

SECTION 28 16 46 – VEHICULAR CONTROL SYSTEMS (VCSs)

1.01 SUMMARY:

- A. ^{A16}**Scope:** Scope of work shall be in accordance with Paragraph 1.01 D. of Section 01 81 26 (Communications, Control, Safety, and Security Systems), as required, for operating areas and rolling gate crossings **as part of the Works.** ^{A16} This Section of the Employer's Requirements shall be read in conjunction with the Sections listed in Table 28 16 46-1.
- B. **Related Sections:**

Table 28 16 46-1: Related Sections		
1.	Section 01 81 26	- Communications, Control, Safety, and Security Systems.
2.	Section 01 81 36	- Operations and Maintenance Buildings and Facilities – Program.
3.	Section 09 96 00	- Corrosion Control Coatings.
4.	Section 26 33 00	- Direct Current Equipment.
5.	Section 28 13 00	- Access Control Systems.
6.	Section 28 23 00	- Closed Circuit Video Systems.
7.	Section 28 50 00	- Evacuation Systems.
8.	Section 40 95 13.13	- Process Control Hardware for Locks Machinery Control Systems.

1.02 REFERENCE:

- A. **Applicable Publications:** Refer to Section 01 81 26 (Communications, Control, Safety, and Security Systems), Paragraph 1.02.

1.03 REQUIREMENTS:

- A. **General Requirements:**
1. The Contractor shall meet all applicable requirements of Section 01 81 26 (Communications, Control, Safety, and Security Systems), Paragraph 1.03.
 2. Vehicular control devices shall be coordinated with the following:
 - a. The corresponding rolling gate (RG) roadway to bridgeway interfaces. Such interfaces shall be remotely controllable from the nearest guard booth or guard house.
 - b. Evacuation systems, in accordance with Section 28 50 00 (Evacuation Systems).

B. Equipment and Materials:

1. General:

- a. Cabinet/housing door shall have safety switches to cut off the power supply during maintenance operations.
- b. Equipment metal parts, unless aluminum or stainless steel, shall be protected to withstand Panama's tropical and salty environment by factory-applied coatings conforming to Section 09 96 00 (Corrosion Control Coatings).
- c. Rising arm barriers (RABs) and road blockers (RBs) shall have vandal and tamper resistant hardware and provisions to prevent compromising the equipment.
- d. RAB and RB operational temperature range shall be 0°C to +90°C.

2. Annunciators:

- a. RABs and RAB/RBs combinations shall be provided with visual annunciator mounted on cabinet or steel pole.
- b. Lamps shall be either red and green (one always on) like in vehicular traffic lights, or yellow or white (flashes when vehicle is detected, turns off when vehicle can cross).

3. Controllers:

- a. Control units shall be protected against dust, electrical, thermal overload, and any other natural condition which may stop its continuous operation.
- b. Logic controller units shall allow for uploading of logic changes.

3. Pushbutton Boxes: Shall be as required for manual control by the Employer's security guard.

4. Rising Arm Barriers (RABs):

- a. RABs shall be medium-speed, and designed to control vehicle access or egress at any time.
- b. The Employer prefers RAB housings made with 16 gauge or thicker stainless steel or a chromium-steel alloy sheet.
- c. RAB shall integrate a variable speed controller to allow opening and closing speed rate adjustments from 0.5 sec to 1.5 sec.
- d. Cabinet dimensions shall be approximately 1,067 mm (42 inch) high x 406 mm (16 inch) wide x 406 mm (16 inch) deep.
- e. The barrier arm shall be made of white enameled extruded aluminum tube with red reflecting stripes visible from both directions. The barrier aluminum arm tube shall be 3,048 mm (10 feet) long or slightly longer.
- f. The barrier arm shall feature balancing by adjustable extension springs or other proved effective mechanism.

