ADNOC GROUP PROJECTS AND ENGINEERING

PRESERVATION AND EXPORT PACKING SPECIFICATION

Specification

APPROVED BY:

24/11/2021

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EFFECTIVE DATE:

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Abu Dhabi National Oil Company

GROUP PROJECTS & ENGINEERING / PT&CS DIRECTORATE

CUSTODIAN	Group Projects & Engineering / PT&CS
ADNOC	Specification applicable to ADNOC & ADNOC Group Companies

REVISION HISTORY

DATE	REV. NO	PREPARED BY (Designation / Initial)	REVIEWED BY (Designation / Initial)	ENDORSED BY (Designation / Initial)	ENDORSED BY (Designation / Initial)
27 Jul 21	1	Wael Al Shouly / Head of Discipline, Material Engineering 27/7/21	Hesham Elashkar / Senior Specialist, Material engineering Digitally signed by Hesham ELASHKAR DN: cn=Hesham ELASHKAR, o=ADNOC, ou=PC&TS / GP&E, email=helashkar2@adnoc.ae, c=AE Date: 2021.07.27 11:09:08 +04'00'	Najem Qambar / Head of Functions, Discipline Engineering Digitally signed by Najem A. Qambar DN: cn=Najem A. Qambar, o=ADNOC, ou=GPE, email=najemaq@adnoc.ae, c=AE Date: 2021.07.27 15:47:51 +04'00'	Ebraheem Al Romaithi / SVP-GPE 23/11/2021

Group Projects & Engineering is the owner of this specification and responsible for its custody, maintenance and periodic update.

In addition, Group Projects & Engineering is responsible for communication and distribution of any changes to this specification and its version control.

This specification will be reviewed and updated in case of any changes affecting the activities described in this specification.

INTER-RELATIONSHIPS AND STAKEHOLDERS

a. The following are inter-relationships for implementation of this specification:
   i. ADNOC Upstream and ADNOC Downstream Directorates; and
   ii. ADNOC Onshore, ADNOC Offshore, ADNOC Sour Gas, ADNOC Gas Processing. ADNOC LNG, ADNOC Refining, ADNOC Fertilisers, Borouge, Al Dhafra Petroleum, Al Yasat
b. The following are stakeholders for the purpose of this specification:
   i. ADNOC PT&CS Directorate
c. This specification has been approved by the ADNOC PT&CS is to be implemented by each ADNOC Group COMPANY included above subject to and in accordance with their Delegation of Authority and other governance-related processes in order to ensure compliance.
d. Each ADNOC Group COMPANY must establish / nominate a Technical Authority responsible for compliance with this specification.

DEFINITIONS

"**ADNOC"** means Abu Dhabi National Oil COMPANY.

"**ADNOC Group"** means ADNOC together with each COMPANY in which ADNOC, directly or indirectly, controls fifty percent (50%) or more of the share capital.

"**Approving Authority"** means the decision-making body or employee with the required authority to approve Policies & Procedures or any changes to it.

"**Business Line Directorates"** or "**BLD"** means a directorate of ADNOC which is responsible for one or more Group Companies reporting to, or operating within the same line of business as, such directorate.

"**Business Support Directorates and Functions"** or "**Non- BLD"** means all the ADNOC functions and the remaining directorates, which are not ADNOC Business Line Directorates.

"CEO" means chief executive officer.

"**Group COMPANY"** means any COMPANY within the ADNOC Group other than ADNOC.

"Specification" means this Preservation and Export Packing

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1 INTRODUCTION

1.1 Scope

The purpose of this specification is to provide adequate and reliable methods of storing new equipment, materials and spares to ensure that they are suitable for use when required for in the COMPANY projects.

Equipment and materials are preserved in order to avoid its possible deterioration and to improve the reliability of the project and to avoid costly corrective action during the Construction, Commissioning and Start Up phases. Preservation is essential in maintaining warranties on supplied equipment and vendor packages. Therefore, it is of great importance to establish a thorough Preservation plan.

This specification shall ensure that, equipment, materials and spare parts required for the project activities in the COMPANY projects are preserved and stored in the correct manner and protecting equipment, materials and spares from corrosion, mechanical damage and dirt during storage period. The scope of this specification covers minimum requirements which are to be actioned by the VENDORs, MANUFACTURER and CONTRACTOR's to protect and maintain new materials equipment and spare parts for projects in the best possible condition for installation and commissioning.

This specification is intended to supplement the preservation and domestic packaging procedures normally provided by the MANUFACTURER or VENDOR and any specific requirements outlined in the Material Requisition. If MANUFACTURER'S standard procedures for domestic packaging and export packing will provide equal or better protection than specified herein, then the same shall be submitted to COMPANY for review and approval. MANUFACTURER shall be solely responsible for the adequacy of the "Preparation for Shipment" provisions employed.

Based on this document, the CONTRACTOR /MANUFACTURER shall submit project specific preservation procedures for COMPANY approval.

1.2 Exclusion

This specification shall not apply to plant piping systems or pipeline systems for mothballing or temporary decommissioning during operation or shutdowns.

1.3 Coverage

This document covers the preservation guidelines for project equipment and material for the following:

- At MANUFACTURER's premises by VENDOR or SUB-VENDOR.
- In Transit between vendor/sub-vendor premises to Fabrication yard or site.
- At Fabrication yards in UAE or other countries and associated ports and interim storage location including barges waiting for unloading large equipment, skids, and modules.
- At Site, including Warehouse and Lay down area.
- Preservation during any shipping, transportation and delivery process involved in procurement or sourcing process.

- In-transit Scope of preservation

The following cases are envisaged as in-transit scope of preservation

- Equipment or material laid down or temporarily stored at the dispatching port, which the CONTRACTOR will ensure through vendors and logistic company that packing and initial preservation are not affected by weather during this storage period.
- Equipment or material lay down or temporarily stored at the receiving port of respective fabrication yards, which the CONTRACTOR will ensure through in-country preservation engineer for fabrication yards and logistic company that packing and initial preservation are not affected by weather during this storage period.
- Equipment or material lay down or temporarily stored at the receiving port of islands/Offshore, which the CONTRACTOR will ensure through their site preservation engineer, site construction sub-contractor and CONTRACTOR's site material controller that packing and initial preservation are not affected by weather during this storage period.
- Modules stored at dispatching ports shall be ensured by in-country preservation engineer and yard sub-contractor for its preservation and protection as well as ensuring that all wrappings and protections are intact for sail away. And similarly, when the same modules are stored at lay down area at port shall be inspected and monitored for ensuring its preservation until they are installed at foundations. After installation at respective foundations, equipment within the modules will be covered under routine preservation schedule.
- Any observations during in-transit inspection shall be recorded and closed by CONTRACTOR's materials manager in coordination with respective preservation engineer.
- Equipment packed and preserved by vendors shall be suitable for the preservation duration until the commissioning period.

1.4 Distribution, Intended Use and Regulatory Consideration

Unless otherwise authorized by ADNOC, the distribution of this specification is confined to companies forming part of the Abu Dhabi National Oil Company and to the Engineers, CONTRACTORs and MANUFACTURERS/SUPPLIERS nominated by them.

If national and/or local regulations exist, in which some of the requirements may be more stringent than in this document, the CONTRACTOR shall determine by scrutiny, which of the requirements are the more stringent and which combination of requirements will be acceptable with regards to safety, environmental, economic and legal aspects. In all cases the CONTRACTOR shall inform the COMPANY of any deviations from the requirements of this specification which are considered to be necessary in order to comply with national and/or local regulations.

