


HVAC System Design and Description

CO₂ Capture Facility

Kårstø, Norway

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1.0 SYSTEM OVERVIEW

The function of the heating, ventilation, and air conditioning (HVAC) system is to provide temperature control, humidity control, air filtration and air movement as applicable for personnel comfort and equipment protection for the Karsto CO₂ Carbon Capture and Compression (CCC) Project Front End Engineering Design (FEED) Study. The information is intended to be general description and guidance only and is not intended to be used as operating instructions.

2.0 DESIGN BASIS

2.1 The system design is based on the criteria set forth by the following documents, standards, and recommendations:

- Fichtner - Gassnova document Exhibit E6.3 – HVAC Design and Control Philosophy (10112936-FI-B-CON-0122, Rev. 05 dated 30.05.2008). In Section 2 of this document, it is noted that the proximity to the Gassco Karsto gas terminal may introduce particular requirements to the HVAC design and control. Fichtner - Gassnova is to further define these requirements so their impact can be evaluated on the system design.
- Norwegian law and regulations, including NORSOK H-001 and NORSOK H-CR-002.
- American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)

2.2 The following areas are provided with mechanical ventilation and electric unit heaters:

- Flue gas blower building
- CO₂ compressor building areas, except the analyzer room
- Control/Workshop/Stores building (workshop & stores areas only)
- Lube oil storage building

2.3 Conditioned air will be provided for all occupied spaces and rooms containing electrical equipment as noted below:

- Control/Workshop/Stores building (control & administrative areas only)
- Electrical building
- CO₂ compressor building analyzer room
- Continuous gas monitoring system (CGMS) building

3.0 DESCRIPTION

3.1 VENTILATION AND HEATING

3.1.1 The flue gas blower buildings will be provided with wall mounted ventilation supply fans. Air is exhausted through wall mounted back draft dampers. Each

supply fan assembly consists of an inlet hood, motorized intake louver, replaceable filter (if required), differential pressure switch and thermostat. The fan is automatically cycled from the thermostat setting.

Thermostatically controlled electric unit heaters are provided to maintain the indoor temperature at 10°C during the winter.

In the event of a fire or combustible gas detection, the supply air fans automatically trip as noted in the Fire & Gas System Cause & Effect Diagram J4-JD-00002. Also, the electric unit heaters remain in their previous operating state.

3.1.2 The CO₂ compressor building will be provided with wall mounted ventilation supply fans. Air is exhausted through wall mounted back draft dampers. The air circulation will be from an upper building elevation out through the exhaust dampers located near grade. Each supply fan assembly consists of an inlet hood, motorized intake louver, replaceable filter (if required), differential pressure switch and thermostat. The fan is automatically cycled from the thermostat setting.

Thermostatically controlled electric unit heaters are provided to maintain the indoor temperature at 10°C during the winter.

In the event of a fire or combustible gas detection, the supply air fans automatically trip. Also, the electric unit heaters remain in their previous operating state. In the event of a CO₂ leak, the supply air fans continue to operate or are automatically started to aid in venting the building of CO₂. Reference the Fire & Gas System Cause & Effect Diagram J4-JD-00002.

3.1.3 The workshop and stores areas in the control/workshop/stores building will be provided with wall mounted ventilation supply fans. Air is exhausted through wall mounted back draft dampers. Each supply fan assembly consists of an inlet hood, motorized intake louver, replaceable filter (if required), differential pressure switch and thermostat. The fan is automatically cycled from the thermostat setting.

~~Thermostatically controlled electric unit heaters are provided to maintain the indoor temperature at 10°C during the winter.~~

In the event of a fire or combustible gas detection, the supply air fans automatically trip as noted in the Fire & Gas System Cause & Effect Diagram J4-JD-00002. Also, the electric unit heaters remain in their previous operating state.

3.1.4 The lube oil storage building will be provided with a wall mounted ventilation supply fan. Air is exhausted through wall mounted back draft dampers. The supply fan assembly consists of an inlet hood, motorized intake louver, replaceable filter (if required), differential pressure switch and thermostat. The fan is automatically cycled from the thermostat setting.

A thermostatically controlled electric unit heater is provided to maintain the indoor temperature at 10°C during the winter.

In the event of a fire or combustible gas detection, the supply air fan automatically trips. Reference the Fire & Gas System Cause & Effect Diagram J4-JD-00002. Also, the electric unit heater remains in its previous operating state.

3.2 HEATING, VENTILATING, AND AIR CONDITIONING

3.2.1 The control room and administrative areas of the control/workshop/stores building will be provided with 2x100% packaged HVAC units. Each unit will consist of a condensing unit, an air-handling unit, electric heater, and an intake filter assembly. The HVAC units are thermostatically controlled. The conditioned air is supplied to all of the areas through a network of ductwork, dampers, and supply diffusers/registers grills. The return air from the control room and offices is routed back to the HVAC unit through return air ductwork. Air from areas such as the locker rooms, toilets, kitchen, mechanical room, I&C shop, etc. is not included in the return air ducting back to the HVAC units. The air conditioned areas will be maintained at 25°C \pm 1.7°C & 60% relative humidity (summer) and 21°C \pm 1.7°C and 60% relative humidity (winter).

In the event of a fire, combustible gas or CO₂ gas detection, the HVAC system is automatically shutdown. Reference the Fire & Gas System Cause & Effect Diagram J4-JD-00002.

3.2.2 The electrical building will be provided with 2x100% packaged HVAC units. The HVAC units are thermostatically controlled. The air conditioned areas will be maintained at same conditions as stated in 3.2.1 above. The HVAC supply is ducted to the low and medium voltage equipment areas, UPS and battery charger area as well as the adjacent battery room. The battery room will also be provided with 2x100% exhaust fans. The entire supply air from the battery room is exhausted outside. The fans are sized to limit the hydrogen concentration below 2% by volume. A fan malfunction alarm is provided in the plant DCS.

In the event of a fire, combustible gas or CO₂ gas detection, the HVAC system is automatically shutdown. Reference the Fire & Gas System Cause & Effect Diagram J4-JD-00002.

3.2.3 The analyzer room in the CO₂ compressor building will be provided with 2x100% packaged HVAC units. The HVAC units are thermostatically controlled. The air conditioned areas will be maintained at same conditions as stated in 3.2.1 above.

In the event of a fire or combustible gas detection, the HVAC system is automatically shutdown. In the event of a CO₂ leak, the HVAC unit continues to operate or is automatically started to aid in venting the room of CO₂. Reference the Fire & Gas System Cause & Effect Diagram J4-JD-00002.

3.2.4 The continuous gas monitoring system (CGMS) building will be provided with 2x100% packaged HVAC units. The HVAC units are controlled from a local

thermostat. The air conditioned areas will be maintained at same conditions as stated in 3.2.1 above.

In the event of a fire, combustible gas or CO₂ gas detection, the CGMS building HVAC system is automatically shutdown. Reference the Fire & Gas System Cause & Effect Diagram J4-JD-00002.