

Technical Specifications of Compactor

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Technical Specifications of 200 Te Compactor

1. Introduction and General Description

1.1 Introduction

The Tarapur site has various facilities which generate solid waste of various types. These wastes are categorized and segregated based on their compressibility and flammability.

The 200 Te compactor will be used for compaction of compressible waste. This waste will be packed in 200 litres carbon steel drum and pelletized by the compactor to give a volume reduction ratio of 1:5. Due to the presence of activity, it is necessary to house the compaction system in an enclosure under negative pressure with a ventilation system.

The pelletisation system comprises of conveying, pushing, indexing and compaction - all operations shall be controlled by PLC based control system. Apart from the drum pelletisation, the system shall also be equipped to compact the used filters, being generated from exhaust and supply air systems of radioactive installations. A volume reduction factor of minimum five. A suitable indication shall be provided in the control panel for the compaction achieved.

1.2 Scope of supply

This includes the design of complete system, preparation of shop drawings, procurement of all the raw material, identification, procurement of bought out components, manufacturing, inspection, testing of equipment at Supplier's works, packing, transportation, installation, and commissioning of testing of 200Te compactor with necessary power pack, roller conveyor, ventilation system comprising of blower, HEPA filter, duct, control and electrical panel, accessories, safe delivery and installation & commissioning at site as detailed below.

| S.No. | Description | |
|--------------|-----------------------------------|--|
| 1. | No. of compactors required | 1 No. consisting of following: |
| a. | 200 Te compactor with power pack. | Cylinder covering outer diameter of the drum during compaction with a) Piercing arrangement for drums b) Denting arrangement for filters |
| b. | Roller conveyor | With idle rollers |
| c. | Ventilation system | 1000 CMH and 100mm static head Blower- 1 no. HEPA filter casing with one no. of 610mmx 610mm x 300mm HEPA filter MS Duct of 300mm x 300 size, approximately 5m long. |
| d. | Overpacks (disposal container) | 2 nos. for collecting compacted drums 2 nos. for collecting compacted filters. |
| e. | Initial fill of oil | To be filled to full tank capacity |
| f. | Spares | Hydraulic Pump (high pr.) – 1 no. Hydraulic Pump (low pr.) – 1 no. Pr. Relief Valve – 2 nos. Seals for main cylinder – 2 sets Seals for indexing cylinder – 4 sets Spares of NRV – 4 sets Suction strainer – 2 nos. Return line filter element – 2 nos. Other Seals & O rings – 1 set DC valves – 1 set |

| | | |
|----|---|--|
| | | Hoses- 1 set Pressure switches- 1 set MCBs – 1 set Contactors – 1 set PLC I/O cards – 1 set Relays – 1 set Limit switches – 1 set Push buttons – 10 nos. Indicator lamps – 10 nos. |
| g. | Functional trials. | Functional test to check the capacity and performance at Manufacturer's premises. Inactive trials and witness of minimum 10 nos. of drums and 10 nos. of filters or till satisfactory compaction at supplier works And Inactive trials of minimum 10 nos. of drums and 10 nos. of filters or till satisfactory compaction during installation and commission at INRP, BARC, Tarapur. Drums and filters required for trials at supplier works are in the scope of Supplier . |
| h. | Painting | 1 coat of epoxy primer-50 micron thick 2 coats of epoxy paint- 50 micron thick each |
| i. | Control panel | PLC based, Painted by 7 tank process. |
| j. | Bought out components. | |
| | Hydraulic pumps Hydraulic valves Hydraulic cylinders Powerpack Lubrication system Switches / sensors Bearings Gearboxes Pneumatic cylinders PLC Contactors Motor Limit switches Proximity switches | Of reputed make |

Note: Air at a pressure of 6 bar will be available at site for operation of the compactor.

Detailed scope of supply is as follows:

- 1.1 Preparation of Design Document for the system including design manual, design calculations, design drawings, safety analysis, etc.
- 1.2 Preparation and submission of detailed fabrication drawings along with bill of material for all the equipment / system and control drawings for Purchaser's approval.
- 1.3 Preparation/Submission of detailed Quality Surveillance program including QAP for Purchaser's approval prior to manufacturing.
- 1.4 Procurement of all materials in accordance with the material specifications as given in the approved drawings, QAP and specification.
- 1.5 Manufacturing of compaction system including mock test set-ups as per approved drawings.

- 1.6 Obtaining approval of deviations (if any) in manufacturing with necessary reasons for the same from Purchaser.
- 1.7 Offering the components and the full equipment for inspection to Purchaser's representative as and when required during the execution of the contract.
- 1.8 Carrying out any necessary improvements until satisfactory performance of the equipment for which they are intended. Such improvements shall be carried out by the Supplier at free of cost if they are required for reasons arising from bad workmanship or non-conformity to the specifications.
- 1.9 Testing of the equipment at Supplier's workshop for its functional requirements with simulated test set up.
- 1.10 Packing and safe crating of the equipment so as to avoid any damage during handling, transportation and storage before their actual usage.
- 1.11 Training the operators and supervisors for operation and maintenance of the system. (Approximately 2 persons for 5 days)
- 1.12 Necessary cable wiring, bolts, screws and other fixtures, guarding and covers for all rotating components, supply of first charge of oil, lubricants, grease, special erection and maintenance tools are in the scope of contractor.
- 1.13 Transportation to site, loading and unloading of equipment at site, complete erection with supervision, final testing and commissioning of entire system with all accessories as per this tender is also in the scope of work.
- 1.14 Testing and commissioning of the equipment at site.
- 1.15 Incorporating the as-built changes in the manufacturing drawings and submission of as-built drawings (reproducible prints and CD).
- 1.16 Submission of bound copies of documents (2 sets) consisting of Q.A. documents, O&M manuals, catalogues and as-built drawings in hard copy and 1 set in CD.
- 1.17 Offering guarantee of the equipment for a period of 12 months after installation of equipment at site. This guarantee shall cover free repairs or replacement of parts, which have failed during normal operation within the guarantee period due to defective material of construction, workmanship etc.

The compaction system shall contain the following major parts:

1. **Feed conveyor:** This will feed the Drum/Filter one by one to the press. It consists of a roller conveyor with idle rollers. Drum is pushed by Pusher arrangement.
2. **Press:** It will be composed of Hydraulic Indexing die and Ram. The indexing die will align the drum/filter at the center of the table and the ram will compress the drum/filter.
3. **Pusher arrangement:** The drum/filter will be aligned by pushing it to the center of the press table. Also, the pusher will push the compressed drum/filter to the disposal container through the gravity rollers. Pusher shall be preferably by Pneumatic cylinder.
4. **Gravity rollers and Disposal container (overpack):** The compressed drum/filter will be moved out on the gravity rollers and collected in overpack.
5. **Exhaust system:** It will provide (10-15) air changes at the enclosed space of the press table during compression of the drum/filter.
6. **Pneumatic cylinders:** Press doors, ventilation system damper and slides shall be operated pneumatically. Compressed air at 6 bar will be available at site.
7. **Hydraulic power pack:** The Ram and Indexing die will operate hydraulically. The hydraulic power pack will provide necessary hydraulic pressure and flow to these systems.
8. **Control panel:** The control panel should provide status of sequential operations through MIMIC. A buzzer along with MMI will give alarm and display the error whenever any fault occurs and push buttons for manual operation.

A sketch of the compactor system is attached at the end.

