

Annexure - I

Piping and erection works at NCCRD, IIT Madras

Description of the work

Two major piping works need to be done at NCCRD, IIT Madras for an upcoming project. Sealed tenders are invited from eligible bidders for installing of compressed air pipe lines to connect compressors and air receivers at NCCRD. Details of each works are described along with necessary drawings below.

1. Part 1: compressor piping works

The compressed air facility at NCCRD involves two 15 m³ test air receivers which store air from the existing compressors. There are 3 screw and one reciprocating compressors which deliver air at 0.4 Kg/s at 40 bars. The air from the receivers is taken to the lab and connected to each floor with 8 inchsize pipe lines.

To meet an additional requirement of 2.5 Kg/ air, we are augmenting 6 additional screw compressors to the existing system. Currently, the compressors are installed in a compressor room and the two air storage tank/ receivers are kept on the terrace of the building. In order to utilize the available space better, we are planning to keep the 6 new compressors on the terrace of the building, and as a part of this work, the existing two 15 m³ air receiver tanks (40 bar pressure rated) need to be relocated and positioned vertically on the ground. The proposed new arrangement and layout of the compressors are shown Figure 1-3.

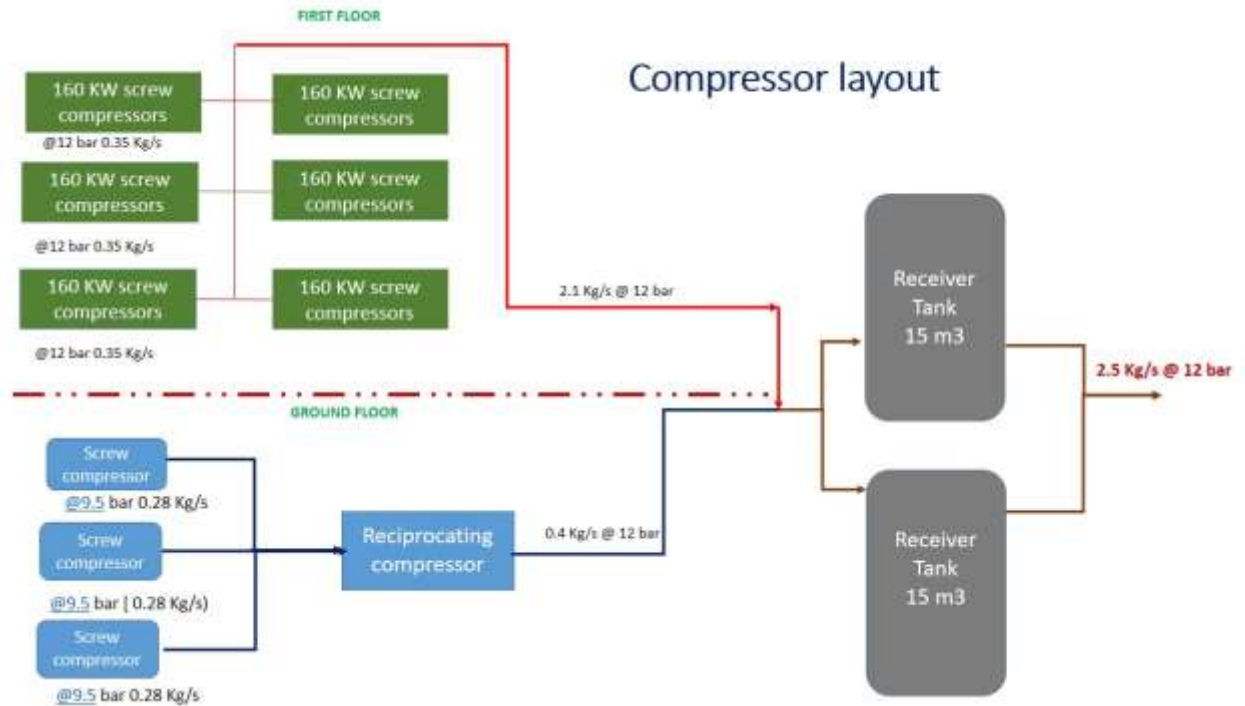


Figure 1: Proposed new compressor facility layout

Since the receivers are to be moved to the ground, the existing pipe line is to be modified to connect the compressors and receivers. In addition to this, additional piping arrangement needs to be done to connect the new compressors to the receiver. Detailed scope of work is described below.