- g. RAB provision shall include installation of integrated vehicle detector and security sensors to prevent gate closing with a person or vehicle in sensor detection area.
- h. RAB cabinet/housing door shall have safety switches to cut off the power supply during maintenance operations.
- i. RAB shall have vandal and tamper resistant hardware and provisions to prevent compromising the equipment.
- j. RAB shall be provided with arm rotational capability to allow easy reverse of arm from one side of the housing to the other when required.
- k. RAB shall be provided with arm swing-off capability to prevent vehicle or barrier damage under vehicle hitting arm event.
- l. RAB mechanism shall integrate a safety device which automatically opens the barrier in case of power failure.

5. **Road Blockers (RBs):**

- a. Units shall be heavy duty and designed to control vehicle access or egress at any time.
- b. RB cabinet/housing and obstacle construction shall be of heavy-gauge steel and allow thousands daily operations without failure.
- c. Cabinet dimensions shall be approximately 1,067 mm (42 inch) high x 406 mm (16 inch) wide x 406 mm (16 inch) deep.
- d. Power consumption in operation shall be less than 500 W.
- e. Height of raised obstacle shall be at least 350 mm.
- f. Length of obstacle: 2,040-2,980 mm (6.5-10 ft).
- g. Operation speed of barrier shall not exceed 3 seconds.
- h. Mechanical endurance (mean cycles between failures (MCBF)) shall be 1.106 cycles or better.
- i. RBs shall have emergency crank for manual operation in case of power failure.
- j. RB shall withstand an impact of a 3 tons vehicle at 90 km/h.

6. **Traffic Lights:**

- a. Standard traffic lights shall be furnished for vehicular traffic control, with green (go), red (no go), and yellow (warning) lamps.
- b. Lamp diameter shall be at least 150 mm, and light sources shall be light emitting diode (LED) arrays or long life light source.

7. **Warning Signs:** All RABs and RBs shall include warning signs large enough to be easily seen from a car trying to get out. If visual annunciator is monochrome (yellow or white), signs shall be similar to Figure 28 16 46-1, with white characters on red background (or other color combination with higher visibility) indicating “*Deténgase – No pase hasta que se apague la luz*” (Stop – Do not pass

until the light turns off) and “*Cuidado – Un auto a la vez*” (Warning – One Car at a Time).



Figure 28 16 46-1: Warning sign for RABs and RBs

- C. **Software:** Shall be furnished as required.
- D. **Installation:**
 - 1. **General:**
 - a. RABs and RBs shall be connected to a back-up power supply circuit for continuous operation.
 - 2. **Audio-Visual Annunciators:**
 - a. RAB control unit shall be equipped and connected to report visual and audible alarm to the guard house under barrier arm swing-off detection event.
 - 3. **Controllers:** RAB and RB logic control unit shall be interconnected to operate with manual 3-push buttons box, full automation mode, card readers suitable for Employer's access control system (ACS) cards, and combination of the three. For details on ACS cards, refer to Section 28 13 00 (Access Control Systems), Subparagraph 1.02 B. 1.
 - 4. **Pushbutton Boxes:** Shall be installed in guard booths and guard houses nearest RABs and RBs.
 - 5. **Rising Arm Barriers (RABs):** RABs shall be equipped for the following:
 - a. Entry and exit roads for employee parking areas.
 - b. Vehicular crossings or bridgeways over rolling gates.

6. **Road Blockers:**

- a. RBs shall be furnished wherever there is a RAB in main entrances, RG crossings, and safety critical points only.
- b. RB shall be installed directly below the RAB onto the road surface, preferably without pit or special infrastructure. Concrete slopes before and after obstacle shall be constructed as part of this Contract.

7. **Traffic Lights:**

- a. Units shall be installed on both ends of all two bridgeways or vehicular crossings across locks chambers, and in all internal road intersections. Such semaphores shall be protected against impact.
- b. Positioning of traffic lights shall not be slaved to RB operating mechanism.

8. **Warning Signs:**

- a. Signs shall be installed in entry and exit points near the applicable RABs and RBs.