1.5 Definitions and Abbreviations

1.5.1 General Definitions

Term	Definition
ADNOC	Abu Dhabi National Oil Company
CONTRACTOR	The Contractor referred in this document is the Engineering Procurement and Construction (EPC) Contractor or the Installation CONTRACTOR who shall be responsible for carrying out all works in accordance with this Specification and other requirements as per Contract.
MANUFACTURER /VENDOR	The named Manufacturer in the ADNOC/EPC Contractor Purchase Order. The term "Manufacturer" as used in this Specification includes all MANUFACTURERs and sub-suppliers of Materials/Equipment covered by this Specification.
Quality Assurance	All those planned and systematic actions (QA) necessary to ensure quality i.e. to provide adequate confidence that a product or service will be fit for its intended purpose.
Quality Manual	A Document setting out the general quality policies, procedures and practices of an organization.
Quality Plan	A document prepared by the Contractor/Vendor setting out the specific quality practices, resources and activities relevant to a particular project.
Quality Management System	The structure organization, responsibilities, activities, resources and events that together provide organized procedures and methods of implementation to ensure the capability of the organization to meet quality requirements.
TPA	Third Party Agency
May/Can	Used where alternatives are equally acceptable.
Should	Indicates a strong recommendation or preference to comply with the requirements of this document.
Shall/Must	Indicates mandatory requirement.

1.5.2 Abbreviations

Abbreviation	Description
ADNOC	Abu Dhabi National Oil Company
ITP	Inspection and Test Plan
MSDS	Manufacturer Safety Data Sheet
QA	Quality Assurance
QP	Quality Plan
QAS	Quality Assurance System
QC	Quality Control
QMS	Quality Management System
TPA	Third Party Agency
VCI	Vapour Corrosion Inhibitors
VpCI	Vapour Phase Corrosion Inhibitor
VPIs	Vapour Phase Inhibitors
VSI	Vapour Space Inhibiting

1.6 References

1.6.1 ADNOC Standard Specification and Guidelines

Designation	Title
AGES-SP-07-001	Cathodic Protection Specification
AGES-SP-07-004	Painting & Coating Specification
AGES-SP-07-002	External Pipelines Coating Specification
AGES-SP-07-006	Field Joint Coating for Line Pipe
AGES-SP-07-009	Galvanizing
AGES-SP-05-002	Centrifugal Compressors (API 617) Specification

AGES-SP-05-001	Centrifugal Pumps (API 610) Specification
AGES-SP-05-005	Gas Turbines (API 616) Specification
AGES-SP-05-003	Reciprocating Compressors Specification
AGES-SP-04-002	Control Valves Specification
AGES-SP-04-004	Emergency Shutdown & On/Off Valves Specification
AGES-SP-04-005	Emergency Shutdown (SIS) System Specification
AGES-SP-06-001	Design Criteria for Static Equipment Specification
AGES-SP-06-002	Pressure Vessel Specification
AGES-SP-06-003	Shell & Tube Heat Exchanger Specification
AGES-SP-09-003	Manual Piping & Pipeline Valves Specification

1.6.2 International Codes

Designation	Title
API Bull 5A2	Bulletin on Thread Compounds for Casing, Tubing, and Line Pipe
API 5A	Specification for Casing, Tubing and Drill Pipe
API Q1	Specification for Quality Management System Requirements for Manufacturing Organizations for the Petroleum and Natural Gas Industry
BS-1133 Section 1 to 19	Packaging Code
BS 1133 Section 6	Temporary protection of metal surfaces against corrosion (during transport and storage)
BS 1133 Section 6.1	Cleaning and Drying of Metal Surfaces
BS 1133 Section 6.2	Packaging code. Protection of metal surfaces against corrosion during transport and storage. Temporary protectives and their application
BS 7541	Specification for temporary protectives for the protection of metal surfaces against corrosion during transport and storage
BS 4800	Paint Colors for Building Purposes

BS 5383	Material Identification of Steel, Nickel Alloy and Titanium Alloy Tubes by Continuous Character Marking and Color Coding of Steel Tubes
ISO 9001	Quality Management Systems Requirements
ISO 9004	Quality Management – Quality of Organization
ISO14001	Environmental Management Systems Requirements
ISO 45001	Occupational Health and Safety Management Systems Requirements
MIL-P-116J	Military Specification: Methods of Preservation

2 DOCUMENT PRECEDENCE

The specifications and codes referred to in this specification shall, unless stated otherwise, be the latest approved issue at the time of Purchase Order placement.

It shall be the CONTRACTOR 'S responsibility to be, or to become, knowledgeable of the requirements of the referenced Codes and Standards.

The CONTRACTOR shall notify the COMPANY of any apparent conflict between this specification, the related data sheets, the Codes and Standards and any other specifications noted herein.

Resolution and/or interpretation precedence shall be obtained from the COMPANY in writing before proceeding with the design/manufacture.

In case of conflict, the order of document precedence shall be:

(a) UAE Statutory requirements;

(b) ADNOC Codes of Practice;

(c) Equipment datasheets and drawings;

(d) Project Specifications and standard drawings;

(e) Company Specifications;

(f) National/International Standards.

3 SPECIFICATION CONCESSION/DEVIATION CONTROL

Deviations from this specification are only acceptable where the MANUFACTURER has listed in his quotation the requirements he cannot, or does not wish to comply with, and the COMPANY/CONTRACTOR has accepted in writing the deviations before the order is placed.

In the absence of a list of deviations, it will be assumed that the MANUFACTURER complies fully with this specification.

Any technical deviations to the Purchase Order and its attachments including, but not limited to, the Data Sheets and Narrative Specifications shall be sought by the VENDOR only through Concession Request Format. Concession requests require CONTRACTOR'S and COMPANY'S review/approval, prior to the proposed technical changes being implemented. Technical changes implemented prior to COMPANY approval are subject to rejection.

4 QUALITY ASSURANCE/QUALITY CONTROL

Quality Management Systems shall comply with the applicable requirements of ISO 9001 and ISO 9004 with due regard to ISO 19011. The CONTRACTOR shall ensure that the VENDOR shall have in effect at all times, a QA programme, which clearly establishes the authority and responsibilities of those responsible for the quality system. Persons performing quality functions shall have sufficient and well-defined authority to enforce quality requirements that they initiate or identify and to recommend and provide solutions for quality problems and thereafter verify the effectiveness of the corrective action.

Quality System and Quality Control requirements shall be identified and included in the CONTRACTOR's purchase and subcontracting document(s). Based on these requirements the VENDOR and SUB-CONTRACTOR shall develop a QA/QC programme, which shall be submitted to the CONTRACTOR for review and approval. The VENDOR's QA/QC programme shall extend to their SUB-VENDOR's.

COMPANY/CONTRACTOR reserves the right to inspect materials and workmanship at all stages of manufacture and to witness any or all tests. COMPANY Quality authority may engage Third Party Inspectors to witness critical activities as per and ITP and/or Quality Plan. Moreover, they will conduct surveillance visits to verify compliance.

5 TECHNICAL REQUIREMENTS

5.1 Packing & Preservation on Shipment

5.1.1 Packing requirements

1. All MANUFACTURER`s must pack securely for sea, air or land shipment to ADNOC as called for in the purchase order.

2. Packing and preservation to materials and equipment shall withstand the following prevailing climatic conditions during the storage period at project site and also suitable for transit time:

    a. Temperature 9°C to 60°C (Black Bulb 85°C)

    b. Humidity - 5% to 100%.

c. Rainfall - Negligible but can be heavy for short periods.

d. Salt and dust laden atmosphere.

