

SECTION 01 89 16 – SITE CONSTRUCTION

1.01 SUMMARY

- A. ^{A7}This Section relates to the design and specification of exterior pavements and surfacing, exterior site enclosures, and landscaping over Area-1 as described in Section 01 81 36 (*O&M Buildings and Facilities – Program*).^{A7} ^{A16}The construction shall be only for the items specifically identified within this Section or in Section 01 81 36 (*O&M Buildings and Facilities – Program*).
1. **Pavements and Surfacing:** Shall be adequate in extent and sufficiently durable to accommodate without damage the types of traffic that can be reasonably anticipated for the facility type and intended user population. This refers to access for vehicular and pedestrian traffic within the lock complex and vehicular access from the lock complex to existing roads.^{A16}
 - a. **Exterior Paved or Surfaced Areas such as Roadways, Driveways, and Parking Lots.**
 - 1) **Roadways and Driveways:** Paved surfaces as required for vehicular access to the Site and to various functional areas requiring vehicular access, including main entrance, parking areas, loading and unloading zones, and areas within the complex where personnel will be required to inspect or perform maintenance shall be included in the layout. *The Contractor shall construct pavements within the complex required for operations and maintenance as well as the pavements from the entrance guard house to connect to existing roads.*
 - 2) **Parking Areas:** Paved surfaces as required for vehicular parking at all buildings and functional areas requiring personnel access shall be included in the layout. *The Contractor shall construct paved surfaces within the complex required for operations and maintenance as well as the paved surfaces outside the complex identified in Section 01 81 36 (O&M Buildings and Facilities – Program).*
 - b. Walkways, Exterior Steps and Ramps not Connected to Buildings, including Handrails and Stair Nosing.
 - 1) **Walkways, Pedestrian Ramps, and Exterior Stairs:** Paved surfaces as required for pedestrian movement on the site without damage to landscaping.
 - c. Appurtenances for roadways and driveways, including curbs, gutters, guardrails, pavement markings, and parking bumpers.
 - d. Signs, including traffic signals, “ALTO”, “CEDA EL PASO”, and directional signs, and parking space marking and identification.

2. **Exterior Site Enclosures:** Will provide permanent physical security along the perimeter of the locks and surrounding areas. *The enclosure shall be designed and constructed by the Contractor.*
 - a. ^{A7}**Fences:** The purpose of the fence is to prevent the access of unauthorized vehicles and persons to the locks installation and control the access of vehicles and persons to adjacent facilities.
 - b. ^{A7}**Gates:** The purpose of the gates is to provide controlled access for authorized vehicles and personnel to the locks installation.
3. **Landscaping:** All areas of the site not finished with paving, surfacing, or buildings in Program Area-1 defined in Section 01 81 36 (*O&M Buildings and Facilities – Program*).
 - a. ^{A16}**Grass Only:** Includes areas affected by work in this Contract and delimited by the complex fence.
 - b. (Reserved)
 - c. **Landscape Plan:** Shall take into consideration lighting, access controls, intrusion alarm system and CCTV surveillance coverage for fenced area. The landscape plan shall include grading that provides a smooth surface with stable slopes based on the type of material and drainage that will not erode the surface.

1.02 REFERENCES: ^{A16}

A. Code of Federal Regulations (CFR):

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|-------------|---|
| 29 CFR 1926 | Occupational Safety and Health Administration (OSHA), Department of Labor - Safety and Health Regulations for Construction |
| 29 CFR 1910 | Occupational Safety and Health Administration (OSHA), Department of Labor – Occupational Safety and Health Standards, Subpart D |

B. ^{A7}American Society for Testing and Materials (ASTM) International Standards:^{A7}

- | | |
|-----------|---|
| B 211-03 | Aluminum and Aluminum-Alloy Bar, Rod, and Wire |
| B 211M-03 | Aluminum and Aluminum-Alloy Bar, Rod, and Wire [Metric] |
| D 2047-04 | Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine |

C. International Code Council (ICC) Code:

- | | |
|----------|-----------------------------|
| IBC 2006 | International Building Code |
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- D. **National Fire Protection Association (NFPA) Codes:**
101-06 Life Safety Code
- E. ^{A5}**American National Standards Institute (ANSI) Standard:**
A117.1-03 Accessible and Usable Buildings and Facilities ^{A5}
- F. ^{A7}**Ministerio de Obras Públicas (MOP):**^{A7}
Especificaciones Técnicas Generales para la
Construcción y Rehabilitación de Carreteras y Puentes
- G. **American Welding Society (AWS) Codes:**
D1.1/D1.1M-06 Structural Welding Code Steel
D1.3-07 Structural Welding Code-Sheet Steel
- H. **Chain Link Fence Manufacturers Institute (CLFMI) Publications:**
Chain Link Fence
Galvanized Chain Link Fence Fabric
Standards for Chain Link Fence Installation
- I. **Federal Specifications:**
RR-F-191K/GEN Fencing, Wire and Post Metal (and Gates, Chain-link
Fence Fabric, and Accessories)(General Specification)
RR-F-191/1D Fencing, Wire and Post, Metal (Chain-link Fence Fabric)
(Detail Specification)
RR-F-191/2D Fencing, Wire and Post, Metal (Chain-link Fence Gates)
(Detail Specification)
RR-F-191/3D Fencing, Wire and Post, Metal (Chain-link Fence Posts,
Top Tails and Braces) (Detail Specification)
RR-F-191/4D Fencing, Wire and Post, Metal (Chain-link Fence
Accessories) (Detail Specification)
- J. **American Association of State Highway and Transportation Officials (AASHTO) Standards:**
GDHS-5 A Policy on Geometric Design of Highways and Streets,
5th Edition
GDPS-4 Guide for the Design of Pavement Structures and 1998
Supplement
- K. ^{A16}**(Reserved)** ^{A16}

1.03 ^{A7}REQUIREMENTS:^{A7}

A. ^{A7}Pavements and Surfacing:^{A7}

1. Where pavements and surfacing are integral with elements defined within another element group, the Contractor shall meet requirements of both element groups.
2. ^{A7}In addition to the requirements of this Section, the Contractor shall comply with all applicable requirements of Section 01 10 00 (*General Project Requirements*).^{A7}
3. **Safety of Pedestrian Surfaces:**
 - a. **Slip Resistance:** The Contractor shall provide walking surfaces of exterior stairs, ramps, and walkways with a minimum static coefficient of friction of 0.80, measured in accordance with ASTM D 2047.
 - b. **Stairs:**
 - 1) **Risers:** Closed.
 - 2) **Treads:** Maximum bevel or radius on leading edge of 12.8 mm.
 - 3) Shall meet the requirements of 29 CFR 1910.24.
 - c. **Guards, Guardrails, or Protective Walls:**
 - 1) Shall meet the requirements of 29 CFR 1910.23(e) for standard railings.
 - 2) Railings shall not be made of wood or materials that will be subject to degradation due to the effects of the rain or sun.
4. **Safety of Vehicular Areas:**
 - a. **Traffic Signs and Signals:** The Contractor shall provide highly visible signs and signals as necessary, in both the temporary and permanent situation, to regulate traffic for safety and convenience. They shall:
 - 1) Comply with requirements of the ACP and MOP for placement and design.
5. **Thermal Comfort:** Provide pavements and surfacing at parking lots with minimum initial reflectivity of 0.3 to reduce solar heat gain.
6. **Accessibility:**
 - a. **Parking:** The minimum parking requirements for employees and for occasional visitors within the fenced Site including parking lots [PLE] and [PLV] (other than the temporary buildings for the Contractor or Employer's Representative) are specified in Section 01 81 36 (*O&M*

Buildings and Facilities – Program) and Section 01 81 36.13 (*O & M Buildings and Facilities – Space Programming*).

- b. **Walkways:** ^{A7} Shall be located where indicated in Section 01 81 36 (*O&M Buildings and Facilities – Program*) and Section 01 81 36.13 (*O & M Buildings and Facilities – Space Programming*) and other areas not mentioned but where access is required for operations and maintenance.^{A7}
- c. **Pedestrian Ramps:** ^{A7} Shall be located where indicated in Section 01 81 36 (*O&M Buildings and Facilities – Program*) and Section 01 81 36.13 (*O & M Buildings and Facilities – Space Programming*) and in other areas not mentioned, but where access is required for operations and maintenance.^{A7}

7. **Stair Comfort:**

- ^{A16}a. **Steepness:** The Contractor shall design exterior stairs with risers of not more than 165 mm and treads sized so that twice the riser height plus the tread depth totals 610 to 635 mm.
- b. **Landings:** The Contractor shall design exterior stairs with maximum rise of not more than 2.5 m between landings.