1.04 DESIGN CRITERIA/SYSTEM PERFORMANCE:

A. **General:**

1. **Problem to be Solved:** Vehicular control systems shall solve the following business needs:
 - a. Block road access to vehicles of unauthorized persons and allow such access to vehicles of authorized persons.
2. **Restrictions to be Considered:** (reserved)

B. **Design Criteria:**

1. Vehicular control devices shall be operable on 120 VAC or 240 VAC @ 60 Hz, 125 VDC, or 24 VDC.
2. The Employer prefers operation based on direct current supplied by equipment in accordance with Section 26 33 00 (Direct Current Equipment).

C. **System Performance:**

1. **RABs and RBs:**

- a. RAB and RB control units shall allow integration and interconnection among them and traffic lights, as per Employer's Requirements.
- b. For inbound and outbound traffic, RAB and RB operation shall be controlled by logic control unit(s) to allow access control card reader based, manual, or fully automated operation. ACS card readers shall be required for employee entrances.

- c. RBs shall drop down before the corresponding RABs is raised to let vehicles pass.
- d. RABs and RBs shall provide safe and secure operation of all access roads which interconnect bridgeways over locks rolling gates.
- e. RABs and RBs shall be designed for no less than 12,000 operations per day and at least 5 million mean cycles between failures (MCBF) without intervention other than normal maintenance.

2. **Traffic Lights:**

- a. Lights for RG crossings shall be controlled by locks machinery control systems (LMCS) in accordance with Section 40 95 13.13 (Process Control Hardware for Locks Machinery Control Systems). Others traffic lights shall be provided with appurtenances for control by Employer's Personnel (security guards).
- b. Traffic lights for RG crossings shall only enable one direction at a time, and shall never turn green until the bridgeway interface enables adequate crossings over the RG.

1.05 SUBMITTALS: The following shall be submitted for substantiation purposes:

- A. **Design:** The following shall be in accordance with Section 01 81 26 (Communications, Control, Safety, and Security Systems), Paragraph 1.05 D.:
 - 1. Calculations, including system availability.
 - 2. Critical path method (CPM) diagram, with monthly updates.
 - 3. Descriptive literature.
 - 4. Drawings.
 - 5. Protection methods for corrosion, electrostatic discharge (ESD), fungus/humidity, lightning/surge, power distortion and harmonics, radio frequency interference / electromagnetic interference (RFI/EMI), thermal, and vibration.
 - 6. Quality assurance and control plans.
 - 7. Specifications.
 - 8. Strengths, weaknesses, opportunities, and threats (SWOT) analysis.
 - 9. Any other data required for review.
- B. **Re-submittals Just Prior to Purchasing Materials:** All items in Subparagraph A. above that have changed from original submittal shall be resubmitted in a design conference in accordance with Section 01 81 26 (Communications, Control, Safety, and Security Systems), Paragraph 1.05.
- C. **Upon Receipt of Shipped Items in Panama:**
 - 1. Instruction manuals for installation, maintenance, and operation.

- 2. Packing lists.
 - D. **Right After Factory Quality Control Tests (FQCT) and Factory Inspection Tests (FIT):**
 - 1. Quality control (QC) and FIT reports.
 - E. **Upon Receipt of Shipped Items in Panama:**
 - 1. Instruction manuals for administration, installation, maintenance, and operation.
 - 2. Packing lists.
 - F. **Prior to Issuance of Taking-Over Certificate:**
 - 1. As-built drawings.
 - 2. List of recommended spare parts.
 - 3. Software licenses.
 - 4. Final field inspection tests (FFIT) reports.
 - 5. Training services.
- 1.06 QUALITY ASSURANCE: Shall include the following in accordance with Section 01 81 26 (Communications, Control, Safety, and Security Systems), Paragraph 1.06:**
- A. Factory quality control tests (FQCT).
 - B. Training services for no less than six persons from the Employer's Personnel.
 - C. Final field inspection tests (FFIT).
 - D. Spare parts.
 - E. Warranty.

END OF SECTION

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