3. CONTRACTOR shall provide preservation and submit their procedure for defined short, medium, and long term periods as following:

   a. Short Term: 6 to 12 months

   b. Medium Term: Minimum two (2) years with an objective of five (5) years

   c. Long Term: More than five (5) years

Note: Minimum preservation period shall be 6 months

4. MANUFACTURER's must advise on any precautions needed to maintain the packaging in good condition for the required period.
5. Fragile articles shall be adequately packed with special packing material depending upon type of articles.
6. The extent of packing/protection shall not be limited by the specified requirements.
7. All delicate surfaces on equipment/material shall be carefully protected and painted with protective paint compound and wrapped to prevent rusting and damage.
8. All mechanical and electrical equipment and other heavy articles shall be securely fastened to the bottom of the case and shall be blocked and braced to prevent movement.
9. All valve sizes are required to be packed in stout wooden cases.
10. All threaded fittings and pipes shall be properly bundled/crated.
11. Pipes/tubes made of stainless steel, Cu/Ni, and CRAs etc., shall be packed in closed wooden cases.
12. Attachments to and spare parts for equipment and all small pieces shall be packed separately in wooden cases with adequate protection inside the case and wherever possible should be sent along with the main equipment. Each item shall be tagged/labelled with Equipment Number and Part Number to identify with the main equipment in accordance with sub-section 8.2 and Appendix - B.
13. All protrusions shall be suitably protected and openings shall be blocked suitably with bolted wooden or sheet metal covers.
14. Wherever required equipment/materials shall be packed in polyethylene bags and silica gel or similar desiccant shall be put inside the bags to protect them.
15. The material designated for onshore and the material designated for offshore/Island shall be packed separately and properly marked as indicated in accordance with sub-section 8.2 Appendix-B.

16. Separate detailed packing list in waterproof envelopes shall be inserted in each package together with equipment/materials. One copy of detailed packing list shall be fastened outside the package in waterproof envelope.
17. Vendor shall be held liable for all damages to goods due to defective or insufficient packing as well as for corrosion due to insufficient protection.
18. Packing shall be inspected before acceptance for shipment by a third party inspection organization or by ADNOC representative.

5.1.2 Identification and Marking of Materials & Equipment

The requirements of *Appendix-B* shall be strictly applied to ensure easy identification of material on arrival at site.

5.1.3 Preservation Requirements

Material or equipment from vendors often must be stored before it is put in use. Consideration should also be given to atmospheric conditions and the length of storage time. The preservation of new materials is directly controlled by the following factors:

1. Effective delivery scheduling of new equipment can reduce or eliminate the need for storage protection. When equipment is stored over long periods, regular inspections must be scheduled to assure protection has not deteriorated.

2. Some protective measures may be provided by the vendor before shipment. It may be advisable to specify the protection required in the purchase order. Cost and available facilities usually determine where protection should be applied. If protection must be removed for receiving inspection, final protection must be provided at the plant site.

3. Acceptable oil-resistant, water-resistant and pressure sensitive tapes these tapes have less than 250 ppm chloride content (not applicable to stainless steels)

4. In consideration of the fact that the material protection is subject to many variables, site/ stores individual circumstances must be considered and additional measures shall be taken where necessary. It is therefore recommended to check the integrity of the protection after the arrival of the equipment/materials on site and whether any changes have occurred in the duration, location or conditions for storage

5. The desiccant bags shall be kept inside the aluminum foil or outside plastic wrap to control the humidity and are provided with humidity indicators in steps of 30%, 40% & 50%.

6. The monitoring frequency shall be submitted along with the preservation procedure based on manufacturer recommendations. The equipment shall be physically inspected for rust marks or any other deterioration which is suitably attended to, before applying preservatives.

7. Preservation procedures shall be prepared for each category of components duly involving Quality Assurance based on manufacturer's recommendations and supplier of preservative products recommendations where possible. All preservation work shall be carried out as per these procedures only, based on their recommendations and this specification requirements, as applicable.

8. Case files for each equipment boxes/containers shall be opened, which contain all details of incoming inspection, a copy of preservation procedure, status of equipment at each inspection, frequency of inspection, the date of next inspection and the action taken report.

5.1.4 Methods of Preservation

Equipment and Materials shall be protected as described herein, these items include but are not limited to the following:

5.1.4.1 Exterior Protection

A. Cocooning:

Cocooning is the envelopment of equipment in a single plastic coating. The coating is applied by spraying either directly onto the equipment body or onto a special wrapping of paper or wire netting. Before cocooning, the equipment shall be carefully cleaned of grease and dust, and then dried. Cocooning should conform to the equipment Manufacturer's recommendations. Where possible, the envelope should be pressurized by inert gas (small overpressure).

B. Painting:

Routine maintenance painting programs for external protection should be continued.

C. Coating:

VCI for temporary protectives suitable for the bright-finished moving parts of mechanical equipment. Storage under cover is preferred. Before application, surfaces shall be thoroughly cleaned and dried.

D. Wrapping:

Wrapping with waterproof paper or VCI paper. However, the equipment protected in this way should be stored under cover.

5.1.4.2 Interior Protection

A. Oil Mist/ coating:

Internal oil coating of stationary equipment may be carried out by spraying or, if the foundation is strong enough, by filling and subsequent draining. Use can be made of VCI Class III or of a light oil of medium viscosity (approximately 35 mPa.s at 38°C) to form a protective film on the surface.

B. Filling:

Often one of the factors limiting the filling of process and storage equipment is the strength of the foundation. Adequate measures shall be taken to allow for expansion of the filling fluid, which can be a gas oil or inhibited fresh water (or inert gas, see below).

C. VPCI/ VPI/ VCI/VSI:

Can be used advantageously for the internal protection of engines, bearings, turbines, heat exchangers, pipes, drums, small tanks and like equipment. Care should be taken to ensure that no pockets of water are present and that the piece of equipment to be protected is dry and properly closed off from the atmosphere. Refer to Appendix A2 for details of each type.

D. Dry inert gas filling:

All hermetically closed equipment may be protected by drying the air or displacing it by an inert gas, e.g. nitrogen, and maintaining a slight positive internal pressure. This pressure is not necessary if a desiccant is present or a vapour phase inhibitor is used.

E. Desiccants:

Drying agents, such as silica gel, can be used inside closed equipment. The desiccant should be placed in a suitable container and periodically renewed. It shall not be used in combination with VCI.

F. Electric heating:

The following methods of electric heating may be considered:

a. Fan heaters; for space heating, e.g. sub-stations, control rooms, basements.
b. Warm air (strip heating, electric trace heating or lamp bulbs); for equipment which is cocooned or otherwise enclosed.
c. Anti-condensation heaters for electrical equipment

5.2 External and Internal Metal Surfaces Preservation

In case it is impractical to seal off equipment from the atmosphere by wrapping or boxing, the unpainted surfaces, if any, shall be protected as follows:

a) External non-painted surfaces, except air cooler finned tubing, including bolting and flange faces, shall be thoroughly cleaned and given a coating of a P-1 preservative (Refer to Appendix - A1)

b) Exposed shafts and shaft couplings shall be coated with a P-1 preservative and wrapped with waterproof moldable cloth, then sealed entirely with waterproof, cloth-backed duct tape. The shafts shall be free to rotate.

c) Oil lubricated pump bearing housings, equipment cases, stuffing boxes and gearboxes shall be fogged and filled 10 to 50 percent of the internal volume with VSI circulating oil. Subsequently, all openings shall be tightly sealed.

