KLM Technology Group
#03-12 Block Aronia,
Jalan Sri Perkasa 2
Taman Tampoi Utama
81200 Johor Bahru
Malaysia

VESSEL INTERNAL LININGS

(PROJECT STANDARDS AND SPECIFICATIONS)

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SCOPE

This Project Standard and Specification covers general design, materials, surface preparation, application, and testing requirements for lining the internal SURFACES of shop and field fabricated tanks, pressure vessels and other equipment in a shop or jobsite environment. The materials and procedures specified herein are provided to protect the internal SURFACES of carbon steel tanks, pressure vessels, and equipment from corrosion and to prevent the possibility of product contamination.

REFERENCES

It shall be the APPLICATOR'S responsibility to be, or to become, knowledgeable of the requirements of the referenced codes and standards. The following codes and standards shall, to the extent specified herein, form a part of this Specification. The latest edition in force shall apply.

1. National Association Of Corrosion Engineers (NACE)

RP0178	Fabrication Details, Surface Finish Requirements, and Proper Design Considerations for Tanks and Vessels to be Lined for Immersion Service (Except Appendix B of this standard RP0178)
RP0184	Repair of Lining Systems
RP0188	Discontinuity (Holiday) Testing of Protective Coatings
RP0287	Field Measurement of Surface Profile of Abrasive Blast Cleaned Steel Surfaces Using a Replica Tape
RP0288	Inspection of Lining on Steel and Concrete
TM0174	Laboratory Methods for the Evaluation of Protective Coatings and Lining Materials in Immersion Service

2. International Organization for Standardization (ISO)

ISO 2409	Paints and Varnishes – Cross-cut test for adhesion
ISO 2808	Paints and Varnishes – Determination of film thickness
ISO 4624	Paints and Varnishes – Pull-off test for adhesion
ISO 4628-2	Paints and Varnishes – Evaluation of degradation of paint coatings - Designation of intensity, quantity and size of common types of defect - Part 2: Designation of degree of blistering
ISO 4628-3	Paints and Varnishes – Evaluation of degradation of paint coatings - Designation of intensity, quantity and size of

	common types of defect - Part 3: Designation of degree of rusting
ISO 4628-4	Paints and Varnishes – Evaluation of degradation of paint coatings - Designation of intensity, quantity and size of common types of defect - Part 4: Designation of degree of cracking
ISO 4628-5	Paints and Varnishes – Evaluation of degradation of paint coatings - Designation of intensity, quantity and size of common types of defect - Part 5: Designation of degree of flaking
ISO 4628-6	Paints and Varnishes – Evaluation of degradation of paint coatings - Designation of intensity, quantity and size of common types of defect - Part 6: Rating of degree of chalking by tape method
ISO 8501-1	Preparation of steel substrates before application of paints and related products-Visual assessment of surface cleanliness - Part 1: Rust grades and preparation grades of uncoated steel substrates and steel substrates after overall removal of previous coatings
ISO 8502-1	Preparation of steel substrates before application of paints and related products-Tests for the assessment of surface cleanliness - Part 1: Field test for soluble iron corrosion products
ISO 8502-2	Preparation of steel substrates before application of paints and related products-Tests for the assessment of surface cleanliness - Part 2: Laboratory determination of chloride on cleaned surfaces
ISO 8502-3	Preparation of steel substrates before application of paints and related products-Tests for the assessment of surface cleanliness - Part 3: Assessment of dust on steel surfaces prepared for painting (pressure-sensitive tape method)
ISO 8502-4	Preparation of steel substrates before application of paints and related products-Tests for the assessment of surface cleanliness - Part 4: Guidance on the estimation of the probability of condensation prior to paint application
ISO 8503-2	Preparation of steel substrates before application of paints and related products-Surface roughness characteristics of blast cleaned steel substrates - Part 2: Method for the grading of surface profile of abrasive blast cleaned steel-Comparator procedure

ISO 8504-2	Preparation of steel substrates before application of paints and related products-Surface preparation methods - Part 2: Abrasive blast-cleaning
ISO 8504-3	Preparation of steel substrates before application of paints and related products-Surface preparation methods - Part 3: Hand and power tool cleaning
ISO 12944-1	Paints and varnishes -- Corrosion protection of steel structures by protective paint systems -- Part 1: General introduction
ISO 12944-2	Paints and varnishes -- Corrosion protection of steel structures by protective paint systems -- Part 2: Classification of environments
ISO 12944-3	Paints and varnishes -- Corrosion protection of steel structures by protective paint systems -- Part 3: Design considerations
ISO 12944-4	Paints and varnishes -- Corrosion protection of steel structures by protective paint systems -- Part 4: Types of surface and surface preparation.
ISO 12944-5	Paints and varnishes -- Corrosion protection of steel structures by protective paint systems -- Part 5: Protective paint systems.
ISO 12944-6	Paints and varnishes -- Corrosion protection of steel structures by protective paint systems -- Part 6: Laboratory performance test methods.
ISO 12944-7	Paints and varnishes -- Corrosion protection of steel structures by protective paint systems -- Part 7: Execution and supervision of paint work.
ISO 12944-8	Paints and varnishes -- Corrosion protection of steel structures by protective paint systems -- Part 8: Development of specifications for new work and maintenance.
ISO 9001-2000	Quality Management System Requirements
ISO 9004-2000	Quality Management Guidelines for Performance Improvement System
ISO 19011	Guidelines for Quality and/or Environmental Management System Auditing

