


Recommended Spare and Wear Parts

CO₂ Capture Facility

Kårstø, Norway

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Recommended Spare and Wear Parts

1.0 PURPOSE

The purpose of this document is to outline the Contractor's philosophy with regard to recommended spare and wear parts for the Kårstø CCC Plant.

2.0 SCOPE

This document is limited providing general recommendations and specification of types of spare parts applicable to the project. Specific recommended parts with part numbers applicable to specific equipment are not provided, but will be developed during detailed design when this information is available from the equipment/component suppliers.

3.0 DEFINITIONS

Startup / Commissioning spare parts are those that may be required at any time during equipment installation, pre-commissioning, commissioning, startup, and testing phase of project.

Operating spare parts are those required to maintain continuous operation of the supplied equipment and/or a system, and to replace those parts and components that fail due to operation. The operating spare parts shall cover the range of parts required to be on hand and available to effect highly reliable equipment operation for a period of 3 years.

Capital spare parts are those major parts and equipment components and sub-systems required to provide reliable equipment plant operation throughout the plant life and have a significant lead time for manufacture and delivery. Capital spare parts are major replacement parts or complete units or sets of equipment essential to the continuity of operations

Special Tools are all those tools, instruments, devices, Human Machine Interfaces (HMI's) or software necessary for the calibration, setup, pre-commissioning, commissioning, startup, operation or maintenance of all the equipment within the scope of his supply. Special Tools do not include those items found in a normal maintenance facility.

4.0 RESPONSIBILITIES

The contractor will provide recommend spare and wear parts lists as provided by the equipment suppliers and submit to the Owner for the Owner's consideration of warehouse stock.

The contractor will collect spare parts information and supply it to the Owner in mutually agreeable format.

The contractor will provide all necessary startup and commissioning spare parts to commission the plant through to turnover to the Owner.

The Owner will review the recommended spare parts list and proceed to purchase those that fit with the Owner's operation philosophy.

In the interest of the project, such parts procured by the Owner will be made available to the contractor, for purchase or replacement in kind by the contractor, to supplement commissioning spares availability provided by the contractor

5.0 DESCRIPTION, RECOMMENDED SPARE PARTS PHILOSOPHY

The following list is in no way intended to be comprehensive, definitive, or prescriptive with respect to spare parts. It is intended only to convey contractor's philosophy on spare parts.

| Equipment Type | Spare Parts |
|-------------------------------|---|
| Horizontal, centrifugal pumps | <p><u>Commissioning 3 sets each type</u> Spare seals, each type, where applicable Spare packing Casing gaskets Couplings, each type Case breathers, each type Oil feeders, each type</p> <p><u>Operational</u> Rebuild kits, w/ bearings, seals, gaskets – each pump Spare impellers for low allow (CS) critical service pumps (high allow/SS, not generally needed)</p> <p><u>Capital</u> Spare pump, each type</p> |

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|---|---|
| Vertical, centrifugal pumps | <p><u>Commissioning</u> 3 sets each type Spare seals, each type, where applicable Spare packing Casing gaskets Couplings, each type Grease pods</p> <p><u>Operational</u> Rebuild kits, w/ bearings, seals, gaskets - each pump Spare impellers for low allow (CS) critical service pumps (high allow/SS, not generally needed)</p> <p><u>Capital</u> Spare pump, each type</p> |
| ID Fans | <p><u>Commissioning</u> Bearing liners Bearing seals Lube oil filter elements</p> <p><u>Operational</u> Bearing liners Bearing seals Lube oil filter elements Vibration pickups</p> <p><u>Capital</u> - Case by Case Evaluation</p> |
| Compressor, multi-stage CO ₂ | <p><u>Commissioning</u> Seals, o-rings Filter elements Strainers</p> <p><u>Operational</u> Seals, o-rings Filter elements Strainers Lube oil pump Instrument, one each type Panel bulb/lenses Bearings Specialty (small) valves, one each type</p> <p><u>Capital</u> - Rotor shaft assembly Lube and charge oil pumps</p> |

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| Compressor, station, air | <u>Commissioning</u> Seals Oil filter Air filters Panel lights Fuse set Belts (as applicable) <u>Operational</u> Seals Oil filter Air filters Panel lights Fuse set Belts (as applicable) <u>Capital</u> Spare compressor |
| Heat exchangers, welded plate and frame | <u>Commissioning</u> None <u>Operational</u> Relief valve assembly <u>Capital</u> None |
| Heat exchangers, compressed stack plate and frame | <u>Commissioning</u> Plate gaskets <u>Operational</u> Plate gaskets 10% spare plates, each size Relief Valve assembly <u>Capital</u> None |
| Cartridge Filters | <u>Commissioning</u> Cover gaskets/o-ring seals set of filters End seals <u>Operational</u> Cover gaskets/o-ring seals set of filters End seals <u>Capital</u> None |