Below are highlights of protection requirements. Refer to Purchase Order and relevant material specification for detailed preservation requirements

5.2.1 Casing & and Tubing – Oil Well (Alloy steel):

Threads shall be cleaned and coated with suitable lubricant conforming to API Bull 5A2 and both ends of the pipe shall be protected with thread protectors in accordance with API Spec 5A. An external mill coating

in accordance with API Spec 5A clause 11.9 is to be applied over the full length of the pipe and couplings. Coating requirements for storage /long term storage shall be as required in ADNOC Specification for Casing and Tubing and the Purchase order.

5.2.2 Pipes / Spools Carbon Steel, Low Alloy Steel and Stainless Steel Material

During the loading, unloading and stacking operations, the pipes and/or spools shall be handled in a manner that prevents damages (such as cuts, cracks, bends, buckles, etc.) to the pipe-walls, beveled ends, and to the coating (including internal coatings, if applied).

Pipe shall not be placed directly on the ground but shall lay or be stacked on a flat surface, free of protrusions, assuring full uniform bearing for the pipe length, or shall be provided with suitable bearing strips equally spaced to avoid pipe bending/deformation. Separate stacks shall be prepared, in order to divide material by different diameter, thickness and grade. Each stack shall not be higher than 2 meters.

a. All shop fabricated and field prefabricated piping spools requiring storage at the pipe spool storage area shall be prepared as follows:
b. Spools to be finish painted except for weld areas
c. To be fitted with end caps and flange blanks
d. Flanges for shop fabricated piping shall be protected over the entire gasket surface with metal hardboard or wood securely attached, after applying and or renewing rust preventive agent on the flange coupling surface.
e. Rust preventive or grease must not be used on pre-cleaned pipe spools.
f. All fabricated piping materials shall be stored such that are not in contact with the ground.
g. Threaded ends shall be protected with grease and fitted with metal, wood, or plastic caps.
h. All weld preparations and threaded connections shall be cleaned and plugged or capped with metal or plastic protectors. Protector edges shall be sealed with waterproof, cloth-backed tape.
i. All unpainted carbon steel extended surfaces shall be completely coated with a P2 preservative (Refer to Appendix - A1)

For stainless steel pipes of 50 mm (2") NPS and smaller shall be wrapped with polythene and sealed. A small quantity of vapor phase inhibitor shall be placed inside the pipe prior to wrapping. However, pipes above 50 mm (2") NPS shall be externally primed as follows:

a. Prior to priming the pipe shall be cleaned. Completely remove all oil and grease by wiping down with white spirit. Wash down with water containing less than 30 ppm chloride to remove all salt and dirt deposition. Thoroughly abrade with coarse abrasive paper and completely remove all residues.
b. Apply one coat of primer, or equivalent, to minimum dry film thickness 50 microns.

c. A small quantity of vapor phase inhibitor shall be placed inside the pipe and the pipe ends shall be capped.

5.2.3 Pipes Fittings Carbon Steel, Low Alloy Steel and Stainless Steel

Pipe fittings shall be packed in totally enclosed wooden boxes lined with Kraft paper impregnated with VCI. The Kraft paper liner shall have a waterproof backing.

For carbon and low alloy steel forged-screwed and socket weld fittings shall be coated with a soft film grease or oil film protective whereas for forged - butt welding fittings shall be coated internally and externally with anti-corrosion varnish or bitumen enamel.

For stainless steel Pipe fittings 50 mm (2") NPS and smaller shall be sprayed or dipped in a light non-drying temporary protective coating and sealed in polythene bags to which has been added a vapor phase inhibitor.

Fittings above 50 mm (2") NPS Shall be protected as detailed in this Specification. Where it proves to be impractical to seal internals from the environment, those surfaces shall be coated with a hard film temporary protective.

5.2.4 Flanges

All flanges' facing and other machined surfaces shall be clean, coated with a P1 preservative (Refer to Appendix - A1) and protected by securely fastened metal covers to prevent damage during shipment. Metal covers shall be a minimum of 6 mm thick and installed with a rubber gasket, using full diameter bolts. The number of bolts used shall not be less than 50 percent of the flange bolt holes (minimum of 4).

Loose flanges shall be bolted face to face with a suitable gasket and securely fastened to a skid. Flange edges shall be sealed with waterproof, cloth-backed tape. Do not use duct tape or other adhesive tape for gaskets or flange face protection.

Flanges shall be stacked in the form of a pyramid, with a height of about 1 m. They shall be coupled in pairs, separated by discs made of soft material (cardboard, strips of soft wood, etc.) in order to protect the resting surfaces of the gaskets. They must be kept above the ground on wooden planks.

Flanges shall be protected with grease or other suitable preservative agent, over the entire gasket surface. Ring joint grooves shall be filled with grease.

5.2.5 Valves

Each valve shall be thoroughly cleaned and dried out and the internals sprayed with a light protective oil such as Lanolin, VCI or similar. Ends to be blanked off to prevent the ingress of dirt and moisture. Install inlet and outlet flange face protectors (plastic or metal) for flanged valves and plugs or end protectors for screwed or weld end valves.

The flange faces shall be adequately coated and a stout waterproof paper disc giving full face protection shall be applied to each flange. The area surrounding the raised face shall be covered with a 1.6 mm thick annular CAF gasket, and the valve connections finally blanked off by means of approved moisture resistant discs, preferably of moulded composition or 3.2 mm thick hardboard, each securely bolted on with four bolts, or by moulded plastic caps secured by steel strapping.

All bright external parts shall be thoroughly coated with Type TP4 to BS 1133 or similar soft film grease; the valve bodies shall be painted with one coat of an approved red primer.

Control valve linkages, positioner arms etc. must be greased and petrolatum taped where possible.

Gland packing, after test the gland packing shall remain in the valves. Gland packing shall be of a general purpose type embracing a suitable corrosion inhibitor.

Valves shall have the glands and spindles shrouded by a wrapping of petrolatum tape around the valve yoke.

All valves shall be tagged to indicate the type of packing fitted. Each valve shall be tag marked with the Order, Item and Vocabulary Number where applicable. Tags shall be of indestructible materials, and indelibly marked with the above details.

Coat exposed operating parts, including valve stems, with a P2 preservative Refer to Appendix - A1).

All valve handles/operators shall be protected by suitable crating/boxing

5.2.6 Bolting

All bolts, nuts and stud bolts shall be immersed in an oil film protective and packed in carboard cartons.

5.2.7 Gaskets

All gaskets shall be coated with a soft film grease and wrapped in grease resistant paper.

5.2.8 Non-Metallic, Rubber and Internally /External Coated Pipes

Glass Reinforced Fiber (GRF)/ Fusion Bonded Epoxy (FBE) coated pipes shall be stored separately and not stacked directly against each other at any time during storage. They shall be separated by full encirclement non compressible rubber pads or equivalent, at least 10 mm thick. Additional separation pads shall be used if required to keep the GRF/FBE coated pipes from touching each other.

Two pads shall be located from 1 to 3 m from each end of the pipe. Others pads shall be placed to support the center section of the pipe. In any case, distance from one pad to the next one shall be ~ 5 meters. The separation pads shall be attached by some mechanical means that ensures they will stay in place.

PVC/RTRP (Reinforced Thermostatic Resin Plastic) pipes shall be adequately supported, and the supports shall be spaced in order to avoid bending and damage to pipe coating.

Rubber items shall be coated with French Chalk or similar and packed in airtight containers. Plastic and Rubber Direct sunlight, heat and weathering will cause deterioration of most plastic and rubber based materials, and shielding is thus required. Rubber-lined equipment shall also be protected against exposure to direct heat or radiation by the sun, by shielding or covering.

