SECTION 09 90 00 — PAINTING

1.01 SUMMARY

A. **Scope**: This section contains the performance specifications for painting the buildings of the lock complexes. The interior and exterior of buildings as detailed in Section 01 81 36 (*O &M Buildings and Facilities — Program*) and Section 01 81 36.13 (*O &M Buildings and Facilities —- Space Programming*), as designed by the Contractor shall be painted, for appearance and protection purposes. This section does not cover the coating of metals, which is covered by Section 09 96 00 (*Corrosion Control Coatings*), nor the coating of hydraulic structures, which is covered Section 05 50 13.13 (*Metallizing and Coating Hydraulic Structures*).

B. Related Sections:

01 35 23	*Health & Safety Requirements*
01 81 36	*O &M Buildings and Facilities — Program*
01 81 36.13	*O &M Buildings and Facilities — Space Programming*
01 84 00	*Facility Interior Performance Requirements*
05 50 13.13	*Metallizing and Coating Hydraulic Structures*
09 96 00	*Corrosion Control Coatings*

1.02 [A17]REFERENCES:[A17]

A. **American Society for Testing and Materials (ASTM) International Standards**:

D 344-04	Relative Hiding Power of Paints by the Visual Examination of Brushouts
D 522-01	Mandrel Bend Test of Attached Organic Coatings
D 660-05	Evaluating Degree of Checking of Exterior Paints
D 661-05	Evaluating Degree of Cracking of Exterior Paints
D 714-06	Evaluating Degree of Blistering of Paints
D 772-05	Evaluating Degree of Flaking (Scaling) of Exterior Paints
D 867-81(86)	Pumice Pigment
D 1653-03	Water Vapor Transmission of Organic Coating Films
D 2247-02	Water Resistance of Coatings in 100% Relative Humidity
D 2583-07	Indentation Hardness of Rigid Plastics by Means of Barcol Impressor
D 2794-04	Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)

D 3273-05	Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
D 3359-02	Measuring Adhesion by Tape Test
D 3363-05	Film Hardness by Pencil Test
D 4214-07	Evaluating Degree of Chalking of Exterior Paint Films
E 84-07	Surface Burning Characteristics of Building Materials

B. **National Electrical Manufacturers Association (NEMA) Standard**:

Z535.1-06	Safety Color Code

C. **National Fire Protection Association (NFPA) Code**:

101-06	Life Safety Code

1.03 REQUIREMENTS:

A. **Protection Requirements**: Design and apply paints that will protect surfaces from deterioration caused by the environment and service and that will maintain a clean appearance.

1. For exterior atmospheric service, use coatings appropriate for a tropical coastal marine environment.

2. Use coating systems with sufficient number of coats to minimize direct contact of the substrate with the environment.

B. Adherence Requirements:

1. Schedule and apply paint coats to avoid any type of surface contamination, including salts, humidity, water, dust, oil or grease, which may affect adherence of the coatings. Where such contamination is suspected, adhesion of thin coating systems shall be tested by the tape test, in accordance with ASTM D 3359.

2. **Compatibility Between Paint Coats of Different Materials**. In general, sealers, primers, intermediate coats and finish paints shall be from the same manufacturer.

3. After application, paints shall not show any adhesion-related failures such as blisters, peeling or flaking, or intercoat delamination. Applied paints shall not show visible evidence of entrapped air, solvents or humidity between the substrate and primer or between coats. Blistering shall be evaluated in accordance with ASTM D 714. Flaking shall be evaluated in accordance with ASTM D 772.

C. **Integrity Requirements**: Applied paints shall be free from mud cracking, wrinkling, cracking, chalking and other paint failures or deterioration. Use surface preparation, sealers, pretreatment, primers, intermediate coats, and finish coats that will, as a system, meet the requirements for the environment and service.