| | |
|-------------------------|---|
| Reverse Osmosis | <u>Commissioning</u> Seal set (membrane, interconnector, end cap) <u>Operational</u> Seal set (membrane, interconnector, end cap) End cap assembly, each side Set membranes (dry) <u>Capital</u> None |
| Chemical metering Pumps | <u>Commissioning</u> Repair kit w/ check valves, seals, diaphragms, relieve valves – each type pump <u>Operational</u> Repair kit w/ check valves, seals, diaphragms, relieve valves – one for each pump <u>Capital</u> Spare pump each type Spare head, each size/type |
| Duct dampers | <u>Commissioning</u> bushings contacts edge seals <u>Operational</u> bushings contacts edge seals actuation joints <u>Capital</u> None |
| Valves | <u>Commissioning</u> Valve seat seal, each type/ size Stem seals <u>Operational</u> Valve seat seal, each type/ size Stem seals valve, one each, NPT < 3" (except welded) <u>Capital</u> Valve, one each, every type |

| | |
|--------------|--|
| DCS | <p><u>Commissioning</u> Cabinet filters Complete fuse sets I/O cards</p> <p><u>Operational</u> Cabinet filters Complete fuse sets I/O cards Remote processor rack, each type Processor cards</p> <p><u>Capital</u> Case by Case</p> |
| Transformers | <p><u>Commissioning</u> Bushing sets Fan and motor set, each size Desiccant Gauges</p> <p><u>Operational</u> Bushing sets Fan and motor set, each size Desiccant Gauges</p> <p><u>Capital</u> Case by Case</p> |
| Load Centers | <p><u>Commissioning</u> Breaker and contactor each type Aux contacts Interposing relays/type Fuses - set each type</p> <p><u>Operational</u> Breaker and contactor each type Aux contacts Interposing relays/type Fuses - set each type</p> <p><u>Capital</u> Installed spare buckets, one each type</p> |

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|---------------------------------------|--|
| Electrical Panels | <u>Commissioning</u> Fuses terminal strips <u>Operational</u> Fuses terminal strips heater – each type Panel lights and bulbs Relays – each type <u>Capital</u> Case by Case |
| Motor drivers | <u>Commissioning</u> Grease fitting End seals termination blocks/bushings <u>Operational</u> Grease fitting End seals termination blocks/bushings <u>Capital</u> Case by Case |
| Fire Suppression – Chemical Detectors | <u>Commissioning</u> spray nozzle bulbs spray nozzles hose connection gaskets <u>Operational</u> spray nozzle bulbs spray nozzles hose connection gaskets spare chemical detector probe, one each type <u>Capital</u> Case by Case |

Parts List and Spare Parts Recommendation

Supplier
 Contact: _____
 Mailing Address: _____
 Phone/fax: _____
 Email Address: _____

Bechtel P.O. No. _____

| Seller Information | | | | Original Supplier Information | | | | Suppliers Recommended Operating Inventory | | | | Storage Category | | Replacement Lead Time (Wks) | | Special Inst./Remarks | |
|--------------------|-------------------|---------------------|-----------------------------|-----------------------------------|-------------------------------------|--|--|---|-----------------|------------------|------------|------------------|--------|-----------------------------|------------------|-----------------------------|-----------------------|
| Bechtel Tag # | Sellers Part Name | Sellers Part Number | Seller Assembly Drawing No. | Original Equipment MFG. Part Name | Original Equipment MFG. Part Number | Original Equipment MFG. Assembly Drawing No. | Operating and Maintenance Manual Title | Unit of Measure | Unit Price (\$) | Shelf Life (Wks) | SU / Comm. | 1 Year | 3 Year | Capital | Storage Category | Replacement Lead Time (Wks) | Special Inst./Remarks |
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Parts List and Spare Parts Recommendation - Template Completion Instructions

Seller to complete the attached Parts List and Spare Parts Recommendation Template. Data inputs shall be complete and specific as stipulated below for all equipment provided by the Seller. Columns which are not applicable shall be populated with "N/A." Entries such as "See IOM Manual" or email references are NOT acceptable and will be rejected. Any deviation from these requirements must be approved by the Project Startup Manager or Representative.

Bechtel Tag # Column - Instructions

Per equipment list and associated P&IDs, the Buyer's tag number assigned to each piece of equipment.

Seller Part Name Column - Instructions

The characters in this column will be the Seller's unique part Name for the equipment or skid. It is **REQUIRED** that the characters in this column MATCH the characters listed at line item detail on the Seller's Shippable Bill of Materials (SBOM) and Packing lists (as indicated in the Buyer's P.O.).

Sellers Part Number Column - Instructions

The characters in this column will be the Seller's unique part Number for the equipment or skid. It is **REQUIRED** that the characters in this column MATCH the characters listed at line item detail on the Seller's Shippable Bill of Materials (SBOM) and Packing lists (as indicated in the Buyer's P.O.).