1.2.1 Drum Compaction – Sequence of Operation

1. The system shall be designed to receive the drum, convey it to the press, compress the same to 1/5th of its original height and discharge it to a container ready for disposal.
2. After the initial loading of the drum, the entire process shall be automatic till the discharge into the container. In case, the pellet is badly damaged (and may release air activity, if dropped), it should be possible to handle the pellet using grapples for lowering the pellet into the disposal container.
3. Drum pusher arrangement pushes the drum to the centre of the table of the hydraulic press.
4. The entry door opens, allowing the drum to pass to the table of the Hydraulic Press.
5. Once the drum is pushed to the centre of the table by pusher, it retracts and the door closes. There has to be a suitable viewing arrangement like acrylic window on one side. After this ventilation damper opens, connecting the enclosure of the Hydraulic Press to the dedicated Ventilation System available.
6. The Hydraulic Press operation then starts. The entire press is enclosed by a structural enclosure.
7. Drum holding dies (one from either side) index the drum to the centre of the table, making it ready for compression. This die also has three sets of rupturing pins for piercing holes of 10 mm dia. Piercing is done to allow escape of air and liquid, if any, during compression. After indexing and piercing of drum index die will retract back. The rupturing pins shall be designed for ease in insertion and retraction.
8. The Ram then moves down to 35% of the height of the drum and compresses it. The pressing tool then retracts by 50 mm. In its second stroke it compresses the drum to 60% of its original height and then retracts by 50 mm. In its third stroke, the pressing tool compresses the drum to 80% of its original height and keeps the drum pressed for 15 seconds, to overcome any spring back.
9. During the compression cycle, if any liquid oozes out of the drum, the same is collected in a sump provided on one side of the machine through the shallow grooves provided on four sides of the table and piping from the table to sump. This will be pumped out when the level reaches maximum.
10. Once the compression cycle is completed, the Ventilation Damper will close and the entry door and the exit door will open. The actuator/ pusher will push the compressed pellet out of the enclosure onto the gravity roller conveyor. The actuator then retracts. The pellet then falls on top of the Slide Gates. Both these slide gates then simultaneously retract allowing the pellet to fall into the pellet container. The slide gates now close once again and are ready to receive the next pellet. The container is designed to take 5 pellets. Once 5 pellets are discharged into the container, it is ready to be taken to disposal area.
11. The disposal container should be provided with a manual latch.

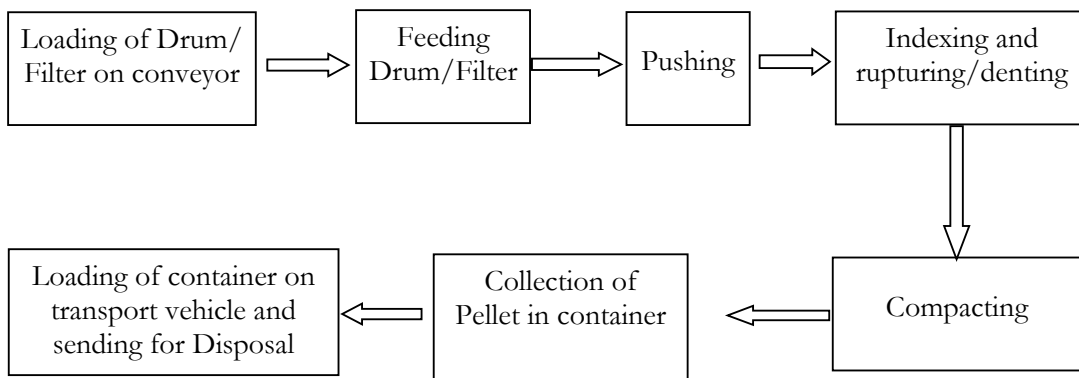
1.2.2 Filter Compaction – Sequence of Operation:

1. The system has to be designed to receive the filter, convey it to the press, compress the same to 1/5th of its original height and discharge it to a container ready for disposal.
2. After the initial loading of the filter, the entire process is automatic till the discharge into the container.
3. A feed conveyor receives the filters. From the feed conveyor actuator / pusher pushes the filter to the center of the table of the hydraulic press.
4. When the pusher starts, the entry door opens, allowing the filter to pass to the table of the hydraulic press.
5. Once the filter is pushed to the center of the table by actuator, it retracts and the door closes. There has to be a suitable viewing arrangement like acrylic window on one side. After this ventilation

damper opens, connecting the enclosure of the Hydraulic Press to the dedicated Ventilation System available.

6. The Hydraulic Press operation then starts. The entire press is enclosed by a structural enclosure.
12. Filter holding dies (one from either side) indexes the filter to the centre of the table, making it ready for compression. The holding die also has a denting arrangement fixed to it. As the filter is indexed, the sides are dented at the sides to a depth of 50 mm, to facilitate easy compaction. Denting arrangement shall be designed for ease in insertion and retraction.
7. The Ram then moves down to 50% of the height of the filter and compresses it to 50% of its height. The pressing tool then retracts by 50 mm. In its second stroke the filter is compressed to 20% of its original height. The filter is kept pressed for 15 seconds to overcome any spring back.
8. Once the compression cycle is completed, the Ventilation Damper will close and the entry door and the exit door will open. The actuator will push the compressed pellet out of the enclosure on to the gravity roller conveyor. The actuator then retracts and the hydraulic table on which this actuator is sitting, goes down to its original position, below the belt conveyor. The pellet then falls on top of the Slide Gates. Both these slide gates then simultaneously retract allowing the pellet to fall into the disposal container (overpack). The slide gates now close once again and are ready to receive the next pellet. The container shall be designed to take about 15 pellets.
9. After the container is filled to capacity, the slide gates will open to enable container to be lifted out by a crane / hoist. It will be taken and loaded on a vehicle for disposal in NSDF. A new container will be lowered for taking the next charge. The slide gates then close, ready to receive the next pellet.
10. The container is provided with a manual latch.

Block Diagram showing Sequence of Operation



2. Summary of Safety Analysis

- System should be completely automatic, however manual mode will also be provided for any emergency situation.
- Control system should be provided with programmable logic control (PLC).
- System should be equipped with man machine interface (MMI) for ease of operation with buzzer alarm.
- Mimic will be provided on the control panel to know the status of sequential operation.
- Interlocks should be provided to prevent any unsafe operation.

3. Principal Design Input

3.1 Design Basis for Drum Compaction

3.1.1 Data

- Drum Size : 600 Ø x 882 height Standard MS Drums
- Drum Volume : 200 Litres
- Drum contents: Waste consisting of paper, rubber & PVC gloves, mop etc. These materials may also contain a little oil/liquid which may ooze out during compaction.
- Maximum weight : 100 Kg.

3.1.2 Basic Requirements

- To obtain 80% reduction in height of the drums by compaction i.e. to reduce the height to 1/5th of the original height.
- Compacted drums in pelletised form are to be sent for disposal to the solid waste disposal facility.
- The entire process is to be automated to the maximum and manual handling is to be minimised.

3.1.3 Capacity of Press

| | |
|--|-------------------|
| Press capacity (Force) | 200 tons |
| Number of compaction stages | 3 |
| Cycle time for compaction cycle starting from feed to discharge of pellet to the container | Within 10 minutes |

3.1.4 Piercing Arrangement for Air Release

Three sets of 10mm dia holes should be made on two sides of the drum i.e. two sets at 50% height and one set at 90% height from the bottom. The holes will take care of air release during compaction.

3.1.5 Collection of Liquid Oozing out during Compaction

The table of the press should be provided with grooves, 25mm wide and 5mm deep on four sides which facilitate collection of any liquid.

3.2 Design Basis for Filter Compaction

3.2.1 Data

- Filter Size: 610 x 610 x 300 mm
- Specification of HEPA filter: Annexure-C enclosed
- Maximum weight: 25 Kg.
- Filters are contaminated and potentially radioactive.

3.2.2 Basic Requirements

- To obtain 80% reduction in height of the filters by compaction i.e. to reduce the height to 1/5th of the original height.
- Compacted filters in pelletised form are to be sent for disposal to the solid waste disposal facility in overpack.
- The entire process is to be automated to the maximum and manual handling is to be minimized.

