


Material Preservation and Storage Philosophy

CO₂ Capture Facility

Kårstø, Norway

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Material Storage and Preservation

1.0 PURPOSE

The purpose of this document is to outline the recommended material storage and preservation philosophy.

2.0 DESCRIPTION

The Karsto CCC Project is located adjacent to the Karsto gas terminal and the combined cycle power plant (CCPP) owned and operated by Naturkraft AS. The CCC plant is owned by Gassnova SF. The CCC project's technology is based on the use of amine for the bulk removal of CO₂ from a flue gas stream by liquid chemical absorbents. The amine plant mainly consists of flue gas ducting and blowers, direct contact coolers, absorption columns, a stripper column, reboilers, reclaimers, and CO₂ compression and drying, along with other equipment such as pumps, filters, and heat exchangers.

3.0 SCOPE

This procedure addresses storage criteria for the site storage and provides maintenance practices for all permanent plant equipment and/or material.

This procedure does not include storage and maintenance requirements of permanent plant equipment and/or material prior to its arrival to the site or after its care and custody has been turned over to the Owner.

4.0 DEFINITIONS

4.1 Storage Category 1 - Outside Storage Outdoors on firm substrate, well drained, not subject to flooding; maintained to reduce growth of vegetation and to prevent the accumulation of debris; and segregated from actual construction areas and traffic. When necessary, items shall be stored on pallets or cribbing.

~~4.2 Storage Category 2 - Outside Storage, Covered Outdoors on firm substrate, well drained, not subject to flooding; maintained to reduce growth of vegetation and to prevent the accumulation of debris; stored and covered on pallets or cribbing; segregated from actual construction areas and traffic. Allowance for adequate ventilation is provided.~~

4.3 Storage Category 3 - Outside Covered with Heat
Outdoors on firm substrate, well drained, not subject to flooding; stored and covered on pallets or cribbing; segregated from actual construction areas and traffic; with heat applied to the item to prevent condensation or corrosion. Allowance for adequate ventilation is provided.

4.4 Storage Category 4 - Inside Storage

Indoors with uniform temperature control or equivalent to prevent condensation or corrosion. Heaters (if installed) connected to power source.

4.5 Storage Category 5 - Inside with Controlled Climate Indoors with controls installed to maintain temperature (including sudden temperature changes) and humidity controlled within specified limits for the items stored.

5.0 RESPONSIBILITIES

5.1 Construction Organization.

5.1.1 The Contractor's construction organization has the responsibility to receive and store material in accordance with the supplier recommendations..

5.2 Owner's Organization

5.2.1 The Owner's organization has the responsibility to receive and store material not installed in the permanent plant in accordance with the supplier recommendations, and turned over to the Owner per project requirements.

6.0 RECOMMENDATIONS FOR STORAGE OF MATERIAL AND EQUIPMENT ON SITE

6.1 Civil

Civil material such as formwork, reinforcing bar, concrete embeds, anchor bolts, and structural steel should be stored in open laydown areas on timber, pallets, or other supports, clear of the ground. Moisture-sensitive material (i.e., grout, cement) should be stored indoors in a covered warehouse. Flammable items are to be stored well away from other items. Chemicals that are dangerous when mixed must be stored separately and clearly identified with labels on containers and Material Safety Data Sheet (MSDS) copies attached to each batch of chemicals.

~~Coating materials shall be stored and handled in accordance with the manufacturer's published instructions. As a minimum, all materials shall be protected from moisture, direct sunlight, and temperatures below 40° F (5° C) or above 90° F (32° C).~~

6.2 Piping

Piping should be segregated by grade of material (i.e., carbon steel, alloy, stainless steel, or galvanized carbon steel) and stored in open laydown areas on timber or other supports, clear of the ground and sufficiently supported to avoid distortion. Pipe caps, covers, and/or polyethylene sheets should protect pipe ends. Piping material purchased specifically for ASME Section I and VIII installation shall be segregated from non-code material and shall have material traceability maintained. Pipefittings and flanges shall be protected from weather, segregated by size and stock code, and placed on pallets or in bins. Valves should have open ends covered

and should be stored in open laydown areas on pallets. Preferred practice is to store motor operated valves (MOV) indoors in a covered warehouse. Alternately, MOV may be stored outside on pallets in open laydown areas provided that open ends are covered and the valve itself is covered for protection from dirt and debris.

Stainless steel materials should be protected from contamination by carbon steel, zinc (galvanized items), lead, copper, halogens, sulfur, and chlorides. Pipe support material and prefabricated support components (i.e., springs, constant supports, pipe clamps) should be stored on pallets in open laydown areas. Instrumentation Control panels should be transported directly into the permanent facility (control room) whenever possible. However, if environmental controls are not available in the permanent facility, the control panels should be stored in dust-free and temperature-controlled environment until the permanent facility is available for panel installation.

Field transmitters, temperature elements, thermowells, pressure gauges, pressure switches, temperature gauges, temperature switches, orifice flanges, orifice plates, converter local controllers, safety relief valves (2 inch [50.8 mm] and under), tank gauges, analyzers, compression fittings, tubing, and other electrical/instrumentation materials should be stored in a covered warehouse. Venturi tubes, control valves, on-off valves, cable drums, tray, and steel support members should be stored in open laydown areas on pallets. Safety relief valves over 2 inches [50.8 mm] should be stored in an upright position with open ends covered in open laydown areas on pallets.