Sellers Assembly Drawing No. Column - Instructions

Sellers Assembly Drawing Number for part identified.

Original Equipment MFG. Part Name Column - Instructions

Original Supplier's Part Name if it differs from the Seller's Part Name

Original Equipment MFG. Part Number Column - Instructions

Original Supplier's Part Number if it differs from the Seller's Part Number

Original Equipment MFG. Assembly Drawing No. Column - Instructions

Original Supplier's Assembly Drawing No.

Operating and Maintenance Manual Title Column - Instructions

Operating and Maintenance Manual title and reference number

Unit of Measure Column - Instructions

Unit of measure by which items/units are quantified, (e.g., foot, pound, set, kit, etc)

Unit Price Column - Instructions

Price per unit of measure in US DOLLARS open for acceptance for 1 year from execution date of Purchase Order

Shelf Life Column - Instructions

The length of time the recommended spare part (or assembly of parts, kit, etc) may be stored without becoming unsuitable for use or will require refurbishment.

Suppliers Recommended Operating Inventory Column - Instructions

SU / Commissioning - Quantity of recommended items to be available during the equipment installation, pre-commissioning, commissioning, startup and testing phase of project.
 1 Year - Quantity of recommended operating spare parts required to maintain continuous operation of the supplied equipment and/or a system, and to replace those parts and components with a life expectancy of 1 year or less.
 3 Year - Quantity of recommended operating spare parts required to maintain continuous operation of the supplied equipment and/or a system, and to replace those parts and components with a life expectancy of 3 year or less.
 Capital - Quantity of recommended major replacement parts or complete units of equipment essential to the continuity of operations

Storage Category Column – Instructions

Seller to input 1-5 for the required storage category for each piece of equipment requiring special storage maintenance.

Storage Category 1 – Outside Storage

Equipment will be stored as received. Pallets or cribbing as necessary.

Storage Category 2 - Outside Storage, Covered

Equipment will be stored outdoors as received, covered with a tarpaulin or equivalent method to prevent exposure to elements. Pallets or cribbing as necessary.

Storage Category 3 - Outside Covered with Heat

Equipment will be stored outdoors as received, covered with a tarpaulin or equivalent method to prevent exposure to elements and space heater energized to avoid condensation. Pallets or cribbing as necessary.

Storage Category 4 - Inside Storage

Equipment will be stored as received indoors. Space Heaters will be energized as required.

Storage Category 5 - Inside with Controlled Climate

Equipment will be stored as received indoors with controls to maintain temperature and humidity as specified.

Replacement Lead Time - Column Instructions

Indicated anticipated amount of time, in weeks, between the placing of an order for recommended spare parts and the receipt of the part at project location.

Special Instructions / Remarks - Column Instructions

Indicate any special instructions, or remarks as applicable.

APPENDIX B

Special Tools Recommendation List

Supplier

Contact
 Mailing Address
 Phone/fax
 Email Address

Bechtel P.O. No.

| Bechtel Tag # | Seller Part ID, Serial, Mark # | Special Tool | Unit of Measure | Unit Price (\$) | Recommended Quantity |
|---------------|--------------------------------|--------------|-----------------|-----------------|----------------------|
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Special Tools - Template Completion Instructions

Seller to complete the attached template. Data inputs shall be complete and specific as stipulated below for all equipment provided by the Seller which requires special tools. Columns which are not applicable shall be populated with "N/A." Entries such as "See IOM Manual" or email references are NOT acceptable and will be rejected. Any deviation from these requirements must be approved by the Project Startup Manager or Representative.

Bechtel Tag # Column - Instructions

Per equipment list and associated P&IDs, the Buyer's tag number assigned to each piece of equipment.

Seller Part ID, Serial, Mark # Column - Instructions

The characters in this column will be the Seller's unique identifier for the equipment or skid. It is **REQUIRED** that the characters in this column MATCH the characters listed at line item detail on the Seller's Shippable Bill of Materials (SBOM) and Packing lists (as indicated in the Buyer's P.O.). Buyer will use this number/character string to link the technical storage and maintenance requirements to the physical equipment received on the jobsite.

Special Tool Column - Instructions

Special Tools are all those tools, instruments, devices, Human Machine Interfaces (HMIs) or software necessary for the calibration, setup, pre-commissioning, commissioning, startup, operation or maintenance of all the equipment within the scope of his supply

Unit of Measure Column - Instructions

Unit of measure by which item/items are quantified, (e.g., foot, pound, set, kit, etc)

Unit Price Column - Instructions

Price per unit of measure in US DOLLARS open for acceptance for 1 year from execution date of Purchase Order

Suppliers Recommended Quantity Column - Instructions

Input the recommended quantity of the unit of measurement special tools.