Care shall be exercised in applying petroleum base preservatives so that nonmetallic parts are not coated because of the possible damaging effect on such items. Petroleum base preservatives shall not be applied to the following:

a) Items fabricated from textiles, plastics, mica, rubber, cork, paper, leather and leather products.

b) Electrical and electronic parts and equipment such as electrical connectors, condensers, distributor rotors, circuit breakers, fuses, switches, resistors and rectifiers.

c) Items which would suffer damage to mechanism or structure or where malfunction or unsafe operational conditions would result due to application or removal of the preservative compound.

Internally coated pipes shall be handled from the outside surface only. Lined and coated pipes and fittings shall be handled with wide fabric or rubber-covered slings of a size appropriate for the weight to be lifted, or with hooks at the ends. The padding shall be of used cloth or hemp belts.

Coated pipe shall not be rolled or dragged on the ground. Such pipes shall be placed at a minimum of 150 mm above ground on a wooden spacer planks or sand bags wide enough to avoid damaging the coating.

5.2.9 Vessels and Heat Exchangers

After completion of all testing and inspection, the inside of complete equipment shall be thoroughly drained and dried out. This shall only apply to shop fabricated vessels and heat exchangers.

Equipment shall be completely dried by passing hot air for sufficient time until no further increase in relative humidity of outgoing air is observed. Dry out shall be done simultaneously on both sides of heat exchangers.

After drying, the equipment shall be purged and filled with dry N_2 at 0.25 barg. The equipment shall be provided with pressure gauge to monitor N_2 pressure and ½" non-return valve. All threaded holes, other than tell tale holes for testing, shall be suitably protected with steel bar plugs. All nozzles not provided with blind flange shall be provided with steel covers, temporary gaskets and bolts. Suitable warning Information shall be added as per Appendix C.

For Pressure Vessels & Heat Exchangers, the VENDOR shall submit further details to COMPANY for review/approval of preservation requirements for the equipment whilst in transit or stored up to the point of handover based on the following intervals:

- Daily
- Weekly
- Monthly
- Quarterly
- Half-Yearly

The equipment parts that could potentially get damaged during the shipment, such as tubes to header joints on an air cooled heat exchanger fin tube panel must be braced by appropriate steelwork and protected by transport timber on as needed basis.

Plate heat exchangers shall be stored under covered shaded area within the MANUFATURER'S recommended temperature. MANUFACTURER shall display long term storage instructions on the outside of the equipment.

Refer to Appendix C for export packing requirements for vessels and heat exchangers.

For tubes of furnace, shall be coated internally with an oil film protective and externally with a hard film protective. A small charge of desiccant (minimum 28 grams) shall be placed inside each tube, the ends shall then be plugged with wooden plugs and sealed with petrolatum tape and lapped back over the tube for a distance of 300 mm (12").

5.2.10 Shop Fabricated Tanks

For Shop Fabricated Tanks, the VENDOR shall submit details to COMPANY for review/approval of preservation requirements for the equipment whilst in transit or stored up to the point of handover based on the following intervals:

- Daily
- Weekly
- Monthly
- Quarterly
- Half-Yearly

5.2.11 Mechanical Rotating Equipment

It is recommended that all functions concerned with mechanical and rotating equipment give serious consideration to planning and adopting corrosion prevention measures for such critical high value equipment. These should include all phases from initial purchase to ultimate part erection and storage on site, and should include the treatment of spares.

This shall include spare rotors of pumps, compressors and turbines shall be supplied in nitrogen pressurized metal containers suitable for both vertical and horizontal storage.

The responsibilities should be well defined and agreed upon by MANUFACTURER's, CONTRACTOR's, and COMPANY. It is further recommended that the CONTRACTORs or MANUFACTURER s of equipment be subjected to the provision that all items are prepared and shipped in such a manner as to provide corrosion protection of all functional surfaces, both internal and external, for up to five years unsheltered outdoor storage.

If not already painted, non-functional surfaces may be treated by painting or otherwise as specified by the Principal. Many MANUFACTURER's have developed their own procedures for accomplishing the above. These should be reviewed by the functions concerned, and may be accepted without change, or modified by mutual agreement. If not installed, large items such as ducting may be stored in the open, on wooden sleepers, providing there is good drainage and the protection will withstand mechanical damage. Particular attention shall be paid to identification of equipment. Every item should be prominently and effectively tagged, and each tag shall show the order number and cross reference the Suppliers drawings approved for construction. Alternatively, items may be identified by marking with paint.

The containers shall be fitted with N_2 cylinder, pressure gauge, safety devices and alarm to indicate loss of N_2 pressure. All insurance spares shall be packaged suitable for at least 4 years of storage without opening for condition monitoring.

The Dry gas seals shall be stored in controlled environments (indoor, air conditioned). Further, the shelf life of the dry gas polymers shall be recorded and monitored during the storage.

5.2.12 Pumps and Motors

Pumps casing shall be fully drained, cleaned and sprayed internally with suitable rust inhibitor.

All flanged connections shall be sealed with gasket steel covers. A minimum of four bolts per flange shall be used.

All threaded connections shall be protected with hard plastic plugs or caps.

All drive shafts and drive flange faces must be protected either by fitting plastic shaft or flange face covers or by lightly greasing and wrapped with petrolatum tape. Shaft coupling must be grease filled and tape wrapped overall.

Pumps & motors shall be wrapped with heavy plastic sheeting capable to withstand the atmospheric conditions.

5.2.13 Machined Spare Parts

Wherever practicable, strippable hot-dip coating to BS 1133 type TP7 or equivalent. Small items may be packed in self-sealing polythene bags with desiccant. Rotary machinery spares such as rotors and turbines shall generally be preserved in accordance with BS 1133 Section 6.

5.2.14 Transmitters, Electronic Controls Panels, Alarm Panels, Indicators and Analysers

Electronic modules and spares which are sensitive to static charges shall be provided with adequate antistatic protection and carry signs to prevent mishandling.

Adequate protection shall be provided to the pin connectors of electronic modules to prevent potential damages during preservation and handling.

a) Open the doors and install porous bags of VCI or VCI emitters.
b) Close doors and seal with petroleum jelly. Apply jelly to door seal before closing to make a more efficient seal.
c) All openings such as conduit connections shall be capped, plugged or sealed with waterproof, cloth-backed tape.

5.2.15 Electrical Equipment

Preservation and export packing for electrical equipment and materials shall be in accordance with the MANUFACTURERS/VENDOR`s standards and Project Specifications.

5.2.16 Name Plates

All name plates must be covered with a light coating of grease.

5.2.17 Welding Consumables

All welding consumables shall be shrink wrapped in polythene bags and boxed in cardboard carton

5.2.18 Brick-Lined/Refractory-Lined Equipment

Pre-stressed brick lining should be kept above 0 °C in order to avoid excessive stresses in the lining. All stacks and refractory-lined equipment shall be protected against water ingress and, in tropical areas, condensation of water vapour.

5.2.19 Ball and Roller Bearings

Ball and roller bearings shall be greased or oiled, wrapped in grease resistant Paper and individually packed

6 MATERIAL AND WORKMANSHIP

6.1 General

Material used for packaging, packing, wrapping, tapes, sealers, moisture-resistant barriers and corrosion preventions shall be recognized brands and grades and shall conform to the best standards in the location in which articles are packed and stored and shall be capable of performing all its protective functions without damage to the commodity content. The nature of the commodity and degree of protection required will govern final selection and size of the material utilized.

The use of cardboard, fiberboard and similar material is not permitted since the component gets exposed to the outside environment.