3.2.3 Capacity

| | |
|-----------------------------|----------|
| Press capacity (Force) | 200 tons |
| Number of compaction stages | 2 |

| | |
|--|-------------------|
| Cycle time for compaction cycle starting from feed to discharge of pellet to the container | Within 10 minutes |
|--|-------------------|

3.3 Specification of the Compaction System

The compaction system includes following sub-systems:

| No | | Details |
|----|-----------------------------------|---|
| 1 | Conveyor System | Idle rollers |
| 2 | Door & Flap | Pneumatically operated |
| 3 | Drum/filter Pushing System | Preferably Pneumatically operated |
| 4 | Drum Indexing System and piercing | Hydraulic operated with total load capacity of 20 tons |
| 5 | Main Press | Hydraulic operated with total load capacity of 200 tons |
| 6 | Hydraulic Power Pack | Vane pump & plunger pump |
| 7 | Control System | PLC based control system equipped with MMI & mimic |

3.4 Safety Protection Systems

The following safety measures have to be adopted for the safety of the operators and machine:

- The system should be automated to extent possible to minimize the manual handling of the active drums and filters.
- The compaction of drum and filter will be carried out only in enclosed space. Interlocking should be provided in such a way that the compression will start only after closing the entry and exit doors.
- Proper off gas system with HEPA filter should be provided to take away the contaminated air developed during the compression of drum / filter in the enclosed space inside the machine. Interlocking should be provided in such a way that the compression will start only after necessary negative pressure (at least -10 mm water gauge- Necessary measurement device to be provided) is established through the ventilation system.
- Provision should be made for sampling of air (8 N.B. tapped nozzle with a needle valve) at the outlet of the compaction chamber before it goes to the ventilation system.
- The control panel will have selection option for compaction of filter and drum.
- The system should provide the following interlocks to prevent accident and consequent machine damages:
- The ram should come down only after the two indexing dies reach the home position and pusher at home position.
- The pusher should actuate only after opening the door.
- The next compaction cycle should start only after ensuring the previous compaction cycle completely ends.
- Suitable grooves on the machine table and subsequent piping should be provided to collect the liquid. A sump (at least 10 litres) should be provided to receive the liquid.
- The MIMIC should be provided on the control panel to know the status of operations. Also, there should be a buzzer alarm and display, annunciate whenever there is any fault on MMI.

- The compacted pellets will be collected in overpacks with proper lids for sending to disposal facility. Suitable mechanical arrangements should be provided for lowering the pellets into overpacks (e.g. electromagnetic for drums and grapple for filters).

4. Technical Features – Broad Guidelines

4.1 Major Parameters

| | | | |
|-----|--|---|------------------------|
| 1. | Main ram capacity (Force) (Adjustable) | : | 200 Te |
| 2. | Main ram stroke | : | 1000 mm |
| 3. | Daylight | : | 1200 mm |
| 4. | Main table size | : | 1000 x 1000 mm |
| 5. | Lateral indexing cylinder capacity (piercing) | : | 20Te – 2 Nos. |
| 6. | Lateral indexing cylinder stroke | : | 500 mm |
| 7. | Feed conveyor length | : | 1000 mm-Idle rollers |
| 8. | Drum pusher stroke | : | 3000 mm |
| 9. | Job loading height from GL | : | 500 mm |
| 10. | Job unloading height from GL | : | 500 mm |
| 11. | Maximum system pressure | : | 196 Bar |
| 12. | Cycle time | : | Within 10 minutes |
| 13. | Compactor door closing/opening | : | By pneumatic cylinders |
| 14. | Overall approx. Dimensions | | |
| | a) Total height | : | 4400 mm |
| | b) Width | : | 4400 mm |
| | c) Length | : | 8000 mm |

4.2 Desired Speeds & Drives

1. Main Cylinder :
 - a) Approach speed : 50 mm/sec
 - b) Pressing speed : 7 mm/sec
 - c) Return speed : 180 mm/sec
2. Lateral indexing Cylinder :
 - a) Forward speed : 30 mm/sec
 - b) Return speed : 80 mm/sec
3. Drum pusher :
 - a) Forward : 50 mm/sec
 - b) Return : 50 mm/sec
4. Electric motor capacity : Suitable capacity required for the duty

5. Constructional Features of Hydraulic Press

Frame: Fabricated out of M.S. plate conforming to IS: 2062 Grade B, designed by considering low deflection & low working stresses. These frames will be stress relieved to reduce internal stresses developed during fabrication. Then it shall be accurately finish machined by ensuring accuracies as per relevant standards for proper alignment of moving & mating parts when fitted.

Cylinder: Cylinder will be made out of solid drawn seamless tubes, accurately bored & honed to fine surface finish. Turcite bushes will be used for perfect guiding of ram. Cylinder will be fitted with fabric impregnated synthetic rubber seals ensuring minimum oil leakage. Wiper rings will be provided to prevent solid matters from entering into the cylinder.

Ram: M.S. Bar, finish machined to high surface finish, ground to fine surface finish and hard chrome plated ensuring hardness of 65 RC to give long life & anti-scratch properties.

Table: Table shall be made out of M.S. plate conforming to IS: 2062 Grade B and shall be finish machined.

Power Pack: The hydraulic power pack shall be designed as per relevant standards and best industry practices in the hydraulic machines to give trouble free operations.

Pump & Motor: Fixed displacement high & low pressure pumps of reputed make shall be properly selected to give the specified speeds. These pumps shall be coupled to the electric motor through a flexible chain type coupling. Accurately designed & machined brackets for pumps & motors ensuring perfect alignment between shafts shall be provided. Motor shall be of reputed make.

Manifold: Most of the valves shall be mounted on a specially designed manifold block reducing piping & thereby leakages from joints & facilitating easy maintenance.

Valves: Directional control valve, non-return valve, fixed pressure relief valve, variable pressure relief valve, unloading valve, prefill & exhaust valve, decompression valve shall be provided in the hydraulic system.

Cartridge Valve: The function of D.C. Valve, pressure relief valve, non-return valve, unloading valve etc. shall be achieved through cartridge in tandem with miniature valves ensuring

- Easy change in control & sequence of operation.
- Short switching time & consequently precise repeatability of valves.
- Smooth & trouble free working.
- Reduced oil leakage & less pressure drop in system.
- Less wear & tear.
- Interchangeability of cartridges.

Strainers: Suction strainers shall be used in suction line of the pumps to ensure entry of clean oil into the pumps.

Return Line Filter: Return line filter shall be provided to ensure filtering of circulating oil.

Oil Tank: Oil tank of adequate capacity shall be provided & containing filter cum breather, oil level indicator etc.

Oil Cooler: Air cooled / Water circulated type oil cooler of suitable capacity shall be provided to maintain the oil temperature within the safe limit. The inlet temperature of water should be around 30°C and the inlet pressure should be 2 bar. (Air cooled - oil cooler is preferable).

Control Elements: Control elements like variable pressure relief valve, pressure gauge with isolator etc. shall be mounted locally.

Hydraulic Piping: Hydraulic piping from press to power pack will be of SDSS type conforming to relevant DIN standards. Welded nipple type couplings shall be used for joining two pipes.

5.1 Controls to be provided for the Machine

Maximum system pressure: A fixed pressure relief valve shall be provided to control maximum working pressure & also for safety of the whole hydraulic system.

Working pressure adjustment: A variable pressure relief valve shall be provided to control maximum working pressure & in turn the total thrust developed by ram.

Stroke adjustment for RAM: Limit Switches shall be provided for presetting the stroke of ram.

Stroke adjustment for pusher: Limit Switches shall be provided for stroke adjustment of pusher.

Self-diagnostic system: Lamp indicators are to be provided for all the solenoids in the power pack to locate fault in the system immediately.

All limit switches and control valves shall be of reputed make approved by the Purchaser.

6. Electrical Requirements

The motor shall be sized / designed for cyclic duty of compactor system. The motor shall be 415 volts \pm 6%, 50 Hz. 3 Phase AC, energy efficient (min. IE2 class), inverter duty. The motor shall be of standard reputed make. The motor shall be provided with space heater and PTC thermistor. The motor starter shall be soft starter type. Control circuit voltage shall be 230 V AC. All necessary electrical components such as contactors, fuses, pilot lamps, push buttons, overload relays etc. supplied by the contractor shall be of reputed make and shall be mounted in dust proof control panel. Electric motor shall be protected from overloading, short circuit & single phasing. The soft starter system and its control circuit shall be provided in the dedicated electrical panel. The sizing of all the wires and cables shall be in the scope of supply. The wires inside the electrical panel shall be copper conductor with FRLS PVC insulation. All the associated cables shall be insulated with HRPVC and shall have FRLS PVC Sheath. The ammeter, voltmeter and LED indicating lamps shall be provided in the panel.

