

SECTION 27 31 23 – IP-BASED TELEPHONE SYSTEMS

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*) for extending IP-based telephone systems from Gatun and Miraflores, as required for telephony services in the third set of locks of the Panama Canal as well as Agua Clara Substation. This Section of the Employer's Requirements shall be read in conjunction with the Sections listed in Table 27 31 23-1. ^{A16}

B. **Related Sections:**

| Table 27 31 23-1: ^{A8} Related Sections ^{A8} | | | |
|--|---------------------|---|---|
| 1. | Section 01 81 16.16 | - | Locks Appurtenances. |
| 2. | Section 01 81 26 | - | Communications, Control, Safety, and Security Systems. |
| 3. | Section 01 81 36 | - | Operations and Maintenance Buildings and Facilities - Program |
| 4. | Section 27 10 00 | - | Structured Cabling System for Communications Inside Plant. |
| 5. | Section 27 11 16 | - | Cabinets, Racks, Frames, and Enclosures. |
| 6. | Section 27 21 00 | - | Data Communications Equipment (DCE). |
| 7. | Section 27 31 33 | - | Radio-Telephone Communications Console Systems. |
| 8. | Section 27 53 13 | - | Time Synchronization Systems. |
| 9. | Section 33 82 00 | - | Communications Cabling for Outside Plant. |

1.02 REFERENCE:

- A. **Applicable Publications:** Refer to Section 01 81 26 (*Communications, Control, Safety, and Security Systems*), ^{A8}Paragraph 1.02^{A8}.

1.03 REQUIREMENTS:

A. **General Requirements:**

1. **General:** The ^{A8}Contractor^{A8} shall meet all applicable requirements of Section 01 81 26 (*Communications, Control, Safety, and Security Systems*), ^{A8}Paragraph 1.03^{A8}.
2. **Dialing Plan:**
 - a. Telephone extensions shall use seven digits and form a part of the national dialing plan.
 - b. There shall be no need to dial a prefix like 9 to go to the public telephone network.

3. **Interoperability and Coordination:**

- a. IP telephone systems for the new lock complexes shall interoperate with the Employer private telephone network as configured at the time of installation and commissioning.
- b. The ^{A8}Contractor^{A8} shall note and consider the following current data:
 - 1) As of ^{A8}April of 2008,^{A8}
 - a) The Employer private telephone network currently includes the following at Gatun and Miraflores: Nortel Meridian 1 Option No. 81C PABXs with release 25.40 software, Enterprise function package, and CDR. Employer PABXs are TDM, not IP based, and use A law for EIs and μ law for T1s.
 - b) The Employer's entire telephone network currently has approximately 11,421 extensions for fax and voice: 71.0% analog, 28.3% digital, and 0.7% IP.
 - 2) ^{A11}In mid 2008, the Employer replaced Gatun PABX and upgraded Miraflores PABX. Both became Nortel Communications Server 1000M MG CP-PIV.^{A11}
 - 3) ^{A11}As of December 2008, the Employer has installed signaling servers and upgraded Nortel software so that other PABXs have become IP communication servers. Main trunks are now IP type, and E1 and T1 trunks remain for backup.^{A11} A few redundant signaling servers are on order and will be added soon.

B. **Equipment and Materials:**

1. **Analog Telephone Sets:**

a. **Indoor Analog Telephone Sets:**

- 1) Phones for indoor use shall be "class type" with display.
- 2) Color shall be white.

b. **Outdoor Analog Telephone Sets:**

- 1) Phones for outdoor use shall be waterproof, intrinsically safe, and suitable for hazardous areas and for wall or pole mounting.
- 2) Units shall have a metal or heavy duty plastic body.

2. **Data Communications Equipment (DCE):** Shall be in accordance with Section 27 21 00 (*Data Communications Equipment*).

3. **Gateways:** Shall be as determined by ^{A8}Nortel^{A8} for the latest software.
4. **IP/SIP Phones:**
 - a. The units shall be full duplex, IP and SIP based, and web-enabled, and have media encryption support.
 - b. The sets shall have a voice mail message waiting lamp and the following or better characteristics:

| TABLE 27 31 23-2: ^{A8}IP/SIP Hard-Phone Characteristics^{A8} | | |
|--|---------------|--|
| Display | | Color screen, pixel driven, with either 3 lines x 24 characters, or 240 x 320 pixels |
| Keys | Fixed | 2 |
| | Programmable | 6 |
| | Soft keys | 4 |
| Line Appearances | | 6 |
| Multilingual Support | | English and Spanish |
| Ports | LAN Interface | Two Ethernet ports suitable for 100/1000 Mbps |
| | Other | One USB port |
| Power Supply | | POE class 2 or 3 compliant |
| Speakerphone | | Full duplex, suitable for hands-free operation |

