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|-------------------------------|------------------|-------------------|--------------------|
| PANAMA CANAL AUTHORITY | | VARIATION | PAGE 1 OF 9 |
| 1. REQUEST FOR PROPOSAL No.: | 2. CONTRACT No.: | 3. DATE: | |
| RFP-76161 | CMC-221427 | January 28, 2014 | |
| | | 4. VARIATION No.: | |
| | | 078 | |

5. ISSUED BY:

PANAMA CANAL AUTHORITY
Employer's Representative
Locks Project Management Division
Building 740, Corozal
Panama, Republic of Panama

| | |
|--|-----------------------------------|
| 6. NAME AND ADDRESS OF CONTRACTOR (INCLUDE PHYSICAL & POSTAL ADDRESS) | 7. CONTRACTOR'S TELEPHONE NUMBER: |
| Grupo Unidos por el Canal, S.A. Building 22B, Brujas Road Cocoli, Republic of Panama | 507-316-9900 |
| | 8. CONTRACTOR'S FACSIMILE NUMBER: |

9. VARIATION:



- ☒ The contract referred to in item No. 2 is hereby varied as set forth in item 10, entitled "DESCRIPTION OF VARIATION".
☒ YES. ☐ NO. The contractor shall send a copy, duly signed, of this Variation to the Employer's Representative/Contracting Officer.

| | |
|---|--|
| | 9 A. THIS VARIATION IS EXECUTED ON THE BASIS OF: (Specify the legal authority). THE VARIATION DESCRIBED IN ITEM 10 IS HEREBY INCORPORATED AND MADE A PART OF THE CONTRACT. |
| | 9 B. THE CONTRACT REFERRED TO IN ITEM NO. 2, IS VARIED TO INCORPORATE ADMINISTRATIVE CHANGES (such as the paying office, account numbers, etc.). |
| X | 9 C. THIS BILATERAL AGREEMENT IS SIGNED AND INCORPORATED INTO THE CONTRACT REFERRED TO IN ITEM NO. 2 OF THIS FORM, ON THE BASIS OF: (Specify the legal authority) Volume III, Conditions of Contract, Sub-Clause 1.16 [Entire Agreement].] |
| | 9 D. OTHER. (Specify manner and the legal authority). |
| | 9 E. ACCOUNT NUMBER (If required): |

10. DESCRIPTION OF THE VARIATION (List in accordance with the order of the Contract. If additional space is required, use blank sheets).

See attached

Except for the variation(s) herein specified, all other terms and conditions of the Contract remain unchanged.

| | | | |
|---|-----------|---|-----------|
| 11. NAME AND TITLE OF THE PERSON AUTHORIZED TO SIGN (Type or print) | | 12. NAME AND TITLE OF THE EMPLOYER'S REPRESENTATIVE/CONTRACTING OFFICER (Type or print) | |
| Bernardo Gonzalez Contractor's Representative | | Jorge de la Guardia, Employer's Representative | |
| 13. CONTRACTOR | 14. DATE: | 15. PANAMA CANAL AUTHORITY | 16. DATE: |
|  (Authorized signature) | 3/02/2014 |  (Employer's Representative/Contracting Officer's signature) | 28/I/2014 |

This Variation No. 078 is issued to reflect the following changes:

1. Allow the use of standard cables instead of the cables with the technical characteristics established in **Volume II, Part 2, Section 26 05 13 [Medium Voltage Cables]**- therefore in the subject Section:

1. Delete **Paragraph 1.02 B** in its entirety and replace it as follows:

“B. American National Standard Institute (ANSI) / Insulated Cable Engineers Association (ICEA) Standards:

ANSI / ICEA S-93-639 5-46 KV Shielded Power Cable for use in The Transmission and Distribution of Electric Energy”

2. Delete **Paragraph 1.03 D - Short-Circuit Capacity**, in its entirety and replace it as follows:

“D. Short Circuit Capacity: All medium-voltage cable feeders shall include a # 2/0 AWG bare copper ground conductor installed with the three-phase conductors in the same conduit.”

3. Delete **Paragraph 1.04 B.1 Medium-Voltage Power Cable**, in its entirety and replace it as follows:

“1. **Medium-Voltage Power Cable:** Shall be single-conductor, concentric-lay-stranded, copper conductor, tape shielded power cable, sizes as per requirements and with ethylene propylene rubber insulation, a 15-kV 133% insulation level, and polyvinyl chloride jacketing. It shall be able to withstand temperatures of at least 90 degrees centigrade for continuous normal operation, 130 degrees centigrade for emergency-overload conditions, and 250 degrees centigrade for short-circuit conditions. Cables are intended for general-purpose power use, with applications in wet or dry locations, including conduit, duct, cable tray, direct burial, submersible, and aerial installations. They shall have all black jacketing, but different color markers shall identify each cable phase. The cable shall meet the applicable requirements of ICEA S-93-639, AEIC CS-8, and UL 1072. However, where these specifications exceed the requirements set forth by those standards, these specifications shall apply. Cables shall be in accordance with the requirements of NFPA 70. All cable shall be identified by means of surface ink printing to indicate the manufacturer, conductor size, insulation type, voltage rating, and UL designations.