7. Control and Instrumentation (C&I) requirements:

The C&I System will be provided for monitoring, control, Alarms, interlocks and logging of the events of the system. All the signals (limit switches, Pressure Transmitters, reed/proximity switches, solenoid valves, status of motors, soft starter etc.) of compactor system will be wired to PLC and PLC will be connected to HMI. The compaction achieved shall be displayed in HMI in real time. The sensor used for the measurement of compaction will give an analogue signal (4-20 mA) calibrated in terms of linear movement of ram and should be compatible for radiation environment. The operating voltage of sensors will be 24 Volt DC and PLC will be operated at 230 Volt AC / 24 Volt DC. The PLC shall have TCP/IP over Ethernet connectivity for connecting to the Plant LAN. The sizing of PLC, HMI and control panel shall be in the scope of bidder. The PLC and HMI shall be mounted in control panel. The minimum size of HMI will be 10 inch. The bidder shall submit the data sheet of all the bought out components proposed to be used for the system. All the sensors, switches and cables inside the compactor cell shall be radiation resistant (100M Rad). There shall be provision to operate the machine in manual mode if PLC system is not available. The control system architecture of the designed system shall be submitted. All the sensors and switches provided inside the compactor cell shall be redundant. The wiring inside the control panel shall be carried out by copper conductor (min. 0.5 sqmm) with FRLS PVC insulation. ALL the components in the control panel shall be of reputed make.

Programmable Logic Controllers -PLC

The electronic circuit shall have interchangeable card system which is micro-processor based consisting of logic circuit and a solid switching circuit. The logic circuit consists of IC's (integrated circuit chips) which controls the sequence of operation. The switching circuit consists of solid state relays which will be connected to the solenoids for signaling. Logic & switching circuit shall be mounted separately. Card system shall be interchangeable minimizing the down time.

The complete sequence of operation of the compaction operation shall be preprogrammed & stored in the PLC. Variable parameters like timers & changes in PLC program shall be carried out through MMI. The minimum scan time of PLC shall be 100 milli-seconds.

8. Inspection & Testing

Contractor shall prepare fabrication drawings as per relevant codes and submit fabrication drawings for approval before starting the fabrication. Contractor shall take dimensions of site, ventilation ducting etc. and submit GA drawing and get purchaser's approval, before starting fabrication. Material test certificate for raw material shall be submitted and samples shall be tested for chemical and mechanical properties. Samples shall be collected in presence of the purchaser's representative. All the necessary tests shall be performed by the contractor at his cost.

The contractor shall provide all the services and facilities for the inspection and testing requirements covered under the scope of this specification. Inspection shall be done in presence of purchaser's representative. Minimum inspection requirements shall be met as per the specified codes. No separate claim shall be entertained for repairs. All the defects shall be rectified to the satisfaction of the purchaser at no extra cost.

Inspection by the engineer or his authorized representative shall not relieve the contractor of inspection and conformity to this specification. Engineer reserves the right to waive off any inspection requirements.

All materials procured by the contractor including welding consumables, liquid penetrant materials, etc., shall be as required by standards.

All welds shall be LP examined after root and final passes as per ASTM E 165. The LPE materials shall be as per ASTM for sulphur and halogen content.

Welder and welding operator qualification shall be as per ASME Section-IX.

- 9. Sub-contract:** Subcontracting of entire contract job is not acceptable. The supplier shall not sub contract any part of the work without a written consent from the purchaser. The supplier shall be responsible to the purchaser for all the work of sub-contractor even if allowed by purchaser.

10. Data to be submitted for approval after the Award of Contract

The contractor shall submit the following drawings and design documents for engineer's approval before proceeding with the fabrication. These drawings and design documents when approved shall form part of the contract:

Design calculation of compactor structure, Hydraulic circuit drawings, electrical power and control panel drawings, calculations for selection of various components like ram, cylinders, piping, pumps, motors etc. The fabrication drawings indicating various dimensions, typical weld details, bill of materials indicating Make of bought out components etc. shall be submitted to the purchaser for approval. Contractor shall start manufacturing of the compactor after approval of all the design and fabrication drawings, bill of materials. Only bought out components of reputed make shall be used for assembly.

The quality control plan for inspection and testing of all materials, fabrication, welding and installation shall be submitted for approval.

11. Manufacturer’s Certificate and Guarantee with Data Folder

The contractor shall maintain records of all test certificates, reports, manufacturer’s certificates, weld procedures and performance qualification and LP test records. All these shall be submitted to the purchaser. The contractor shall provide the guarantee/warranty for the compactor for a period of 18/12 months from the date of supply/commissioning against manufacturing defects and workmanship.

12. Pre-dispatch inspection

Before shipment, items shall be tested for performance. Following the same, the entire system shall be tested for the rated load. The system shall be delivered only after satisfactory compaction operation for a minimum 10 operations of drums and 10 operations of filters.

13. Work not covered

Civil work: construction of foundation and pit is not in the scope of contractor.

However, contractor shall submit the drawings for construction of foundation.

14. Quality Surveillance

The QA document shall be prepared by qualified QA personnel. The QA engineer’s credentials of the firm shall be approved by NRB. The documents like QAP, procedures; WPS, PQR and WPQ will be prepared by company QA Engineer and shall be submitted to NRB for approval.

14.1 Scope of QA engineer is to prepare the Quality Assurance Plan (QAP), Non Destructive Testing (NDT) procedures, welding procedures & qualification and other QA documents. He will also witness and review all QA activities including welding inspection, pickling etc. involved in the job right from raw material to finished product as per tender specification and QAP.

1. All NDT procedures (UT & LPT) shall be reviewed by Level-II (ASNT/ISNT/BARC) certified inspector.
2. QA professionals to be engaged by the supplier shall be professionally qualified and have adequate experience as below:

| Sr No | Person Designation | Experience & Qualification |
|-------|--|--|
| 1 | QA engineer/ Surveyor- Mechanical | 1. Experience in QA: Minimum 3 years for BE and 5 years for Diploma holders. And 2. NDT certification: Minimum Level-II in required/applicable technique from BARC/ISNT/ASNT. |
| 2 | Welding engineer/ Inspector- Welding | 1. Experience in welding inspection: Minimum 3 years for BE and 5 years for Diploma 2. Certification: Certified welding inspector (CWI) from AWS/CSWIP as applicable. |
| 3 | QA engineer- Electrical, Electronics & Control | Experience in QA: Minimum 3 years for BE(Electrical/Electronics / Instrumentation) and 5 years for Diploma(Electrical/Electronics/ Instrumentation) in similar quality assurance/ construction work. |

3. Bidder/supplier shall submit the CV of above personnel with signature of person along with the testimonials to qualify the QA staff to carry out the QA activities. A CV review and/or interview may be held to judge the candidate’s suitability for the intended work. Purchaser’s approved candidates shall only be deployed in the job.

4. Approval of selected candidate/s may be cancelled by purchasers (NRB/BARC) in case of unsatisfactory performance during the period of contract.
5. All QA activities shall be supervised & administrated by NRB. In case of any controversy/conflict in QA activities, NRB decision will be final.

15. Delivery, Loading/Unloading and Installation

The delivery period for compactor system along with all the items shall be 24 months (18 months for supply and next 6 months for installation and commissioning).

Items shall be delivered and unloaded at INRP site, Tarapur, Dist. Palghar, Maharashtra. Item shall be installed and commissioned at INRP Tarapur.

ANNEXURE-A:
(Vendor Evaluation Criteria)

1. Price Bid & Validity of the offers:

Commercial bid shall be submitted separately as per instructions of Directorate of Purchase & Stores. The offer shall be valid for minimum 120 days from opening of the tender.

A pre-bid meeting shall be arranged to explain the entire requirement in detail & to address the queries of the bidders. Bidders should nominate technical representative for the meeting. No queries shall be entertained after the pre- bid meeting.