- c. ITU-T H.323 compatibility is desirable.
- C. ^{A16}**Software and Licenses:** Shall be furnished as required to meet the Employer's Requirements and increase the number of telephone extensions to serve the third set of locks and Agua Clara Substation.^{A16} This shall include additional Nortel ISMs and licenses as required.
- D. **Installation:**
1. **General:**
 - a. The Employer will provide connectivity to existing IP communication servers in Miraflores **building 7D** and Gatun **building 24**.
 2. **Phone Patch:**
 - a. Each telephone system shall include a phone patch to the corresponding public address system. These shall require a 3 digit quick call number for access.
 - b. Priorities shall be 1 (highest) to the Main Control Building operator, 2 to canal protection personnel, and 3 to all other phone users. Lower priority voice communications to public address systems shall be interrupted by higher priority signals.

3. **Gateways:** Shall be no less than one for Atlantic Locks complex, and one for Pacific Locks complex, and shall be installed in the telecommunications room at the ground floor of the main control buildings.
4. **Telephone Sets:**
 - a. **Indoor Phones:**
 - a. Indoor analog phone sets shall be furnished for all emergency generator rooms, electrical rooms, passenger and special purpose elevator cars, machinery rooms, and maintenance shops.
 - b. Indoor IP/SIP phone sets shall be furnished in rooms in main control buildings.
 - c. Unless otherwise specified, the quantity of the above phone sets shall not be less than one unit for each 10 m² and shall include no less than one set for every emergency response site.
 - b. **Outdoor Phones:** Outdoor analog phone sets shall be furnished for the following:
 - 1) Crossunders, one at each end.
 - 2) Each designated meeting point in case of emergency.
 - 3) Poles of Section 01 81 16.16 (*Locks Appurtenances*), along each locks wall, at distances not to exceed 122 m (400').

1.04 DESIGN CRITERIA/SYSTEM PERFORMANCE:

A. General:

1. **Problem to be Solved:** Telephone systems shall solve the following business needs:
 - a. Provide connectivity to the Employer's private telephone network and the Republic of Panama's public telephone network.
 - b. Provide indoor and outdoor rated telephone sets.
 - c. Provide reliable telephone service in locations required for emergency response.
2. **Restrictions to be Considered:**
 - a. ^{A11}Equipment shall be fully compatible with make and models of existing Employer telephone systems in use at the time of installation.^{A11}

- B. **Design Criteria:** Existing ^{A8}Nortel^{A8} telephone systems at Gatun and Miraflores shall be expanded to cover Atlantic and Agua Clara Substation, and Pacific Locks complexes, respectively.

C. **System Performance:** IP-phone systems shall support the following functions:

1. ^{A8}The functionality of the telephone software in use by the Employer's Gatun telephone system at the time of installation of Atlantic Locks complex telephone equipment^{A8}.
2. The functionality of ^{A8}Nortel^{A8} software in use by the Employer's Miraflores telephone system at the time of installation of Pacific Locks complex telephone equipment.
3. Broadcast alerts to IP phone screens.
4. Zone paging.
5. Emergency communications.

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*), ^{A8}Subparagraph 1.05 D.^{A8}:

1. Calculations, including bandwidth requirements and system availability.
2. CPM diagram, with monthly updates.
3. Descriptive literature.
4. Drawings.
5. IT security methods.
6. Preliminary one-line diagram or sketch.
7. ^{A19}Protection methods for corrosion, ESD, fungus/humidity, lightning/surge, power distortion and harmonics, radio-frequency interference/electromagnetic interference (RFI/EMI), thermal, and vibration.^{A19}
8. Specifications.
9. SWOT analysis.
10. Any other data required for review.

B. **Re-submittals Just Prior to Purchasing Materials:** All items in 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. **Right After FQCT and FIT:**

1. Test reports.

D. **Upon Receipt of Shipped Items in Panama:**

1. Instruction manuals for administration, installation, maintenance, and operation.
2. Packing lists.

E. **Prior to Issuance of Taking-Over Certificate:**

1. As-built drawings.
2. List of recommended spare parts.

3. Software licenses.
4. Test 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*), ^{A8}Paragraph 1.06^{A8}:

- A. Factory Quality Control Tests (FQCT).
- B. Final Field Inspection Tests (FFIT).
- C. Warranty.

END OF SECTION