- 1) Fabrication and erection of a pipe line assembly with supports to connect the existing compressors and air receivers.
- 2) Fabrication and erection of a pipe line assembly with supports to interconnect the new compressors and to connect the new compressor pipe line to the main supply line from the existing compressors.

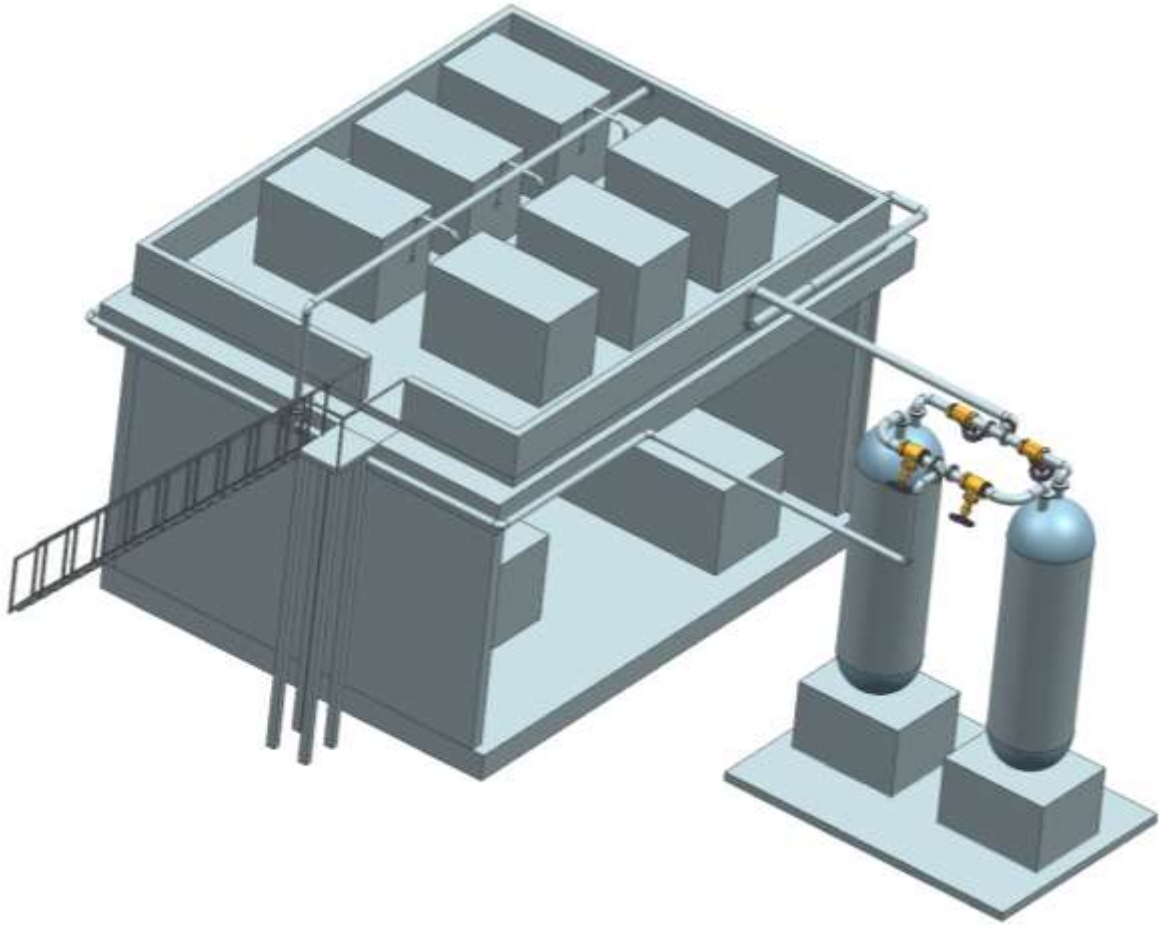


Figure 2: Proposed compressor facility along with receiver arrangement.