- a. **Conductor:** The conductor shall be soft drawn, Class B stranded, uncoated copper per ASTM B8, with the lengths and sizes required.

- b. **Conductor Shield:** The conductor shall have an extruded layer of semi-conducting thermosetting polymeric conductor shielding meeting the requirements of ICEA S-93-639. The thickness of the conductor shield shall be according to AEIC CS-8.
- c. **Insulation:** Cables shall utilize ethylene propylene rubber insulation meeting the requirements of ICEA Standard S-93-639. Insulation thickness shall be in accordance with AEIC CS-8.
- d. **Insulation Shielding:**
- 1) A layer of semi-conducting thermosetting material meeting the requirements of ICEA Standard S-93-639 shall be extruded over the insulation to serve as an electrostatic shield. The shield compound shall be compatible with the insulation and legibly identified as semi-conducting. The thickness of the shielding shall be in accordance with AEIC CS-8. Semi-conducting shielding shall be free stripping from the insulation with a strip tension of 27N to 107N (6 to 24 pounds) when tested in accordance with AEIC CS-8.
 - 2) **Metallic Shield:** Cable rated for a circuit nominal voltage of 15 kV (133% insulation), shall have helically applied copper tape directly over the extruded insulation shield. This tape shield shall meet the requirements of ICEA Standard S-93-639 and AEIC CS-8.
- e. **Outer Jacket:** The cable shall be provided with an overall black PVC jacket. The jacket shall be tight fitting, but allow for free stripping from the insulation shield. The jacket shall be suitable for dry and wet locations, meeting or exceeding the physical requirements of ICEA Standard S-93-639 and AEIC CS-8 and be sunlight resistant as per UL Standard 1072. Jacket shall be moisture and oil resistant and flame retardant."

The changes indicated above will result in a reduction of USD 485,617.32 to the Contract Price.

(Refer to Letters IAE-UPC-1092, GUPC-IAE-1550 and IAE-UPC-1456 and RFI 463)

2. Eliminate all activities related to the design, procurement, installation and testing of the Radio-Telephone Communications Console System (RTCCS) work as instructed by the Employer in letter IAE-UPC-1524 of May 14, 2013. Accordingly, the following provisions of the Employer's Requirements are hereby deleted:

| No. | Section | Eliminated Items |
|-----|--|---------------------------------|
| 1 | 01 81 26 Communications, Control, Safety, and Security Systems | Table 01 81 26-2, item 7, RTCCS |

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| No. | Section | Eliminated Items |
|-----|---|--|
| 2 | 12 59 83 Custom Systems Furniture | Table 12 59 83-1, item 5, RTCCS |
| 3 | 25 11 00 Data Processing Equipment | Paragraph 1.03.D.4, touch sensitive monitors |
| 4 | 27 21 33 IP Based Telephone Systems | Table 27 31 23-1, item 7, RTCCS |
| 5 | 27 31 33 Radio-Telephone Communications Console Systems | The entire section |
| 6 | 27 37 00 Multi-band Mobile Radio Communication Systems | Table 27 37 00-1, item 7, RTCCS |
| 7 | 40 95 13 Process Control Hardware | Table 40 95 13-1, item 10, RTCCS, and paragraph 1.03.B.24, RTCCS |

The changes indicated above will result in a reduction of USD 43,482.95 to the Contract Price.

(Refer to IAE-UPC-1524, GUPC-IAE-2004, IAE-UPC-1647)

3. Eliminate all activities related to the design, procurement, installation and testing of the Vessel Detection System (VDS) along with related wireless data transmission and reception, and portable terminals, as follows:

- A. **Volume II, Part 2, Section 25 11 00 [Data Processing Equipment (DPE)]:**
Delete **Paragraph 1.03 B.5** in its entirety and replace it with the following

“(Deleted)”

- B. **Volume II, Part 2, Section 27 21 00 [Data Communications Equipment (DCE)]** Delete **Paragraph 1.03 C.10** in its entirety and replace it with the following

“(Deleted)”

- C. **Volume II, Part 2, Section 27 37 00 [Multi-Band Mobile Radio Communications System].**

1. Delete **Paragraph 1.01 C.2** in its entirety and replace it with the following:

“2. Note that this Contract excludes radio base stations for communications in wide open areas.”