2. General Conditions:

(a) Work should be carried out strictly conforming to the material specification as given in of this tender specification. Deviations, if any, should be clearly indicated by the supplier in their offer as per Annexure II.

(b) The bidder shall procure the items strictly as per technical specification of the item. The test certificate of such purchase items must be reviewed and certified by the purchaser (NRB) and/or its representative before the delivery of these items to bidder's stores.

(c) Post supply inspection in respect of supplies made is not permitted. Any offer containing the condition of post supply inspection will be out-rightly rejected. It is therefore, mandatory for the bidders while quoting, to indicate in clear terms the requirement of post supply inspection by any outside agency.

(d) The bidders shall provide the details in vendor evaluation pro-forma as given in Annexure-1.

(e) The supplier shall not sub contract any part of the work without a written consent from the purchaser. The supplier shall be responsible to the purchaser for all the work of sub-contractor even if allowed by purchaser.

(f) The Installation and commissioning charges shall be quoted separately.

Payment terms:

1. Payment Terms:

Following conditions are authorized for the Indian rupee contract instead of payment terms indicated in DPS-P-103.

- a) 10% Payment against milestones for completing design for which deliverable are Design Approval Procedure (DAP), Design Report (DR), Approval of design & fabrication drawing, Approval of QAP, etc. and against equivalent amount of Bank Guarantee valid till the delivery period and two months' grace time thereon.
- b) 70% Payment against supply of equipment against issue of shipping release and delivery of the equipment.
- c) Balance 20% payment alongwith 100% installation & commissioning charges will be paid after successful installation, commissioning and final acceptance of all the materials after installation and successful testing at site and submission of PBG (10% of total order value) as per installation of equipment.
- d) In case installation and commissioning is deferred due to non-availability of site for more than one year from date of full supply, the balance 20% payment will be released against submission of following documents.
 - i. Bank Guarantee towards 20% of supply cost of the equipment valid for 3 years from date of delivery of complete supply.
 - ii. An Undertaking from the Supplier that the installation & commissioning will be carried out within the quoted price & warranty and Performance Bond Bank Guarantee shall be provided as per the contract conditions.

3. Vendor Qualification Criteria:

3.1 Financial Qualification Criteria:

- a. The average annual turn-over of the firm in last three (3) financial years ending March, 2019 shall not be less than Rs. 1.56 Cr.
- b. The firm should not have incurred loss in more than two (2) years continuous, during the last five financial years ending 31st March -2019.
- c. Financial net worth of the firm should not be negative.
- d. The firm should not be under liquidation, court receivership, or similar proceedings. A self-certified statement by the firm should be furnished.

3.2 Technical Qualification Criteria:

- a. The bidder should have satisfactorily designed, manufactured & supplied at least 100 Te Capacity Hydraulic Press in the last five years.
- b. The firm should have experience in integration of hydraulic Press with PLC based control system.
- c. Performance of hydraulic press supplied by the firm in the past shall be satisfactory.
- d. The firm shall have Engineers for Mechanical design (minimum 1 no.), and manufacturing/production engineers (minimum 1 no.).
- e. The bidder shall have in-house machine shop for general as well as heavy duty machining facility.
- f. The bidder shall have minimum 50 square mtr covered and clean area for fabrication, assembly, testing of compactor. The vendor shall have material handling facility of minimum 5 Te capacity.
- g. Availability of in-house minimum 1 no. qualified welder for fabrication.
- h. The firm shall have minimum 1 no. of ASNT/ISNT or Equ. Level-II qualified person in LPT.

4. Documents Required from the Bidders:

The firm should submit the following documents as documentary proof for meeting the above requirements:

- i. List of executed jobs/orders as per Annexure-III. Technical data as per Annexure- B
- ii. Financial turnover statement for the last five years i.e. from FY 2016-17 to March 31st 2019 (refer Annexure-IV)
- iii. List of qualified & experienced key personnel as per Annexure-V.
- iv. The profile of the organization with the organization chart & the total technical/non-technical staff as per Annexure-VI.
- v. List of machining/ fabrication facilities, installation/erection capabilities, quality control/testing facilities as per Annexure-VII.
- vi. List of qualified welders, fabricators, machinist as per Annexure-VIII.
- vii. Schedule of Deviation as per Annexure- II.
- viii. Standards followed for Quality Management System.
- ix. Audited balance sheet and profit & Joss a/c for the last five years.
 - x. Statement showing the net worth of the firm.
- xi. Declaration or self-certified statement that the firm is not under liquidation, court receivership or similar proceedings.
- xii. Performance certificates from the users/ clients for similar jobs executed.
- xiii. List of testing facilities available in-house with the bidder.
- xiv. Copy of QA Plan approved by purchaser/TPI for similar orders executed in recent past.

ANNEXURE-I
VENDOR EVALUATION PROFORMA

(To be filled in and submitted along with the tender)

Reference Tender Enquiry No.

Quotation No.

1. Vendor Details:

- (a) Name
- (b) Address (Office & Works)
- (c) Contacts (Phone No., and e-mail id)
- (d) Contact Person
- (e) Details of ownership of premises (Only if not owned by company)

2. Registration Details:

Registration No.:

- (a) Small Scale Industry
- (b) Directorate of industries
- (c) Others

3. Organization Details:

- (a) Nature (proprietary, partnership, private limited, public limited, state/central government undertaking)
- (b) Top management (name, qualification and position) (c) Date of incorporation (include all details in case of sister company)

4. Performance of preceding five years with profit and loss account

- (a) Year
- (b) Capital
- (c) Turnover
- (d) Profit/loss

5. Current year performance:

- a) List the orders already executed.
- b) List the orders in hand, their value and anticipated date of completion.

6. Details of Facilities Available:

- a) Space
- b) Key departments
- c) List of machines, equipment etc. available
- d) No. and details of welding sets
- e) No. and details of qualified workers
- f) Man power available
- g) Quality control facilities available Instruments, Qualified operators
- h) Facilities available from other sources

7. Documentation: (Yes/No)

- a) Reference standards specific to tender enquiry
- b) Plant standards availability with each department duly updated
- c) Procurement of materials with emphasis on test certificates for purchaser's verification
- d) Availability of inward inspection
- e) Availability of process inspection
- f) Availability of final Inspection

ANNEXURE-II

Schedule of Deviation

1. Whether vendor fully agrees to comply with the Technical Tender Specifications: (YES/ NO)
 - 1.1 If yes, submit declaration on company letter head with official seal and signature.
 - 1.2 If not, please indicate the deviation clearly point wise and put the official seal and signature.

ANNEXUR- III

Performa for Past Experience of Similar Orders Executed

The following information should be provided in the format given below for each reference assignment for which the firm, either individually as a corporate entity or as one of the major companies within an association has been primarily responsible to render the services.

1. Description of Job:
2. Scheduled Time Period:
3. Contract Value (Rs):
4. Name of the Client:
5. Address of the Client: (with name, telephone & fax no. of contact person)
6. Start Date (Month/Year)
7. Completion Date: (Month/Year).
8. List of design codes & standards used:
9. Any other relevant information:

Important Notes:

- Bidders may use separate sheet for each job and for more technical details.
- Performance certificates from users/clients for already completed similar work shall be submitted along with the offer.

ANNEXURE-IV

Assets & Liabilities of the Firm

| Assets & Liabilities (In Rs Crores) | 2016-17 | 2017-18 | 2018-19 |
|--|---------|---------|---------|
| Total Assets | | | |
| Current Assets | | | |
| Total Liabilities | | | |
| Current Liabilities | | | |
| Profits Before Taxes | | | |
| Profits After Taxes | | | |
| Total Annual Turnover | | | |

- In case of a consortium, annual turnover of the LEAD PARTNER only will be considered.
Hence bidders shall indicate details of the lead partner only. Bidders shall also indicate details of the consortium partner separately.
- Please enclose audited balance sheet and profit & loss statement for last five years.