3. Steel Structures Painting Council (SSPC)

SSPC-PA-2	Measurement of Dry Paint Thickness with Magnetic Gauges
SSPC-SP 1	Solvent Cleaning
SSPC-VIS 1	Pictorial Surface Preparation Standards

4. American Society For Testing and Materials

ASTM D4285	Test Method for Indicating Oil or Water in Compressed Air
ASTM E337	Test for Relative Humidity by Wet-and-Dry Bulb Psychrometer

DEFINITION AND TERMINOLOGY

For the purposes of this Specification, the following definitions shall apply:

CONCESSION REQUEST
- A deviation requested by the SUBCONTRACTOR, usually after receiving the contract package or purchase order. Often, it refers to an authorization to use, repair, recondition, reclaim, or release materials, components or equipment already in progress or completely manufactured but which does not meet or comply with COMPANY requirements. A CONCESSION REQUEST is subject to COMPANY approval.

SHALL
- The use of the word “shall” indicates a mandatory requirement.

SHOULD
- The use of the word “should” indicates a strong recommendation to comply with the requirements of this document.

APPLICATION DATA
- Application instructions, recommendations and guidelines described in the published literature of the lining materials Manufacturer, referenced industry standards and any specific requirements noted in this Specification and any drawings issued to the APPLICATOR.

APPLICATOR
- The party responsible for the lining work, including surface preparation, application, curing and inspection and each and every task necessary for installing complete lining system in accordance with this Specification.

Qualifications of the APPLICATOR personnel shall be approved by the CORROSION ENGINEER.

CORROSION ENGINEER
- The engineer in the CONTRACTOR'S organization responsible for the development and/or the maintenance of the Specification and whose C.V. has been approved by the COMPANY.

DESIGN TEMPERATURE
- The temperature for which the tank is designed and which is shown on the tank drawings. This temperature shall not be used for selecting the lining systems.

DFT MEASUREMENT
- The average value of three readings recorded by the use of a properly calibrated dry film thickness gauge. The readings shall be within a 150 mm radius and evenly spread out from a given spot.

DRY FILM THICKNESS (DFT)
- The dry film thickness of the lining, in the absence of a specified range, the value stated shall mean a minimum value. The maximum value shall not be more than 1.5 times the stated value.

MAXIMUM OPERATING TEMPERATURE
- The maximum operating temperature (MOT) is the same as the normal operating temperature. However, if upset conditions are stated on the P&IDs, then the highest temperature during upset conditions shall be considered as the maximum operating temperature, superseding the normal operating temperature.

REFERENCE PANELS
- Panels with lining system applied by the MANUFACTURER and approved by the CONTRACTOR for use as standard reference panels for testing and inspection of the lining system applied by the APPLICATOR.

SURFACES
- All carbon steel surfaces which will be exposed to the process fluids at maximum capacity, including interior surfaces by way of example, but not by limitation, surfaces of all items located inside the tank (structural supports, pipe supports, mixers, etc.), nozzle interiors, flange facings, sides of pontoon, access way covers, blind flanges, guide poles, roof legs, footings, etc. For lining purposes of floating roof tanks, unless otherwise stated in data sheets,

shell interior side up to the highest operating level of the roof shall be considered for lining installation.

TANK FABRICATOR
- The party responsible for fabricating the tanks.

DOCUMENT PRECEDENCE

The APPLICATOR shall notify the CONTRACTOR 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 CONTRACTOR in writing before proceeding with the design/ manufacture.

In case of conflict, the order of precedence shall be stated in the AGREEMENT or other PROJECT documents as applicable.

SPECIFICATION DEVIATION/ CONCESSION CONTROL

Any technical deviations to the Specification including, but not limited to, the Data Sheets and Narrative Specifications shall be sought by the APPLICATOR only through the 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.

QUALITY ASSURANCE/ QUALITY CONTROL

APPLICATOR'S proposed quality system shall fully satisfy all the elements of ISO 9001 and ISO 9004. The quality system shall provide for the planned and systematic control of all quality-related activities performed during design, development, production, installation or servicing (as appropriate to the given system). Implementation of the system shall be in accordance with the CONTRACTOR'S Quality Manual and Project Specific Quality Plan, which shall both together with all related/referenced procedures, be submitted to COMPANY for review, comment and approval as required by purchase/contract documents.