The new compressors need to be interconnected and a single line need to be taken to the receiver. Layout of the same is given in Figures 3 and 4. Compressors are interconnected using a 3" pipes and the main line is 6" size. Operating pressure is 12 bar and maximum flow rate is 2.1 Kg/s. A rupture disc, ball valves (BV) and non-return valves (NRV) need to be installed in this line to protect the 12 bar compressors during the 40 bar compressor line operation. Similarly, the existing compressor line also need to be modified. The existing gate valves (2 inlet and outlet) need to be converted to lotto lockable gate valves. The valve positioning and specs should be arranged as per the pre-bid meeting. An approximate bill of materials are listed in Table 1.

Table 1: Pipe line work to connect new and existing compressors to receiver

Bill of materials: new compressor piping

1. 3" ball valves – 6 no.s #300, Leader, Audco or equivalent
2. 6" ball valve – 1 no.s #300, Leader, Audco or equivalent
3. 6" end flange, #300, MS
4. Reducers 6" to 3" – #300 -6 no.s
5. Rupture disc – Limit pressure – 14 bar, Reputed make
6. Support for piping – 4" MS channel as needed
7. NRV – 6" size, 12 bar limit pressure, swing type, BS1868, API598
8. 6" seamless schedule 40 pipe - ~ 45 m
9. 6" elbows – Sch 40 C ~ 10 no.s

Bill of materials: Existing compressor piping

1. Support for piping – 4" MS channel as needed
2. 6" seamless schedule 40 pipe - ~ 10m
3. 6" elbows - ~ 5 no.s
4. Lotto lockable valve arrangement for the existing gate valves
5. 8" schedule 40 pipe line from the receiver exit to the main supply line to the lab ~ 10 m
6. Support for piping – 4" MS channel as needed