6.2 Wood

6.2.1 Dimensional Lumber

Dimensional lumber shall be new, sound and well-seasoned (to moisture content of not less than twelve percent (12%) but not more than eighteen percent (18%) of its oven dry weight). Pieces shall be free from all defects that could materially weaken them or interfere with the nailing. Knots or knot clusters shall be sound and not in excess of 1/3 width of the board. Knots shall be located as not to cause nailing interference which would result in structural weakness. Bad cross graining should be avoided. Lumber dimensions used in this specification are nominal.

6.2.2 Plywood

New, clean, dry, C-D exterior glue plywood shall be utilized.

6.3 Nails and Strapping

6.3.1 Nails

All nails shall be hot-dip galvanized box nails. For maximum strength, they shall be driven into side grain of lumber. The size of the nail to be used is governed by the species and thickness of the wood. Corrugated fasteners should be preferred to nails when packing items are highly susceptible to pilferage and theft

6.3.2 Strapping

Unless otherwise specified, metal strapping shall be un-annealed steel, minimum 19 mm width applied with a stretching tool and secured with crimped steel seals. Metal straps must be cut evenly at the seal with no sharp

edge. Corner protectors shall be provided to keep strapping from cutting into edges of package. Not less than two straps per box and not to exceed 900 mm centre to centre.

6.4 Workmanship

Workmanship shall be in accordance with the best commercial practice and with the requirements of the applicable specification. There shall be no defects, imperfections, or omissions which would tend to impair the protection afforded by the package as a whole.

7 EXTERNAL AND INTERNAL PACKING

7.1 External Packing

7.1.1 Construction of Packing Containers

The container and interior packaging shall be designed so as to both absorb the shocks and relieve the destructive forces by means of cushioning material, or to distribute, localize and transform these forces in such a manner that the commodity and container will be able to withstand them without damage to the merchandise.

Selection of packing depends on the nature of the commodity. Items which completely fill the container and contribute to the strength of the package are normally the easiest and most economical to package. Articles which do not completely fill the selected container must be cushioned, braced, fastened, or blocked to prevent damage to the article itself or destruction of the container.

Minor disassembly and nesting to conserve shipping volume and prevent damage shall be followed. Material requiring special jigs, fixtures, tooling or recalibration for reassembly shall not be dismantled. Parts, attachments, or fixtures of the commodity packed shall be boxed, or blocked and braced within the shipping container (where practical) containing the main unit, maintaining a low centre of gravity.

If the load must be kept upright, equip the packing with lift handles, skids, top peaks or gables, or some similar device to assure stowage and handling in an upright position. Break bulk items shall be equipped with lifting lugs when required.

Do not exceed whatever capacity the (box, crate, etc.) was designed to accommodate. Inner blocking and bracing must distribute the contents' weight over interior surfaces rather than concentrate it on one or two critical points.

7.1.2 Bundles and Pallets

Unitize, palletize, or assemble cargo in the largest practical unit consistent with handling, weight and dimension limitations at transhipment points and destination. Material packed on pallets shall be enclosed and strapped to four way entry pallets. Material must fit pallet without large voids and must be capable of withstanding stacking without damage.

Material packed in bundles shall be segregated to length and size, shall be securely strapped (32 mm width heavy duty strapping) with a stretching tool, secured with crimped steel seals (spaced 900 mm apart) and skidded to permit stacking without damage. Bundles are not to exceed 1000 kg gross weight unless previously approved by the CONTRACTOR.

Sturdy commodities such as rough castings, structural or fabricated steel, heavy wall pipe, or tanks not subject to water or handling damage, shall be bundled, skidded, or secured to pallets for shipments.

Material subject to handling or stowage damage shall be packed in crates or boxes. Large items not subject to water damage should be packed in unsheathed (open) crates.

Materials subject to water damage shall be packed in:

a) Waterproof lined boxes or sheathed crates.
b) An inverted waterproof bag slipped over the material within the box or sheathed crate.
c) Should a higher degree of protection be required, employ the use of both.

Shipping containers over 23 kg shall be provided with 4 way skids permitting handling by forklift and/or slings. Minimum skid depth will be 64 mm. Skid ends shall be chamfered.

Crates and boxes are not to exceed 5000 kg gross weight unless previously approved by CONTRACTOR.

7.1.3 Cardboard Containers

Cardboard containers shall be used for inner packaging and be a minimum of two-ply construction manufactured from water-proofed paper cardboard and shall be limited to a maximum net weight of contents of 50 kg per container.

Cardboard containers shall be capable of sustaining a corner drop of 600 mm, with a packed test weight of 50 kg, to a solid, concrete surface without rupturing or failing.

Items packaged in cardboard containers shall be fully contained within the container and firmly packed by means of cushioning and floating or by use of pre-moulded cushioning containers.

Cardboard containers shall be sealed completely by application of waterproof tape, minimum of 50 mm wide, to all exterior edges and seams upon completion of the packaging operation.

Cardboard containers for pre-packaging of individual items for consolidated packing in a wooden box or crate shall be used for items weighing up to 250 kg. Containers so used shall meet the above requirements for cushioning and sealing and shall be capable of containing and protecting the contents.

7.1.4 Drums, Kegs and Barrels

Containers of a cylindrical style such as drums, kegs and barrels shall be provided for the packaging of liquids, powders, palletized materials and small hardware objects such as bolts.

Cylindrical containers shall be manufactured from wood or steel and shall be capable of sustaining a drop of 1200 mm from a diagonal position, while loaded with the maximum intended weight, to a solid concrete surface without rupturing or failing.

Cylindrical containers of like sizes and contents shall be securely strapped together and to pallets, when possible, for consolidation of packages.

7.1.5 Skidded and Framed Boxes

Skidded and framed boxes shall be constructed upon skid members joined by headers and shall be floored with 50 mm lumber. Each header shall be double bolted to each skid member. Each bearing surface of machinery or equipment shall rest over a skid member and bolts securing equipment to skid shall pass through a skid member. Lag screws are not acceptable for this purpose. Framed construction shall employ the use of X-bracing with 50x 100 mm lumber. The clear distance between skids shall not exceed 1200 mm.

Rub strips will be used to allow entry by fork on four sides. Provisions shall be made so that slings can be easily inserted under the ends of the box.

7.1.6 Bolting

a) Use 10 mm (3/8) inch diameter carriage bolts when fastening pieces up to 66 mm thick.
b) Use 13 mm (1/2) inch diameter carriage bolts when fastening pieces over 66 mm thick up to 92 mm thick.
c) Use 16 mm (5/8) inch diameter carriage bolts when fastening pieces over 92 mm thick.

Prevent loosening of nuts by using lock washers, or lock nuts, or deforming the bolt threads, or by staking the nut to the bolt.

7.1.7 Crates

Open crates can be used where contents are virtually indestructible and packing is required only to facilitate handling and stowage. Crates also serve well as over packs to consolidate fibreboard boxes or to provide unit pack stiffness to resist crushing. Three ways corner construction reinforced with diagonals shall be used for all crates that are not plywood sheathed.

Large crates usually must bear great superimposed loads. Ensure top strength by frequent (not more than 950 mm apart) top joists. When sheathed, place joists under sheathing.

Provide joist supports directly under joist ends. Reinforce floor at load bearing points when between skids or sill members.

To permit entry of forklifts, terminate end sheathing at flooring. Terminate side sheathing 12 mm short of skid bottom. To transfer load to the tines of the forklift, add additional cross members at 500 mm and 1000 mm from each end.

Ventilation holes shall be placed at intervals around the sides and ends of sheathed crates.

Provide drainage holes through the deck or space floor boards 10 mm apart when the crate structure above the base is not weatherproof or where condensation can occur.