8. **Noise Control:** Design paving at parking lots, roadways, and driveways that minimizes noise from automobile tires due to rough surface texture and paving joints.^{A16}

9. **Ramp Comfort:**

- ^{A5}a. **Pedestrian Ramps:** Slopes shall meet the requirements of ANSI A117.1.^{A5}
- ^{A5}b. **Landings:** For ramps shall meet the requirements of ANSI A117.1.^{A5}

10. **Appearance:**

- ^{A16}a. **Vehicular Paving:** Design paving to achieve plain, utilitarian appearance.
- b. **Pedestrian Walkways, Ramps and Stairs:** Design pedestrian walking surfaces that contrast with vehicular paving.
- c. **Curbs and Gutters:** Design smooth, rounded shapes that contrast with roadway, and walkway surfaces for maximum visibility.
- d. **Railings, Handrails, Guardrails, and Protective Walls:** Design materials and finishes that are consistent with building exterior in appearance.^{A16}

11. ^{A7}Where pedestrian access is alongside paved areas that are not intended for pedestrian use, the area for pedestrian use shall be clearly identified and defined by paint or other means.^{A7}
12. ^{A7}The main roadway within each lock complex shall be located a minimum distance of 46 m from all structure and 15 m from the fence, which shall, in turn, be located at least 150 m from the face of the lock wall.^{A7}

B. Exterior Site Enclosures:

1. Fences:

- a. ^{A7}Shall provide a physical barrier that separates the lock complex from the surrounding areas.^{A7}
- b. Shall be located a minimum of 50 m from all structures within the facility and a minimum of 150 m from the face of the lock wall.
- c. ^{A7}Shall terminate at the upper and lower boundaries in a manner the will ensure the security of the complex from land or water.^{A7}

2. Gates:

- a. Pedestrian and vehicular access gates shall be located at guard booths and guard houses. Refer to Section 01 81 36 (*O&M Buildings and Facilities – Program*) and drawings VF-1706-118-3 and VF-1706-118-103 ^{A17}provided in Volume VI, Part 1 ^{A17} for proposed locations.
- b. Provide road blockers at entry and exit roads located at the main gate and Guard House [GH] and at the secondary gates that control access/exit of vehicles to the bridgeways of each lock complex. The road blockers shall be on the exterior side of the gates and shall meet the requirements of Section 28 16 46 (*Vehicular Control Systems (VCSs)*).
- c. Provide rising arm barriers at entry and exit roads located at the main gate and Guard House [GH] and at the gates that control access/exit of vehicles to the bridgeways of each lock complex. The rising arm barriers shall effectively restrict vehicle access when the arm has been lowered, and shall meet the requirements of Section 28 16 46 (*Vehicular Control Systems (VCSs)*).

C. ^{A16}(Reserved) ^{A16}

1.04 ^{A7}DESIGN CRITERIA/SYSTEM DESCRIPTION AND PERFORMANCE:^{A7}

A. ^{A7}Pavements and Surfacing:^{A7}

1. **Exterior Stairs, Ramps, and Elevated Walkways:** Capable of supporting loads in excess of those required by code and meet the requirements, as follows:
 - a. **Live Load:** Minimum 7.5 kPa.

- b. **Concentrated Load:** ^{A7}Minimum 1,780 N at any point.^{A7}
 - c. **Minimum Widths:** Sized to allow comfortable two-way traffic.
 - 1) **Main Entrance:** ^{A7}1,830 mm.^{A7}
 - 2) **Secondary Entrances and Emergency Exits:** ^{A7}1,220 mm.^{A7}
 - 3) **Major Routes:** ^{A7}1,525 mm.^{A7}
 - 4) **Secondary Routes:** ^{A7}1,220 mm.^{A7}
 - d. **Handrails, Railings, or Protective Walls:** Required when pedestrian surfaces are more than 300 mm above adjacent grade and shall be designed for the design life in the marine tropical environment of the site. This requirement applies at the Water Saving Basins and Gate Recesses but does not apply to the chamber side of the Lock Walls and Approach Structures.
 - e. Access along lock walls and between lock levels shall provide surfaces that are adequate for the working conditions required for the line handlers and personnel involved in lockage operations.
 - f. Use of the following is not permitted for Pedestrian areas:
 - 1) Decorative concrete topping
 - 2) Brick pavers
 - 3) Asphalt pavers
 - 4) Concrete pavers
 - 5) Stone pavers
 - 6) Turf reinforcement paving system
 - 7) River-washed gravel over compacted sub-base
 - 8) Crushed stone over compacted sub-base
2. **Exterior Handrails, Guards, and Guardrails:** Capable of resisting forces in excess of those required by code and meet the requirements, as follows:
- a. **Uniform Load:** Minimum 0.75 kN/m applied in any direction at the top.
 - b. **Concentrated Load:** Minimum 890 N applied in any direction at any point along the top.
 - c. **Normal Load to Intermediate Rails or Guard:** Minimum 220 N horizontally applied to area of not more than 305 mm square.