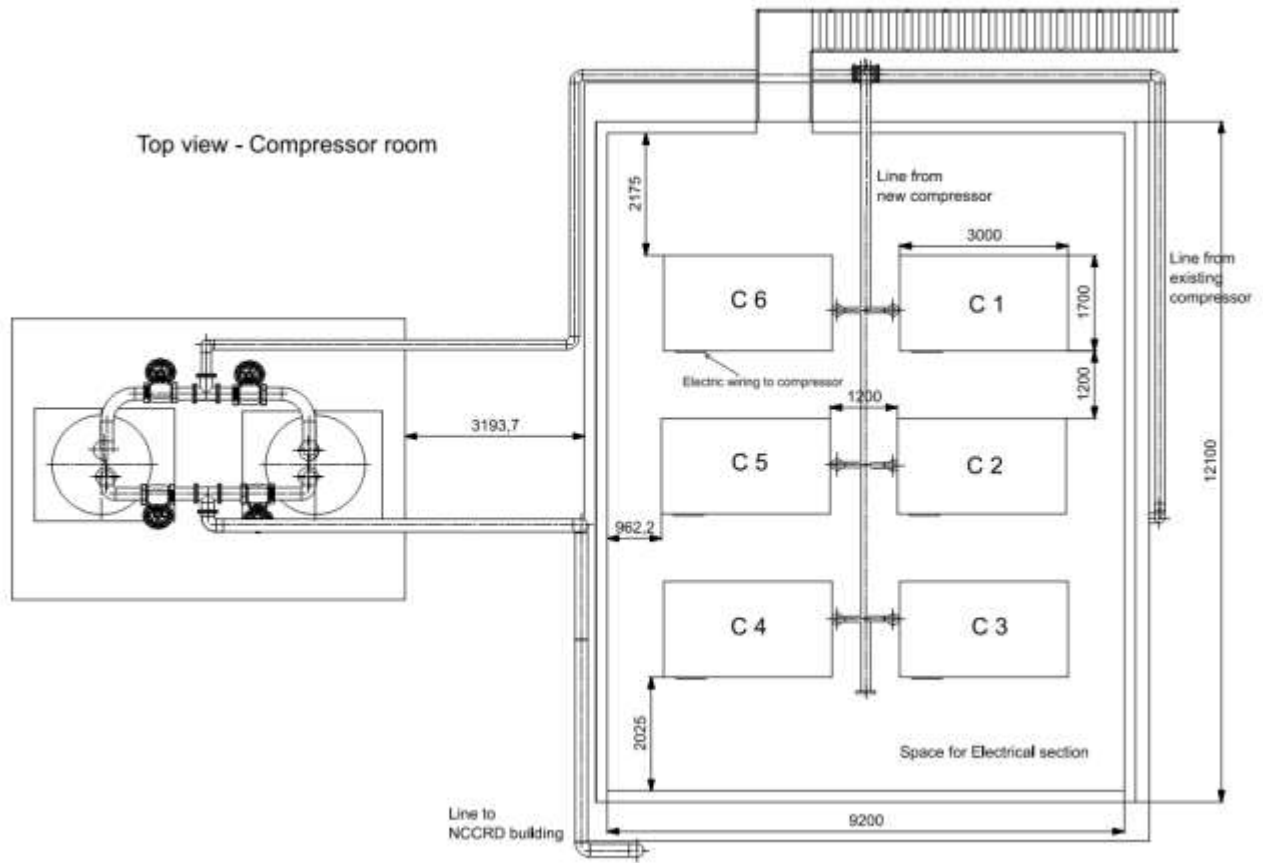


Fig. 3 Top view of the proposed new compressor facility(refer Fig 4 for pipe end connections details)

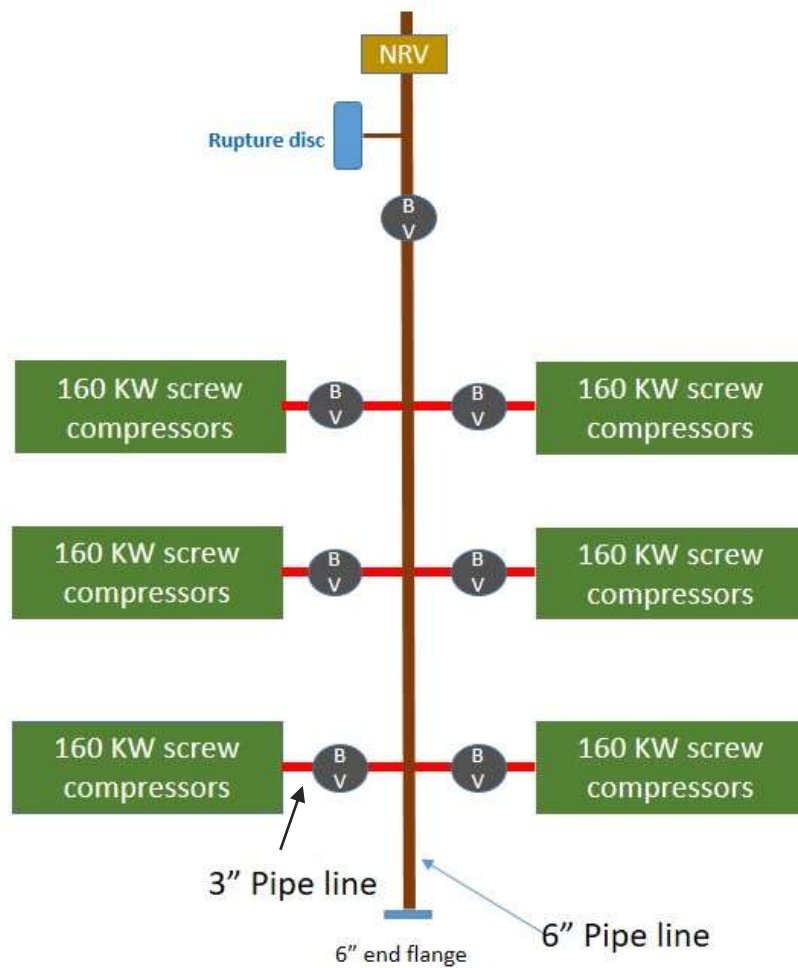


Figure 4 : New compressor arrangement.