ANNEXURE-V

Qualification & Experience of Key Personnel

| Sl. No. | Position & total number on companies Pay-rolls | Experience | Qualification | Area of Expertise/ |
|---------|--|------------|---------------|--------------------|
| 1. | Team Leaders -Nos. | | | |
| 2. | Project Coordinator (S)/ Project Manager-Nos. | | | |
| 3. | (a) Design Engineer or Equivalent-Nos. (b) QA Managers or equivalent-Nos. | | | |
| 4. | Production Engineer or equivalent-Nos. | | | |
| 5. | Planning Engineers/QA Engineers-Nos. | | | |
| 6. | Specialist in Assembly & Testing-Nos. | | | |
| 7. | Support Staff-Nos. (Draftsman/Supervisors/Fabricators/ Welders etc.) | | | |
| 8. | Any other information | | | |

ANNEXURE- VI

Organization & Structure

Please indicate below or attach the organization chart showing the company structure including communication & responsibilities, structure of engineering group, production group, erection group (project group), finance group, QA group, and the positions of Directors & relevant key personnel (by name, educational qualification & experience), specially bring out the line of reporting

ANNEXURE-VII

List of Typical Plant & Machinery

A. Machining/Fabrication

Bidder to indicate separate lists of equipment/machinery owned by him and available with him for this project. Machinery shall be in good operating condition.

B. Erection/installation

Bidder to indicate separate lists of equipment/machinery owned by him and available to him for installation of the machine.

C. Quality Control/ Testing

Bidder to indicate separate lists of equipment/machinery owned by him for Quality control and testing. List of measuring instruments with calibration certificate to be provided.

Note: Bidders to indicate complete list of equipment for Machining/ Fabrication/ Erection, Testing and commissioning required for completing the tendered works.

ANNEXURE- VIII

List of Machinists, Qualified Welders & Fabricators

(Employed in service since last 3 years)

| SL No. | Name | Age | Qualification | Experience | | Nature of Work Handled | Previous Employment | Project Handled |
|--------|------|-----|---------------|-----------------|----------|------------------------|---------------------|-----------------|
| | | | | in Organization | Previous | | | |
| (1) | (2) | (3) | (4) | (5a) | (5b) | (6) | (7) | (8) |
| | | | | | | | | |
| | | | | | | | | |

Annexure-B: Technical Data Sheet

(Must be filled by the supplier/ bidder with the offer)

Information regarding manufacturing of "200 Te Compactor" shall be filled by the supplier/ bidder with offer.

1. Conceptual scheme sketch.
2. The specification for all components, make & catalogs shall be provided.
3. The design scheme shown in our sketch is indicative, supplier shall workout detailed design and own ideas for simpler design, compact construction and other requirement as mention in above paragraphs.
4. The bidder shall provide all information asked below and any other missing information should be clearly indicated in the tender. Additional information supporting the points as asked below may be provided on separate sheet and to be submitted along with tender. Any special features of the system offered shall be clearly specified.
5. All the dimensions shall be in Metric Units.

Technical Information to be provided by bidder: 200 Te Hydraulic Compaction System

| S. No. | Description | |
|--------|--|------------------------|
| 1 | Initial fill of oil (To be filled to full tank capacity) | Accepted/ Not Accepted |
| 2 | Spares (please mention make of the items): 1. Hydraulic Pump (high pr.) – 1 no. 2. Hydraulic Pump (low pr.) – 1 no. 3. Pr. Relief Valve – 2 nos. 4. Seals for main cylinder – 2 sets 5. Seals for indexing cylinder – 4 sets 6. Spares of NRV – 4 sets | |
| | 7. Suction strainer – 2 nos. 8. Return line filter element – 2 nos. 9. Other Seals & O rings – 1 set 10. DC valves – 1 set 11. Hoses- 1 set 12. Pressure switches- 1 set 13. MCBs – 1 set 14. Contactors – 1 set 15. PLC I/O cards – 1 set 16. Relays – 1 set 17. Limit switches – 1 set | |

| | | |
|---|--|--------------------------------------|
| | 18. Push buttons – 10 nos. 19. Indicator lamps – 10 nos. | |
| 3 | Functional trials Functional test to check the capacity and performance at Manufacturer’s premises. Inactive trials and witness of minimum 10 nos. of drums and 10 nos. of filters or till satisfactory compaction at supplier works And Inactive trials of minimum 10 nos. of drums and 10 nos. of filters or till satisfactory compaction during installation and commission at INRP, BARC, Tarapur. Drums and filters required for trials at supplier works are in the scope of Supplier. | Accepted/ Not Accepted |
| 4 | Painting a). 1 coat of epoxy primer-50 micron thick b). 2 coats of epoxy paint- 50 micron thick each | Accepted/ Not Accepted |
| 5 | Control panel PLC based, Painted by 7 tank process. | Accepted/ Not Accepted |
| 6 | Make of Bought out components. | |
| | 1. Hydraulic pumps 2. Hydraulic valves 3. Hydraulic cylinders 4. Powerpack 5. Lubrication system 6. Switches / sensors 7. Bearings 8. Gearboxes 9. Pneumatic cylinders 10. PLC 11. Contactors 12. Motor 13. Limit switches 14. Proximity switches | Please mention the make of the items |

Annexure-C
Specifications for High Efficiency Particulate Filter (HEPA Filter)