6.3 Electrical

Switchgear, Motor Control Centers, batteries/chargers, and panels should be transported directly into the substation or permanent facility for installation. If the permanent facility is not available, the material should be stored in a covered warehouse. Transformers should be stored in place on their permanent foundations. If the foundation is not available, the transformer should be stored in open laydown areas on timber or other supports that clear the ground. Transformers for use indoors, shall be stored indoors; unless properly packaged and maintained per manufacturers recommendations. Control stations, lighting fixtures, junction boxes, termination material, conduit fittings/hardware, and other miscellaneous material should be stored in a covered storage area.

Cables and rigid conduits should be stored in the original packing in open laydown areas clear of the ground. Hybrid and Fiber Optic Cables should be stored per manufacturers recommendations Store cable reels upright on the reel flanges unless the reels are 18 inches [500 mm] or less in diameter, or the reel weighs less than 50 pounds [22.75 kg]. Seal cable ends by using electrical tape or heat shrink caps. Cover cable stored outdoors unless marked "Sunlight resistant". Block cable reels to prevent accidental movement. If necessary, store cable on cribbing to prevent the cable from coming in contact with the ground.

6.4 Mechanical

Mechanical equipment (i.e., pressure vessels, rotating equipment, packaged units) should be stored in place on their permanent foundations. If the foundation is unavailable, the equipment, which would normally be installed outside, should be stored in laydown areas on timber or other supports with flange/opening protectors in place and clear of the ground. Equipment that would normally be installed indoors shall be stored in a covered storage area with any required environmental controls in place. Skid mounted equipment with installed electrical gear/panels should be covered by tarps, plastic, or other waterproofing/weather protection means to prevent damage to the gear.

6.5 Other

Vendor material and equipment shipped in crates or cartons should be stored as recommended by the vendor. It should not be assumed that crated material can always be stored outdoors in open laydown areas. Welding electrodes and filler material should be stored in accordance with the project welding procedures.

RECOMMENDED MINIMUM PERMANENT PLANT STORAGE CATEGORIES

MATERIAL DESCRIPTION	Category 1	Category 2	Category 3	Category 4	Category 5	Remarks
CIVIL						
Reinforcing bar	X					Bulk Material
Anchor bolts (Large bolts)	X					Bulk Material
Anchor bolts (Ram-set, Hill)				X		Bulk Material
Embeds	X					Bulk Material
Structural steel	X					Bulk Material
Paints and insulation				X		Bulk Material
Grouts				X		Bulk Material
Cements				X		Bulk Material
PIPING						
Pipe spools	X					Bulk Material
Straight run pipe-all types/sizes	X					Bulk Material
Pipe fitting 2" and smaller				X		Bulk Material
Pipe fittings > than 2"	X					Bulk Material
Valves 2" and smaller				X		Bulk Material
Valves 2-1/2" and larger	X					Bulk Material
Valves, Motor Operated				X		
Pipe supports	X					Bulk Material
Pipe supports – insulated				X		Bulk Material
Piping specialties 2" and smaller				X		Bulk Material
Piping specialties > than 2"	X					Bulk Material
Gaskets				X		Bulk Material
Bolts and studs				X		Bulk Material
INSTRUMENTATION						
Tubing, all types/sizes/material				X		Bulk Material
Tubing fittings				X		Bulk Material
Instrument and tubing valves				X		Bulk Material
Instrument supports and tray	X					Bulk Material
Instrument stands	X					Bulk Material
In-line instrumentation				X		Bulk Material
Other instrumentation				X		Bulk Material
Control valves		X				Bulk Material
Relief valves 2" [50.8mm] and smaller				X		Bulk Material
Relief valves > 2" [50.8mm]	X					Bulk Material
Electronic devices					X	Bulk Material
DCS cabinets					X	Bulk Material
PLC cabinets					X	Bulk Material

MATERIAL DESCRIPTION	Category 1	Category 2	Category 3	Category 4	Category 5	Remarks
ELECTRICAL						
Bulk fittings 3" and smaller		X				Bulk Material
Bulk fittings > 3"	X					Bulk Material
Unistrut, cable tray, and conduit	X					Bulk Material
Termination boxes and cabinets				X		Bulk Material
Power cable < 600 volts	X					Bulk Material
Power cable ≥ 600 volts	X					Bulk Material
Lighting wire, all sizes				X		Bulk Material
Instrumentation cable		X				Bulk Material
Lighting transformers				X		Bulk Material
Power transformers small dry type				X		Bulk Material
Transformers large oil-filled			X			
Switch gear				X		Bulk Material
Electronic devices					X	Bulk Material
Lighting fixtures				X		Bulk Material
UPS equipment				X		Bulk Material
Bus duct		X				Bulk Material
Capacitor banks				X		Bulk Material
MECHANICAL						
Stationary equipment	X					
Columns, vessels, drums	X					
Exchangers	X					
Rotating equip w/≤50 hp motor				X		
Rotating equip w/>50 hp motor			X			
Rotating equip – gas/diesel/steam			X			
WELDING						
Weld electrodes and filler material				X		Bulk Material

APPENDIX A

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