- d. Shall be designed for the design life in the marine tropical environment of the ^{A17}Site. ^{A17}

3. **Roadways and Driveways:**

- a. Comply with recommendations of AASHTO GDHS-5.
- b. **Minimum Widths:** Traffic lanes not less than 3.65 m wide.
- c. **Maximum Slopes:** 1:10.
- d. **Curbs:** Minimum 150 mm mountable curbs at all roadways and driveways.
- e. **Gutters:** Minimum 300 mm width, designed in accordance with AASHTO recommendations, located on one side of all roadways and driveways. Water from gutters shall flow into the system as required by Section 01 86 36 (*Drainage Systems*).
- f. **Traffic Lanes and Directional Markings:** Permanent and highly visible, minimum width of 100 mm.
- g. ^{A7}Roadways shall be continuous around buildings and structures to permit access by the shortest possible routes^{A7}
- h. ^{A7}**Minimum Estimated Vehicular Traffic:**^{A7}
 - 1) **Sedan/SUV:** Daily – 25 per day, Maintenance – 75 per day
 - 2) ^{A7}**Pickups, 10T Cranes:**^{A7} Daily – 15 per day, Maintenance – 40 per day
 - 3) ^{A7}**10T Trucks, 25T Cranes:**^{A7} Daily – 10 per day, Maintenance – 75 per day
 - 4) ^{A7}**20T Trucks, 40T Cranes:**^{A7} Daily – 4 per day, Maintenance – 15 per day
- i. Use of the following is not permitted for Vehicular paving:
 - 1) Decorative concrete topping
 - 2) Brick pavers
 - 3) Asphalt pavers
 - 4) Concrete pavers
 - 5) Stone pavers
 - 6) Turf reinforcement paving system
 - 7) River-washed gravel over compacted sub-base

- 8) Crushed stone over compacted sub-base
- ^{A16}j. Roads that will be subject to high volume traffic or used by heavy equipment (20T trucks, cranes) shall be designed utilizing concrete pavement.^{A16}
- k. The design of roads leading to the main entrance to the locks shall be designed to ensure that vehicles cannot approach the guard booth at high speeds. The purpose is to ensure that the vehicles do not constitute a threat to the security of the area.
- l. All pavements in the vicinity of operations buildings shall be designed to support the loads imposed by the equipment required for operations and maintenance activities.
- 4. ^{A7}**Parking Areas Other than the Temporary Areas for the Contractor or Employer's Representative.**^{A7}
 - a. **Minimum Width of Parking Spaces:** 2.75 m.
 - b. **Bumpers or Wheel stops:** Located and sized to prevent damage to fixed objects, or excessive encroachment on pedestrian walkways.
 - c. **Space Markings:** Permanent and highly visible (day and night), minimum width of 100 mm.
 - d. **Parking Signage:** As required by code and project program.
- 5. The Contractor shall design all paved surfaces for Service Life Span of Paved Surfaces: ^{A7}20 years, under daily use.^{A7}
- ^{A16}6. The Contractor shall design pavement to accommodate traffic as follows, based on procedures in AASHTO GDPS-4 and GDPS3-V2, Guide for Design of Pavement Structures:^{A16}
 - a. **Category A:** Parking areas and access lanes for autos, pickups, and panel trucks only.
 - b. **Category A1:** Truck access lanes for average daily truck traffic of 1 vehicle with 6 wheels or more.
 - c. **Category B:** Parking entrance areas and major service lanes, with average daily traffic of 25 vehicles with 6 wheels or more.
 - d. **Category B1:** Parking areas and interior traffic lanes for buses or trucks, with average daily traffic of up to 25 vehicles.
 - e. **Category C:** Parking entrances and exterior traffic lanes for buses or light trucks, with average daily traffic of up to 25 vehicles.

- f. **Category D:** Parking entrances and exterior traffic lanes for heavy trucks, with average daily traffic of up to 25 vehicles.