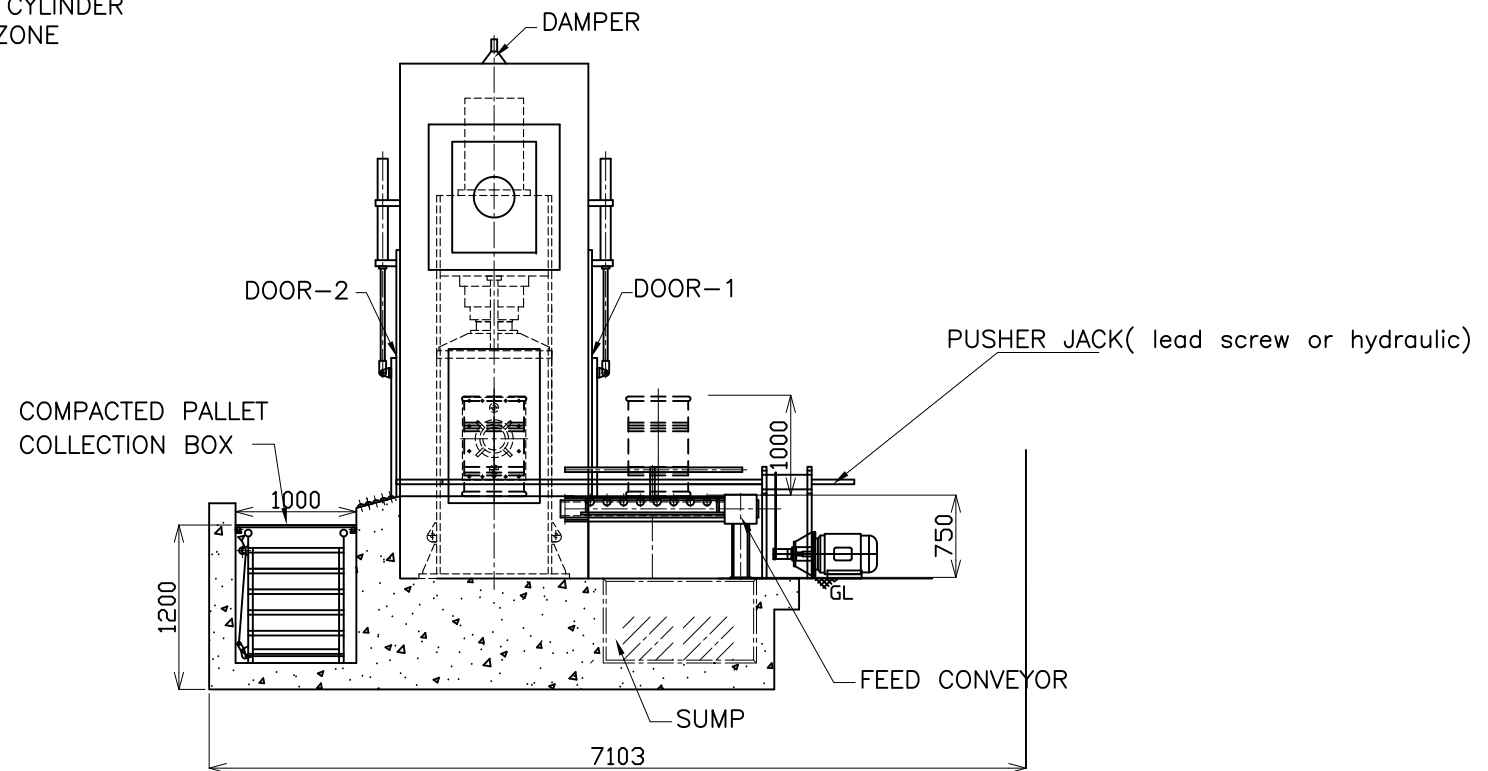
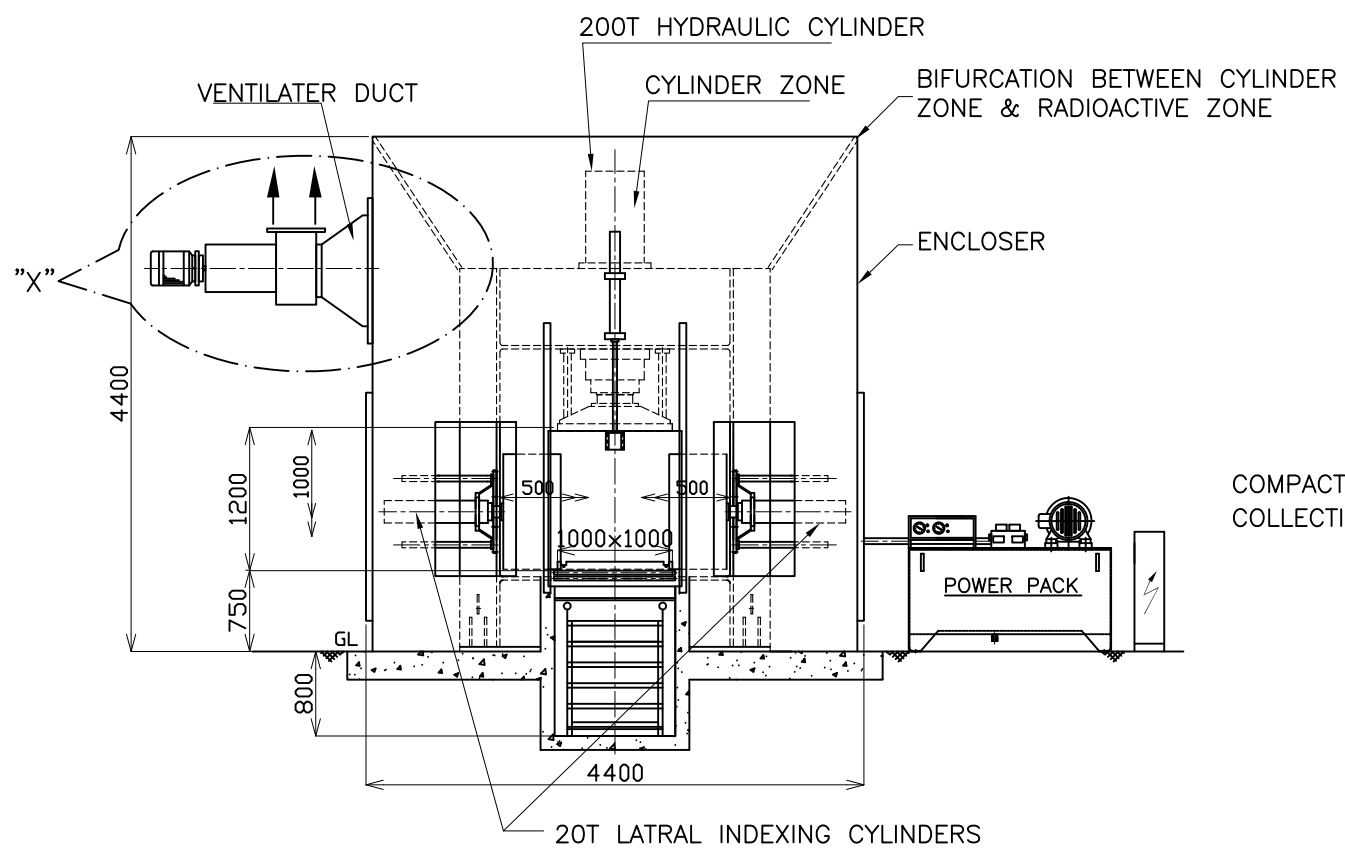
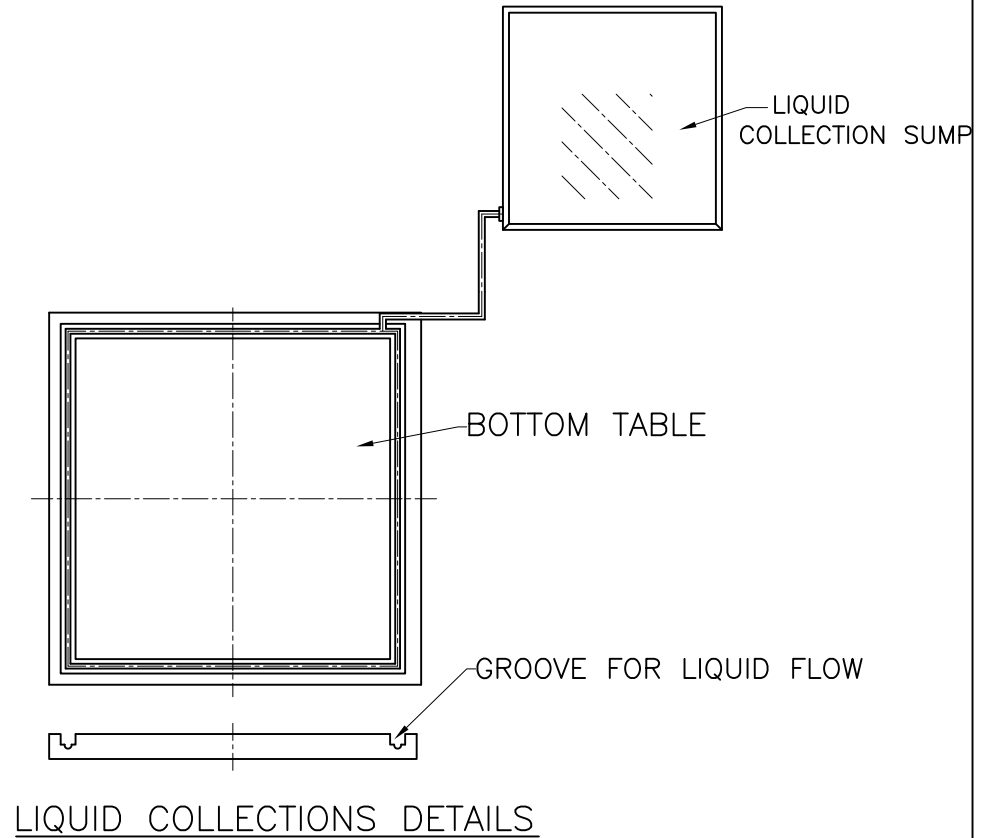
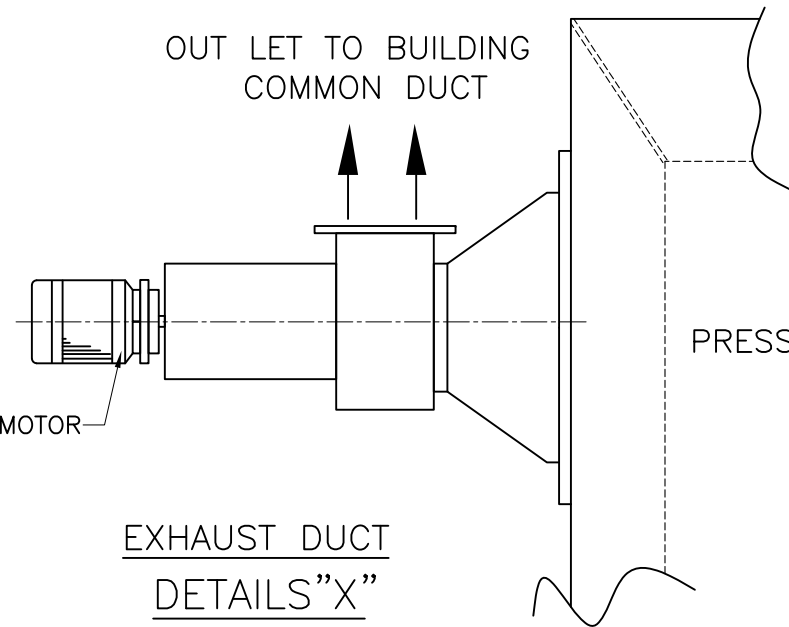
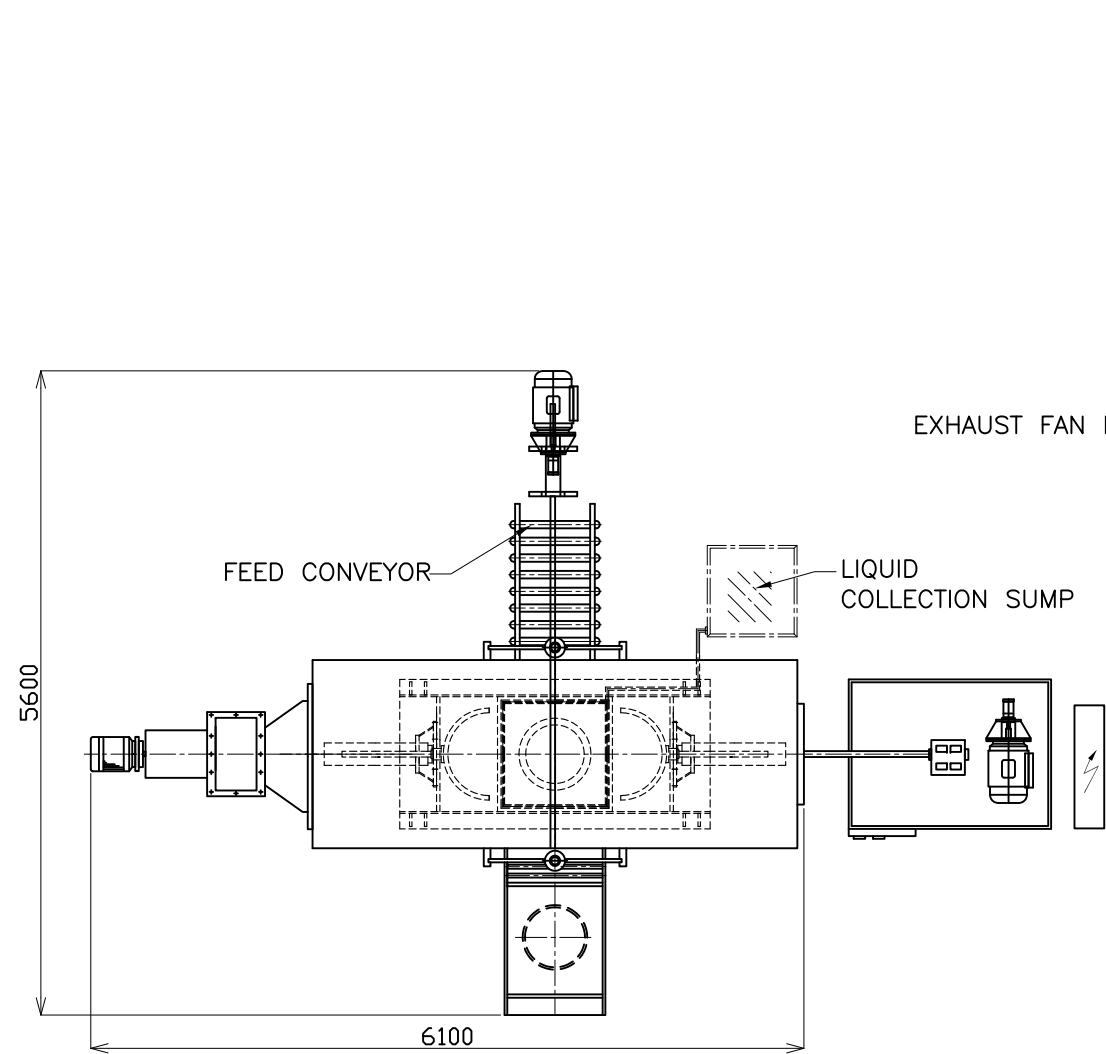
| | | |
|----------|---------------------------|---|
| 1 | Capacity | 1700 CMH |
| 2 | Overall dimensions | Face: 610mm x 610mm (+0mm, - 3.0mm) Depth: 292 mm (+1.5mm –0 mm) Excluding gasket. |
| 3 | MOC | |
| | Filter frame | CRCA carbon steel as per IS 513 of 16 SWG with one coat epoxy primer and two coats of chemical resistance epoxy paint on all exposed surfaces |
| | Filter medium | Water repellent 100% micro glass fiber (borosilicate) |
| | Separator | Corrugated aluminum foil of minimum 0.038mm thickness. |
| | Sealant | oil resistance and shall be adequate to meet the temperature and humidity conditions specified |
| | Gasket | Soft, impermeable, closed pore neoprene rubber gaskets with Shore hardness less than 5 and shall be of 6mm. |
| | Faceguard: | The filter shall be rigidly fitted with face guards on both faces |