D. **Thickness Requirements**: Paint thickness shall be appropriate for the environment and service.

E. **Chemical Resistance Requirements**: Provide paints with chemical resistance adequate for the environment in which the surface is to perform its service. As a minimum, paints shall be resistant to:

1. Acids from acid rain or fog that may form from electrical thermal generation or vehicular and ship exhaust and

2. Alkalis from salts in the coastal environment.

3. Coatings that are used in areas where fuels and oils, grease, or other lubricants are used and that may be subject to splash or spillage shall be resistant to hydrocarbons.

F. **Water Resistance Requirements**:

1. Design and apply paints that will be impermeable and resistant to rainwater and low pressure water cleaning at 1.72 MPa.

2. The finish shall allow free drainage of water to minimize time of wetness.

3. Paints shall have low water permeability. Water vapor transmission rate shall not exceed 13.8 $ng/s \cdot m^2 \cdot Pa$ when tested in accordance with ASTM D 1653.

4. Paints shall have an excellent humidity resistance, as tested by either of the humidity cabinets specified in ASTM D 2247.

G. **Flexibility Requirements**:

1. Paints applied on surfaces exposed to thermal expansion and contraction or bending shall be adequate for such service. Such coatings shall pass the mandrel bend test performed in accordance with ASTM D 522.

2. Paints after full cure and exposure to the actual service environment shall show no signs of cracking, as evaluated by ASTM D 661.

H. **Temperature Resistance Requirements**: Design and apply paint systems that will meet performance requirements in the full temperature range of the service environment.

I. **Fire Resistance Requirements**: Paints applied to building superstructure or doors where fire retardance is required by NFPA 101 shall have fire retardance or fire resistance rating in terms of flame spread, fuel contribution, and smoke density equal to or greater than the NFPA 101 requirement, as tested in accordance with ASTM E 84.

J. **Abrasion Resistance Requirements**: Floor paints shall be resistant to the expected foot or wheel traffic.

K. **Slip Resistance Requirements**: Floor paints shall contain non-skid pigments to produce slip resistance for pedestrians. Non skid pigments conforming to ASTM D 867 shall be added to the coating material in a proportion recommended by the paint manufacturer.

L. **Hardness Requirements**:

1. Each paint system after full cure shall have sufficient hardness to sustain its integrity under the expected service and operational environment.

2. The applied paint hardness shall not be less than that stated in the manufacturer's technical documentation, as measured by the pencil hardness test per ASTM D 3363 or the Barcol hardness test per ASTM D 2583.

M. **Impact Resistance Requirements**: Paints that will be subject to impact shall pass ASTM D 2794.

N. **Durability Requirements**: Design and apply paints that have a minimum service life of 5 years without maintenance, in the environment in which the painted items will function.

1. **Weathering**: Design and apply paints that have superior weathering resistance, and resistance to degradation from ultraviolet radiation.

2. Apply paints on surfaces that have been properly prepared, to the degree specified, in accordance with the surface preparation standards.

O. **Biological Resistance Requirements**:

1. Design and apply paints that are resistant to bacteria, fungus, and other forms of biological attack, leading to premature coating breakdown.

2. Fungicides shall not be in the ACP Prohibited Substances List included in Section 01 35 23 (*Health and Safety Requirements*) and shall be the type and quantity recommended by the coatings manufacturer. Resistance to growth of mold on the coating surface shall be high, as tested in accordance with ASTM D 3273.

P. **Uniformity Requirements**: Apply paints in such a manner as to produce a protective, continuous film of uniform thickness and consistency.

Q. **Appearance Requirements**:

1. Finished paints shall not show evident contamination by dust abrasives; brush marks or fibers; runs or sags; dry overspray; or missed spots, spattering, or cratering.

2. Corners and edges, and other irregular surfaces shall show complete covering.

3. Finished paint shall be free from checking, discoloration, chalking, and other paint failures. Chalking shall be evaluated in accordance with ASTM D 4214. Checking shall be evaluated in accordance with ASTM D 660.

4. As much as possible, the exterior of all buildings shall be uniform in appearance, to provide a harmonic panoramic look.

R. **Health and Environmental Protection Requirements**: Design paint systems that will minimize impact on health and the environment.