Where excessive heat and humidity can be expected, additional ventilation should be provided. This can be done by drilling holes through the ends near the top, but not through any frame members. These holes should not be greater than 38 mm diameter nor more than three holes per 600 mm of crate length or width.

7.1.8 Plywood Boxes and Crates Thickness & Grade

Up to 4536 kg and/or spans 600 mm or less, use 10 mm C-D exterior glue plywood. For 4536 kg and over and/or spans up to 1220 mm, use 13 mm C-D exterior glue plywood.

Note: CONTRACTOR approval is required for crates over 5080 kg.

If exceptionally rough and abusive handling or pilferage problems are anticipated, use 13 mm C-D exterior glue plywood regardless of size.

7.1.9 Frame Members

Up to 454 kg, use 25 mm x 100 mm lumber. For 454 kg to 5080 Kg, use 50 mm x 100 mm lumber.

7.1.10 Skids and Rub Strips

Up to 454 kg, use 50 mm x 100 mm lumber. For 454 kg to 5080 kg, use 100 mm x 100 mm lumber.

7.1.11 Fasteners

Staples shall be used to secure plywood to struts. The following applies when staples are used:

a) Use maximum length possible and clinch.
b) Crown width should be at least 10 mm.
c) Orient crown 45° to grain of plywood.
d) When fastening, mating members must be in contact, since staples do not draw parts together.

7.1.12 Framing

a) Corners should be lapped double post.
b) Nails spaced at 80 mm maximum intervals.
c) All frame members to be inside the crate.
d) Horizontal brace required when 1500 mm or over in height.

7.2 Internal Packing

All items shall be braced and/or cushioned within the container to prevent damage from shock, vibration, rough handling and transportation. Water absorbing cushioning material should be avoided.

Small items shall be packaged in cartons, bags or boxes prior to packing in shipping containers. They should not be packed loose.

Shield commodities on top and sides by use of waterproof shrouds or waterproof case liners.

As many waterproof barriers contain asphalt, an additional paper liner would be necessary to prevent the asphalt material from bleeding onto the commodity.

Preserved surfaces shall be insulated from hydroscopic material (wood, fibreboard, etc.) with grease proof, non-corrosive barriers. Do not bring polyethylene film in contact with rust inhibitor coatings. Finished and painted surfaces shall be protected from abrasion. Place commodities on skids, pallets, or dunnage to keep from resting in collected drainage. Crates and other large containers shall have drain holes in the bottom to preclude collection of water within the packing.

Commodities shall be nested or packed to reduce volume as much as possible. Pack articles firm but not tight. Construct containers having dimensions to prevent slack space.

Moisture sensitive commodities (precision instruments, electrical, and electronic assemblies, etc.) subject to water vapor damage shall be packed (following appropriate preservation methods) in an interior moisture-vapor proof barrier together with silica gel or a comparable desiccant. When packs or bags of preservatives are used, each unit shall be tagged and data recorded on the tag.

NOTE: It will be the responsibility of the MANUFACTURER/VENDOR of the commodity for packing to assure that the commodity is free and dry of all moisture both internally and externally. Certification is be required for items which are known to have undergone hydro-testing.

The amount of silica gel or desiccant will be in proportion to the total volume of the outer container. Suitable cushioning will be used on all corners, edges and protrusions to protect flexible barriers from puncture. Included air volume shall be kept to a minimum. When flexible barriers are used, the barrier shall cling tightly to the enclosed item without puncture.

Silica gel or desiccant shall not come in contact with critical working surfaces or highly finished surfaces.

8 HANDLING, STORAGE AND MARKING

8.1 Handling & Storage

Refer to Material Requisition/Purchase Order for the individual equipment item and material(s) for specific requirements, if any, regarding its handling and storage. In parallel, CONTRACTOR shall ensure the following:

a) Appropriate packing by MANUFACTURER/VENDOR to prevent any damage to equipment and material.
b) Timber shoring within a package and within a container to prevent movement
c) Adequate selection of the ship by the Shipping Agent for handling intended cargo. COMPANY's preferred shipping companies and agents should be used.
d) Ensure proper rigging procedures are followed for handling of the equipment and materials during loading/unloading from ship and truck.
e) Safe handling of cargo by crane, fork lifting or other such mechanism shall be ensured by ensuring proper certification of the handling machine and its drive.
f) Ensure presence of CONTRACTOR's representative during ship to dock to truck transfer of equipment and material or vice versa.

On issue of materials or equipment, the long term packaging should be seen to be secure and signed for by Contractor as so received

8.2 MARKING

Indelible inks, paint and waterproof labels shall be used to preclude obliteration of marks, shipping instructions and handling symbols.

Marks shall be legible at a distance of 9 meters and approximately 80 mm to 120 mm in height whenever possible. Marks shall not be less than 50 mm without prior written approval from CONTRACTOR.

Only those marks specified in the Purchase Order, plus any cautionary markings, and special handling symbols. No advertising or marks which indicate contents or other extraneous information shall be used. Use standard international symbols for center of gravity, lifting points, up arrows, keep dry and fragile.

Refer to Appendix – B for further details.

9 APPENDICES

APPENDIX – A1: PRESERVATION TYPE (based on MIL-P 116G spec)

Authorization	P1	P2	P3
Application Method and Temperature	Spray, Dip, Brush 5-350°C	Spray, Dip, Brush Flush 5-350°C	Spray, Dip, Brush Flush 5-350°C
Method of removal	Pet. Solvent Vapor Degreaser	Pet. Solvent, Lube Oil, Hot Alkali, Wash, Vapor, Degreaser	Pet. Solvent, Lube Oil, Hot Alkali, Wash
Description	Cold Application, Solvent Cut-Back, Firm, black, Opaque Film. Flash 38°C Min	Cold Application, Solvent Cut-Back, Soft, Amber, Transparent Film. Flash 38°C Min	Cold Application, Solvent Cut-Back, Oily, Light Amber Transparent Film. Flash 38°C Min
Intended Use	General purpose preservative, indoors or outdoor, with or without cover, for domestic and overseas shipment where a firm film is cover.	Extended undercover or indoor protection of interior or exterior surfaces of machinery, instruments, bearings, etc. For limited periods of outdoor protection where metal temperatures do not produce flow of film.	Where water must be displaced and corrosion prevented or arrested. For protection of interior surfaces of machinery, instruments, or material under cover for limited periods

Notes:

1. Preservation materials specified or referenced by manufacturer name and/or number are intended to describe the type and quality level of materials desired and are not intended to be restrictive or to exclude similar materials by other manufacturers, provided they are approved by the COMPANY.

2. The temporary corrosion preventatives types, references are taken from BS 1133 - Section 6 (Sub-Section - D clauses 33 to 42) can also be applied.

APPENDIX A2 RUST PREVENTIVE MATERIALS

A2.1 Vapor CORROSION Inhibitor (VCI)

VCI is a powder used to protect equipment that will be packaged or otherwise enclosed. VCI will assure constant protection for as long as two (2) years.

VCI reaches the metal surfaces in the vapor phase, and is absorbed on the metal to form an invisible film which prevents corrosion. Excellent protection is given to ferrous metals, most nonferrous metals and nonmetallic materials.

VCI can be applied dry by use of a Floc Gun or other dusting device. VCI powder shall be dispersed over exposed metal surfaces.

Application requirements and limitations shall be in accordance with manufacturer's instructions.

Note: Vapor Corrosion Inhibitors or Volatile Corrosion Inhibitors (VCI) is generic terms for corrosion preventive products that contain environmentally safe chemicals.