B. ^{A7}**Exterior Site Enclosures:**^{A7}

1. **Fences and Barriers Other Than Building Exterior Walls:**

- a. **Security Level 1:** At locations where performance is specified as to inhibit passage of people.
 - 1) ^{A7}2,130 mm high.^{A7}
 - 2) ^{A7}Not climbable without use of portable stairs or other equipment.^{A7}
 - 3) Maximum opening size 25 mm.
- b. **Security Level 2:** At locations where performance is specified as to prevent passage of people.
 - 1) ^{A7}2,440 mm high.^{A7}
 - 2) ^{A7}Not climbable without use of portable stairs or other equipment.^{A7}
 - 3) Maximum opening size 50 mm.
 - 4) Minimum 300 mm overhang on outside.
- c. **Security Level 3:** Perimeter fence.
 - 1) ^{A7}2,440 mm high.^{A7}
 - 2) ^{A7}Not climbable without use of portable stairs or other equipment.^{A7}
 - 3) Maximum opening size 50 mm.
 - 4) Minimum 300 mm overhang on the inside and outside.
 - 5) Sharp material on top of fence.
- d. **Service Life:**
 - 1) **Fence and Gates:** 15 years under normal use and weather.
- e. **Weather Resistance:** Same as specified for components of exterior shell in Section 01 83 00 (*Facility Shell Performance Requirements*).
- f. Use one of the following:
 - 1) Galvanized chain link fencing at the perimeter fence.
 - 2) Vinyl-coated chain link fencing at the perimeter fence.

- 3) Aluminized chain link fencing at the perimeter fence.
- 4) ^{A4} (Reserved) ^{A4}
- 5) ^{A4} (Reserved) ^{A4}
- g. Perimeter fence for the locks shall be located a minimum of 50 m from structures.
- h.. ^{A7}Fence and gates shall meet the requirements of Subparagraph 1.02 H. except as modified above. ^{A7}

2. **Visual Barriers:**

- a. Use one of the following:
 - 1) Chain link fencing with privacy slats.
 - 2) Walls constructed of same materials as the building.
 - 3) Walls constructed of any materials specified as acceptable for building (not necessarily matching).
 - 4) Hedges or other plantings.

3. **Sound Barriers:**

- a. Use one of the following:
 - 1) Pre-cast concrete.
 - 2) Masonry.

C. ^{A16} (Reserved) ^{A16}

1.05 ^{A7}SUBMITTALS: ^{A7}

- A. ^{A7}All drawings, specifications and other submittals shall be submitted in accordance with the requirements of Section 01 33 00 (*Submittal Procedures*) and the requirements of this Section for the following phases: ^{A7}
- B. ^{A16}**Intermediate Design:** When the design has advanced sufficiently for the Employer to review the proposed design the Contractor shall submit to the Employer's Representative. ^{A16}

1. **Drawings showing:**

- a. Items to be removed, relocated, or demolished
- b. Layout and dimensions of pedestrian walkway
- c. Layout and dimensions of roadways
- d. Layout and dimensions of parking areas

- e. The layout of the fence.
 - f. The location of the gates.
 - 2. **Documentation:**
 - a. ^{A16} (Reserved) ^{A16}
 - b. All relevant specifications
- C. ^{A7}**Final Design:** ^{A7} 42 days before construction begins the Contractor shall submit:
 - 1. **Final Drawings showing:**
 - a. Items to be removed, relocated, or demolished
 - b. Layout, dimensions and details of pedestrian walkway
 - c. Layout, dimensions, plan and profile, sections and details of roadways
 - d. Layout, dimensions, sections and details of parking areas
 - e. All signs and markings for roadways and parking areas
 - f. Layout of the fence.
 - g. Location of the gates.
 - ^{A16}h. (Reserved)
 - i. (Reserved) ^{A16}
 - 2. **Documentation:**
 - ^{A16}a. Analysis and design data for roadways.
 - b. Concrete design for roadways, pedestrian walkways, and paved areas.
 - c. (Reserved) ^{A16}
 - d. Connection details where paved areas adjoin the lock structures
 - ^{A16}e. (Reserved)
 - f. (Reserved) ^{A16}
 - g. All relevant specifications
- D. ^{A7}**After Construction:** ^{A7}
 - 1. ^{A16}**Drawings:** As-Built Drawings for all items identified for construction under this Section. ^{A16}

2. **Documentation:**

- ^{A16}a. (Reserved)
- b. (Reserved)
- c. (Reserved)^{A16}

1.06 ^{A7}**QUALITY ASSURANCE:**^{A7}

- A. ^{A7}The Contractor, through the Contractor's Quality Manager, shall verify conformance with the requirements of this Section. All requirements in Section 01 40 00 (*Quality Requirements*) shall apply to this Section.^{A7}
 - 1. ^{A16}The Contractor shall provide to the Employer's Representative for approval, the inspection procedures that will be carried out for the items in this Section.^{A16}
 - 2. ^{A17}The Contractor shall provide to the Employer's Representative for approval, the procedures for correcting noncompliance of the acceptance criteria at the Site or after installation.^{A17}
 - 3. ^{A16}(**Reserved**)^{A16}

END OF SECTION

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