1. **Solvents**: Use paint materials and cleaning solvents that will emit only small quantities of solvents to the atmosphere. Do not use paint materials that contain solvents or cleaning solvents that are in the ACP Prohibited Substances List included in Section 01 35 23 (*Health and Safety Requirements*).

2. **Contents**: Use paint materials which do not have ingredients that are considered carcinogenic or hazardous to human health or the environment. Do not use coatings that contain lead and other heavy metals. Do not use paint materials that, when removed, would be considered hazardous waste.

3. **Safety Requirements**: Use paint materials and cleaning solvents that do not have contents hazardous to health and are not in the ACP Prohibited Substances List included in Section 01 35 23 (*Health and Safety Requirements*).

S. **Maintenance Requirements**:

1. Design and apply coating finishes to prevent dirt pickup and to allow for low-pressure water washing without damaging the coating.

2. Use coatings that may be touch-up repaired without requiring complete removal or complicated surface preparation.

3. Where possible for similar items, use the same paint systems in both lock complexes.

T. **Color Requirements**:

1. Colors shall be as approved by the Employer's Representative. Color designation used for safety purposes shall be in accordance with NEMA Z535.1.

2. Use paint finishes that will retain color and gloss during the required service life.

3. Design and apply coating finish materials with complete hiding characteristics. If required, hiding shall be evaluated in accordance with ASTM D 344.

1.04 DESIGN CRITERIA/SYSTEM DESCRIPTION AND PERFORMANCE:

A. **General Requirements**:

1. **Paint System**: A paint system for protection of building superstructure interior and exterior surfaces shall be designed considering the service environment, work site environment, and operating environment. In general, select a generic paint material that has superior performance for the service and operating environment, with proven record of such performance and industry-wide acceptance.

2. Coating system shall include substrate surface preparation, paint schedule, and number of coats.

3. Paint all non metallic items such as walls and ceilings. Do not paint items that are factory painted or have special finishes, such as those required in Section 01 84 00 (*Facility Interior Performance Requirements*).

B. Surface preparation and paint application shall be in accordance with manufacturer instructions.

1.05 SUBMITTALS:

A. [A17]**Intermediate Design**:[A17]

1. **Paint Systems**: For each type of surface to be painted, provide a description of the system proposed for use, including recommended surface preparation, and then coat with the proposed paint system.

2. Provide a color presentation board with recommended color scheme for all painted surfaces. The colors recommended by the Contractor for approval by the Employer's Representative shall be coordinated with all special finishes and factory painted items.

B. [A17]**Final Design**:[A17]

1. **Paint Systems**: For each different type of paint system to be used, the Contractor shall submit a paint system schedule identifying the surfaces to be painted and specifying the level of surface preparation and proposed paint coat schedule. The schedule shall include the color and dry film thickness of each coat.

2. **Documentation**: The Contractor shall submit descriptive literature, technical data, and application instructions for each type of material, including blasting abrasive material, solvents, primers, and paints proposed for use in the Works, with its batch number and date of manufacture and an updated copy of its material safety data sheet. Technical data shall include the ASTM laboratory test methods and corresponding results.

B **Before Issuance of the Taking-Over Certificate**:

1. **Maintenance Manuals**: The Contractor shall submit maintenance manuals for each type of paint system that has been applied, indicating detailed procedures for repair and maintenance of the paint systems, including surface preparation and paint material application.

2. **Inspection and Test Reports**: The Contractor shall submit a certified copy of inspection and test reports demonstrating that the paint systems have been properly applied in accordance with the schedule and the manufacturer's instructions.

1.06 QUALITY ASSURANCE:

A. In general, field testing shall be minimized. Testing, if required, shall be performed by qualified laboratories. Laboratory testing results printed in the commercial product technical documentation and/or certified by the paint manufacturer shall be accepted in lieu of field testing.

B. Non destructive tests shall be preferred to destructive tests. Where destructive tests are performed, the Contractor shall repair the damaged area in a manner consistent with the original coating system requirements.

END OF SECTION

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