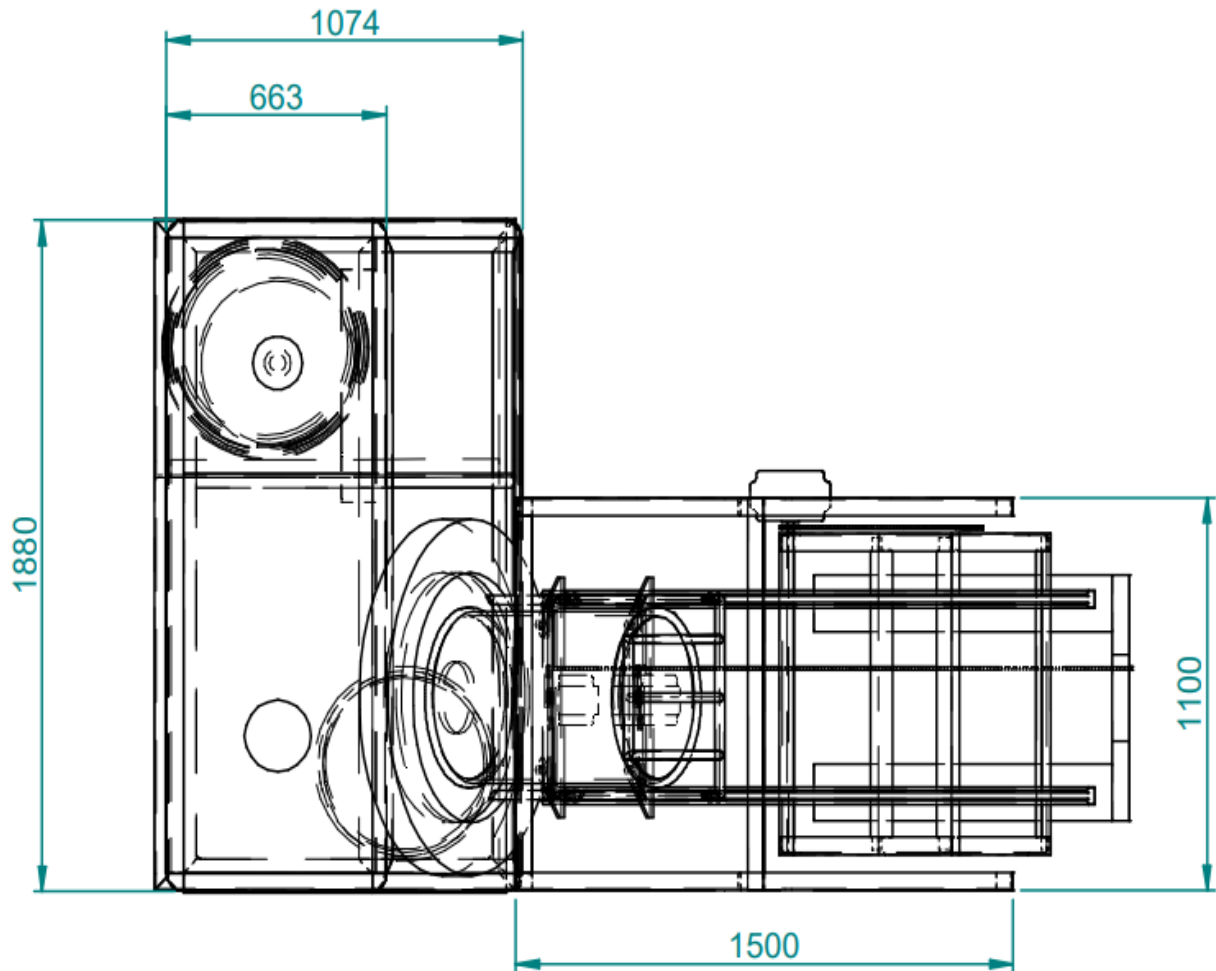
- Verification of all the documents as listed in article of this specification on information management.

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- Verification of traceability of raw materials and components used in the glove box.
 - Helium leak testing of the glove box to satisfy leak rate of the system $< 1 \times 10^{-6}$ mbar lit/sec.
 - The glove box vacuum system shall be tested for working vacuum of 1×10^{-2} mbar in empty chamber.
 - The manufacturer shall perform all the above checks / testing / verification on their own and send the test report to Engineering Services prior to calling Engineers for pre-dispatch factory acceptance test.

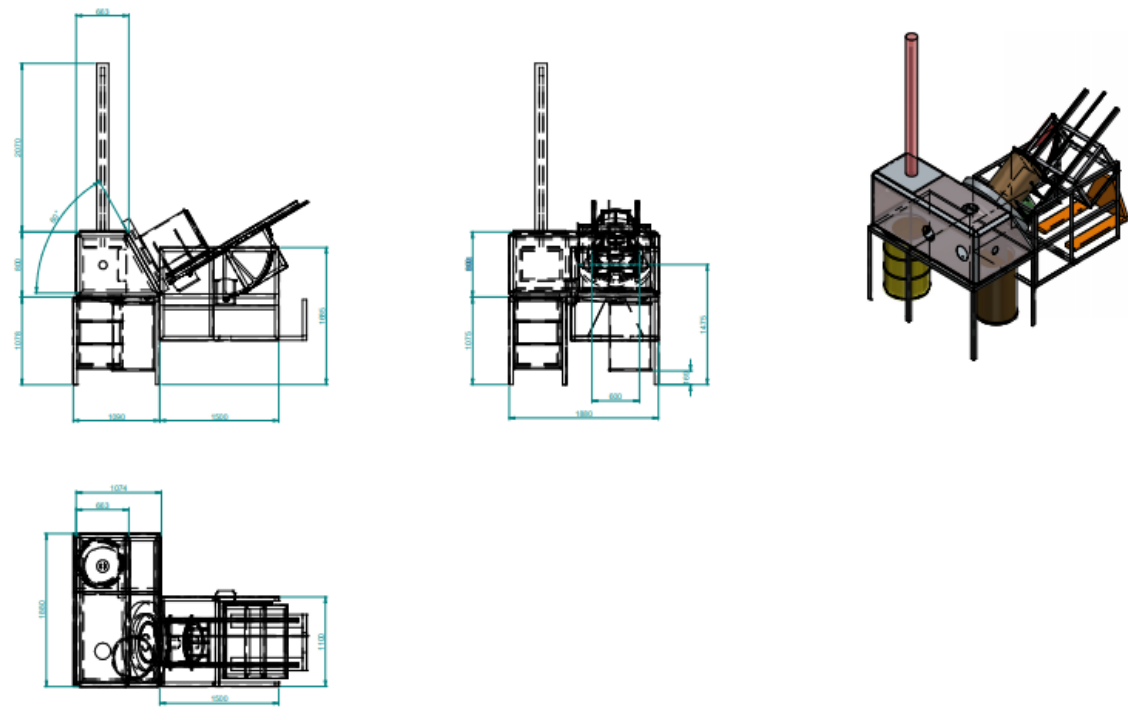
Appendix A
Glove-box Model









THIS IS A CONCEPT AND THE DIMENSIONS CAN CHANGE



<p>NOTES</p> <p>1. THIS IS A CONCEPT AND THE DIMENSIONS CAN CHANGE</p>	REV	DESCRIPTION	DATE	CLIENT ACCEPTANCE / APPROVAL OF DRAWING			FIRST ISSUE	ORIGINAL SCALE AS SHOWN ON VIEW		PROJECT: DRUMSORTING GLOVEBOX	LAST UPDATE 2023/10/20	
					APPROVED	DATE						

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