A2.1.1 Safety Precautions

VCI shall be handled in accordance with the manufacturer's instructions. VCI under normal conditions is not hazardous. However, workers exposed to air containing VCI powder shall wear dust masks.

A2.2 Vapor Corrosion Inhibiting Papers

VCI Vapor Barrier is a Kraft paper that is coated with a rust inhibiting chemical. It offers excellent protection for up to two (2) years when applied correctly. It is supplied in rolls, sheets and strips.

VCI papers give off invisible vapor that prevents oxygen in moisture from combining with steel to form rust. There are no special requirements for storing materials protected with these papers other than storing them in a cool, or shaded area and in a dry location. Packages could be opened briefly for inspection without loss of protection by merely resealing the package immediately following inspection.

A2.3 VCI Emitters

VCI Emitters are sponges that have been treated with Vapor Corrosion Inhibitor. Generally they have an adhesive backing for attachment to the inner surface of the enclosure where corrosion control is required. These emitters are convenient and an acceptable alternative to porous pouches of VCI.

A2.4 Vapor Space Inhibited (VSI)

VSI is an oily concentrate and contains an oil soluble, volatile anti-rust compound. This corrosion inhibitor fills the vapor space above the oil level to form a rust preventive barrier on exposed interior metal surfaces and combats vapor space rusting. VSI oil is available in one viscosity grade and is suitable for hydraulic, turbine, and general lubricating applications.

APPENDIX – B: LABELLING AND MARKING

B.1 General

The following requirements have been devised to ensure easy identification of materials on arrival at site and must be strictly adhered to.

B.2 Labelling

B.2.1 Items should be individually labelled except where a number of identical items are to be supplied, in which case only one item in each package need be labelled. The package should also be clearly marked with all item details and quantities.

B.2.2 Indestructible labels must be firmly attached to show the following information:-

a) ADNOC order number

b) Order item number

c) ADNOC vocabulary number if given on the order

d) Makers part number, if any

B.2.3 Where parts are treated with temporary protectives it is essential to maintain the legibility of any affixed labels. Card or paper labels should be protected with transparent tape or clear lacquer.

B.3 Marking

Details of the shipping mark, color banding and other special markings are given on the purchase order. The following requirements must be strictly adhered to:-

B.3.1 Cases and Crates

a. The word "Top" to be boldly marked on the top surface.

b. Shipping marks should be displayed on the top, one end and one side.

c. Where applicable, slinging and grabbing points should be clearly marked, particularly in respect of cases and crates which are heavy at one end.

d. It must be clearly indicated if cases must not be tipped.

e. Gross and net weights and overall dimensions must be clearly marked.

f. A packing note detailing the contents, enclosed in a waterproof envelope, should be nailed inside the top cover of cases, or protected with a metal cover on the outside of crates. For security reasons some areas specifically prohibit the contents labels to he displayed.

B.3.2 Carbon Steel, Stainless Steel, Corrosion Resistance Alloys Pipes and Fittings

Pipes and fittings material shall generally be marked and color coded in accordance with COMPANY color code identification specification and BS 5383 requirements as applicable

The sizes of the characters to be 6mm for pipes and fittings up to 40 mm (1 1/2") NPS and 9 mm for pipes and fittings over 40 mm (1 1/2") NPS.

a. On pipes the details shall be printed along the full length commencing at least every 750 mm (30"). Any gap between printed characters exceeding 75 mm (3") shall be filled with cruciform characters in the appropriate colour and size.

b. On fittings a ring of the colour appropriate to the material composition shall be painted around the material identification mark

c. Bundles of steelwork and pipe over 6 meters (20 ft.) in length should be marked at each end.

d. Gross and net weights and overall dimensions should be clearly marked.

e. Plates should be individually marked.

f. Pipes 50 mm (2") NPS and over, if not bundled, to be individually marked.

g. Where the markings cannot be applied direct, an indestructible label shall be used.

APPENDIX – C PREPARATION OF PRESSURE VESSELS AND HEAT EXCHANGERS FOR SHIPMENT

1. This section covers the requirements for MANUFACTURER'S preparation of shop fabricated pressure vessels and heat exchangers for shipment. These requirements do not apply to pressure vessels which are shipped in sections for assembly at the jobsite.
2. The MANUFACTURER/VENDOR shall submit for approval the complete details of the preparation for shipment.
3. Vertical vessels shall be furnished with shipping saddles and tie downs. Vessel shells shall be designed to maintain structural integrity during shipment and storage when supported on horizontal supports. The dimensional tolerances of the ASME Code requirements and Project Specifications shall apply to the vessel after removal from the horizontal supports.
4. Horizontal vessels shall be shipped on their own supports.
5. Parts shipped or stored loose from the vessel are to be shop fit up by the MANUFACTURER/VENDOR for field fit up prior to shipment of storage.
6. Watertight Integrity

a) Carbon steel or low alloy steel vessels and heat exchangers without internal austenitic stainless steel Lining.

- All openings shall be made watertight against an external pressure of 1.05 kg/cm2. For covers on nozzles over 24 inch nominal diameter, adding external stiffening bars is an acceptable method to reinforce the cover plate.
- All flanged connections which are not furnished with permanent blinds shall be covered with gasket and 12 mm minimum thick, full diameter, steel plate covers. The covers shall be installed with full bolting. Flanges drilled for bolting larger than ¾-inch diameter should be secured with ¾-inch diameter bolts and suitable cut washers. Flange edges shall be sealed with waterproof, cloth-backed tape.

b) Carbon Steel or Low Alloy Steel Vessels and Heat Exchangers with Internal Austenitic Stainless Steel Lining and Solid Austenitic Stainless Steel

- In addition to the requirements mentioned in 6.1, the interiors of vessels and exchangers shipped separately shall have additional protection from the intrusion of moisture or contaminants. Unless a specific method is noted on the CONTRACTOR'S design drawing, the method proposed shall be submitted to CONTRACTOR for review.
- For Vessels pressurized with inert gas, indicate gas pressure, gauge (description and location) and warning labels. Gas pressure shall be maintained inside the vessel throughout shipment using gas cylinders and pressure regulators. A warning or instruction label shall be placed on the vessel or shipping container and every manway, and shall describe the method of protection used.
- For Vessels pressurized with inert gas, all flange connections shall be checked for leaks after pressurization with a suitable liquid not detrimental to the stainless steel weld overlay at edge of flange facing or solid alloy nozzle flange.
- For Vessels pressurized with inert gas, warning tags shall be attached to each opening to "DE-PRESSURIZE BEFORE OPENING". Any signs or markings marked directly on the vessel shall be subject to CONTRACTOR'S approval.

7. All external carbon or low alloy surfaces not required to be painted per specification shall be primed with a suitable primer.

8. All external exposed austenitic stainless steel surfaces shall be protected with waterproof over wrap to prevent contact with seawater during shipment. (Outside of solid alloy vessels, solid alloy nozzles, exposed surface of alloy weld overlay on flanges, nameplates, etc.)
9. For vessels having materials of 12 percent chrome content or greater (including austenitic stainless steels), temporary supports shall not be moisture retaining materials such as raw wood. Shields shall be provided to protect the vessel when wood supports are used.
10. Special vessel openings shall be provided with suitable closures designed by the MANUFACTURER.
11. Any removable internals, spare gaskets, spare bolting and other equipment shipped separately shall be wrapped in polyethylene or other suitable wrapping and packed in sturdy wood boxes to insure against damage and contact with seawater during shipment. The boxes shall be marked with the Purchase Order number and vessel item number and shall be securely attached to the vessel.
12. Protective measures shall be subject to inspection and rejection. All costs associated with any rejection shall be for the account of the MANUFACTURER/VENDOR.