Annexure-D

Sample QAP format for 200 Te Compactor

| S. No | Components & operation | Characteristics to be checked | Type & method of check | Acceptance norms | Format of record | Agency | |
|-------|---|---|--|--|---|--------|----------|
| | | | | | | Vendor | NRB |
| 1 | Approval of design, drawings. WPS/PQR/WPQ, QA procedures. Manufacturing procedures etc. | Design, drawings and reports/ procedures | Review and approval | As per relevant standards | Submission of drawing and Calculation sheets in printed & bounded form along with 2 soft copies in CD/DVD | P | H,R,A |
| 2 | Raw Material Receipt, Material Identification and sample collection | Material Identification with MTC and sample collection | Identification and testing of material (Chemical & Mechanical Tests) | ASME/ASTM | Material Identification Report and Sample analysis report Material test certificates | P | W,R,A |
| 3 | All Bought out items, Valves, Motors, Gear Box, etc. | Reputed make as per Technical Specification & Approved Drawings | Drawing and TTS | Related Standards | Details product specification (Hard Bounded Manuals and Catalogues with 2 soft copies in CD/DVD) | P | W,R, A |
| 4 | Welding Procedure specification welding operator performance qualification | Welding procedure Welder Performance Qualification procedures /reports | Document Visual, NDE/ Mechanical | ASME Sec IX | Document Approved. WPQ&PQR | P | W,R, A |
| 5 | Pre -final inspection | All Dimensions, Alignment, Assembly of parts, Drive Mechanism | Visual testing, (100%), Load Testing | As Per Technical specifications & Approved drawings | Inspection reports | p | H,W, R,A |
| 6 | Final Inspection | Modifications proposed in pre/ final inspections of hydraulic press, Performance of Electronic and Instrumentation Components Evaluation of acceptance criteria as per tech spec. | Visual (100%) Approved Drawings & Technical Specifications, Requirements | Pre-Final Inspection Report as per technical specifications | Inspection Reports | p | H,W, R,R |
| 7 | Packing and Forwarding | Cleaning of Equipment, Packing | Visual | Safe and as per standard engineering practice | Report and Packing List | p | R,A |
| 8 | Installation & Commissioning | Functional testing, Load testing | Visual Test | As Per Tender Technical specifications and acceptance criteria | Documents and Approved Inspection Reports | p | W,R, A |

Legends: P: Perform; H: Hold; W: Witness; R: Review; A: Approval



SKETCH OF COMPACTOR