Part 2. Piping connections to an electric air heater and from the heater to the inside lab region.

An electric heater will be installed on the terrace of the main NCCRD building. A pipe line need to be taken from the 4th floor of the building to the heater and another line need to be taken from the heater to the rig. The proposed bill of materials and scope of work are given in table 2. Top view of the piping that connects the heater and rig, is given in Figure 5.

Table 2: Air heater piping bill of materials

Works to be done		Bill of materials	Specs	Total no
Air heater piping		Inlet connections		
1		4" seamless pipe, Schedule 40	Working pressure= 40 bar	26m
2		4" bends	Working pressure= 40 bar	2
3	4" Ball valve	Working pressure= 40 bar,	1	
4	Pressure relief valve with T joint connections	12-16 bar limit pressure, 1" size MOC: carbon steel, ASME VIII	1	
5	Rupture disc with a T joint connections	14 bar, reputed make		
	Outlet connections			
6	4" seamless pipe, Schedule 80	Working pressure= 40 bar, 350 deg. C temperature,	21 m	
7	4 " bends	Working pressure= 40 bar, 350 deg. C temperature	6	
8	Omega bend, 4"	Working pressure= 16 bar, 350 deg. C temperature	1	

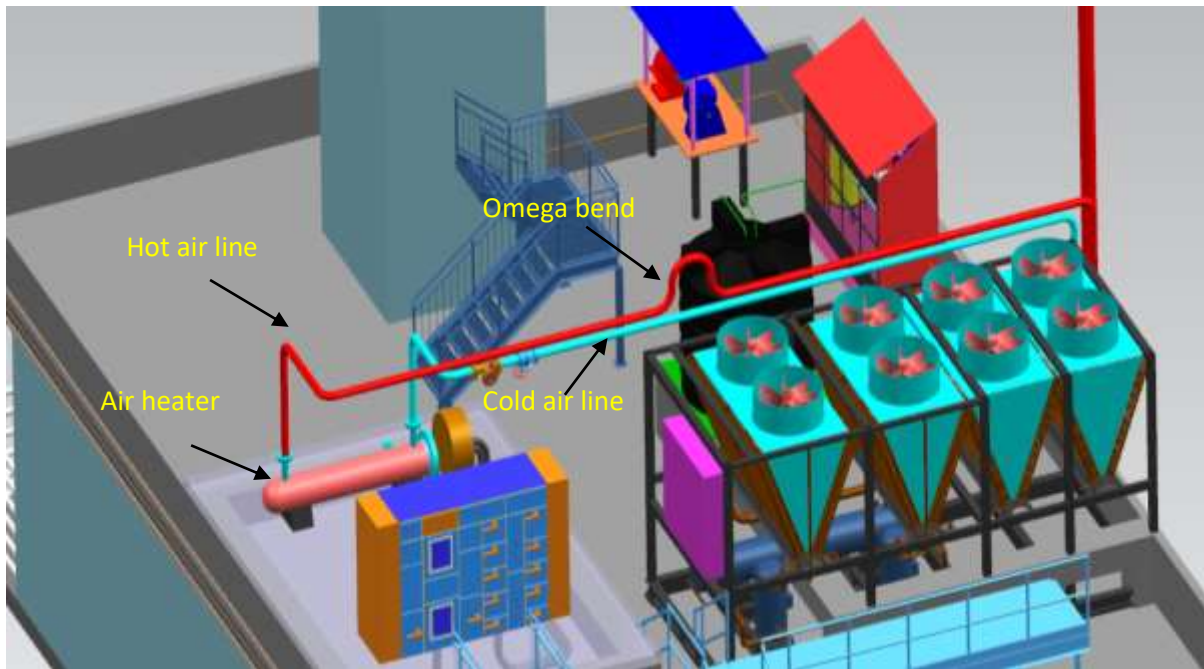


Fig. 5. Top view of the terrace of the building, showing the heater pipe line connections

Scope of work for the electrical heater piping

1. Erection of the 4” sch.40 pipe line from the 4th floor lab outlet to the air heater on the terrace
2. Hot air piping connection from the heater to the 4th floor lab window with omega bend (to allow thermal expansion)
3. Suitable support structures for the hot and cold air pipe lines for every 3 meters.

All erection works are to be estimated based on site visits and discussions. It is the vendors responsibility to assess the work/ access provisions available at terrace of the building and compressor building to layout the pipeline.

Work Specifications:

The material used and work should be of the specification given below:-

- 1) Pipes : Carbon steel seamless, Schedule- 40. Material as per ASTM A-106 Grade B. (sizes: 8”NB, 6”NB, 4”NB)
- 2) Pipe Make : Jindal/ Tata
- 3.) Pipe Fittings, bends,

- elbows. : Seamless carbon steel forged fittings as per class 300 and material as per ASTM A234 WPB
- 4.) Valves : Flanged Gate/Ball Valves, #300. MOC: Carbon steel, (ASTM A694 A216 / ASME SA694 SA216)
- 5.) Valve Make : L&T / Leader.
- 6.) Support : Support structures are to be provided.
- 7.) Painting : The entire length of the pipeline should be given 1 coat of Zinc Chromate Primer & 2 coats of Enamel as per Standard blue colour for compressor air supply lines, and the supports should be painted Black as per IS 5 standard.
- 8.) Pressure Testing : The pipelines should be pressure tested(hydrostatic)at 1.3 times of the working pressure (40 bar) for a duration of 30 minutes.
- 9.) Test Certificate : Test certificates for the pipes and fittings should be furnished by the bidder.
- 10.) Radiography : 15% of the joints selected at random by the end user should be Radiographically tested for defects by a third party.
- 11.) Welder should furnish WQR with a valid certificate along with a recent photograph.
- 12.) PMI test certificate for fittings should be provided by 3rd party.

Terms and Conditions:

1. Vendor should perform all the pipeline and receiver modifications as per the relevant ASME standards.
2. Hydrostatic testing and post weld heat treatment should be done for pipe lines, as needed.
3. Detailed specifications of all components, along with preferred makes, will be discussed during the pre-bid meeting.
4. Warranty terms:
All the components quoted in the tender bid should be covered under warranty for 3 years.
5. Warranty service must be provided on-site at IIT, Madras for duration of warranty period.
6. Vendors should provide continuous technical support and maintenance of work done. The vendor must have at least 10 years of experience in similar works as required in the tender.
7. Vendors must have sufficient experience in executing major piping and erection works in reputed organisations(end users) of value not less than Rs.30 lakhs. Experience of the vendors will also be used as a criterion for the selection of bids that meet technical requirements. List of reputed end users inclusive of educational institutions in India(at least 3) with contact details wherein similar works have

been executed should be furnished. Testimonials from the reputed organisations must be provided with the tender bid.

8.The vendor should complete all the works within two months from the date of release of PO.

9. Vendors must provide detailed documentation for the work to be done along with complete information on the makes of the hardware items, fabrication and erection standards.

10. For any technical clarifications please contact Mr.P.John George (9042301070).

11. Vendors should furnish the tender with a price split up against each of the work listed in the document.

12. Vendors should refer to the details given during the pre-bid meeting for any clarifications regarding the bill of materials or scope of work. IIT Madras will not be responsible for any lack of information in the tender documents submitted.

13. Vendor should show the pricing for each of the above items separately in the financial bid.

14. Vendors should follow all safety standards and ensure the safety of workers while carrying out the fabrication and erection works at the NCCRD site.

15. Vendor should provide a detailed work execution plan and chart (MS project/ Gantt chart) including, supply of material & work completion stages, testing, handing over and certifications.