2. Delete **Paragraph 1.03 B** in its entirety and replace it as follows:

“(Deleted)”

- D. **Volume II, Part 2, Section 35 12 00 [Vessel Detection Systems (VDSs)]**

1. In **Paragraph 1.01 B**, delete **Table 35 12 00-1** in its entirety and replace

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it as follows:

| Table 35 12 00-1: Related Sections | | |
|------------------------------------|---------------------|--|
| 1. | Section 01 81 26 | Communications, Control, Safety, and Security Systems. |
| 2. | Section 25 11 00 | Data Processing Equipment. |
| ^{A3} 3 | Deleted | |
| ^{A3} 4 | Deleted | |
| ^{A3} 5 | Deleted | |
| ^{A3} 6 | Section 40 00 00 | - Process Systems Integration. |
| ^{A3} 7 | Section 40 91 00 | - Primary Process Measurement Devices. |
| ^{A3} 8 | Section 40 94 43 | - Programmable Logic Controllers (PLCs). |
| ^{A3} 9 | Section 40 95 13 | - Process Control Hardware. |
| ^{A3} 10 | Section 40 95 45 | - Process Control Software. |
| ^{A3} 11 | Section 40 96 45.13 | - Process Control Software for LMCSS. |

2. Delete **Paragraph 1.03 A.2.b** in its entirety and replace it as follows:

“(Deleted)”

3. Relocate **Paragraph 1.03 C.2** into new **Paragraph 1.03 A.7** as follows:

“7. Several technologies may be considered for this system. If using LASER or light detection and ranging (LIDAR) sweep detection / distance sensing, microwave array, or similar technology, multiple sensors shall be provided as required to meet these requirements. Use of radio frequency identification (RFID) technology is acceptable if it can reach the required distances and if feasible to meet these requirements at the time of installation.”

4. Delete **Paragraph 1.03 C.**, including c.1 through c.9 in its entirety and replace it as follows:

“(Deleted)”

5. Delete **Paragraph 1.03 E.1** in its entirety and replace it as follows:

“(Deleted)”

6. Delete **Paragraph 1.03 E.2.b** in its entirety and replace it as follows:

“(Deleted)”

7. Delete **Paragraph 1.03 F.2** in its entirety and replace it as follows:

“(Deleted)”

8. Delete **Paragraph 1.03 ~~G.2~~** in its entirety and replace it as follows:

"(Deleted)"

9. Delete **Paragraph 1.03 H.3** in its entirety and replace it as follows:

"(Deleted)"

10. Delete **Paragraph 1.04 A.1.b** in its entirety and replace it as follows:

"(Deleted)"

11. Delete **Paragraph 1.04 A.1.c** in its entirety and replace it as follows:

"(Deleted)"

12. Delete **Paragraph 1.04 A.1.d** in its entirety and replace it as follows:

"(Deleted)"

13. Delete **Paragraph 1.04 B.2** in its entirety and replace it as follows:

"2. HMI displays shall be designed considering the input of Employer's Personnel (locks operators) as end users."

14. Delete **Paragraph 1.04 C.1.a** in its entirety and replace it as follows:

"(Deleted)"

15. Delete **Paragraph 1.04 C.1.d** in its entirety and replace it as follows:

"(Deleted)"

16. Delete **Paragraph 1.04 C.1.f** in its entirety and replace it as follows:

"(Deleted)"

17. Delete **Paragraph 1.04 C.1.g** in its entirety and replace it as follows:

"(Deleted)"

18. Delete **Paragraph 1.04 C.1.h** in its entirety and replace it as follows:

"(Deleted)"

19. Delete **Paragraph 1.04 C.5. a. through g.** in its entirety and replace it as follows:



“(Deleted)”

20. Delete **Paragraph 1.05 A.6** in its entirety and replace it as follows:

“(Deleted)”

E. Volume II, Part 2, Section 40 91 00 [Primary Process Measurement Devices]

1. Delete **Paragraph 1.03 C. 11 a.** , previously agreed upon in Variation No. 026, and replace it as follows:

“a. One anemometer shall be provided for each end of the locks, with data for use by the locks and the Employer’s Personnel through the LMCS System.

2. Delete **Paragraph 1.03 B.16.a** in its entirety and replace is as follows:

“a. Sensors for vessel presence detection shall be suitable for multiple vessel hull colors and shapes, as applicable, and shall operate reliably considering the presence of one or more tugs near the vessel as per Section 35 12 00 (*Vessel Detection Systems*).”

F. Volume II, Part 2, Section 40 96 45.13 [Process Control Software for LMCs]

1. Delete **Paragraph 1.04 B.7.f** in its entirety and replace it as follows:

“f. **Detected Vessel in Lock:** Vessel detection system (VDS) shall be indicated as waves or light screens traveling across the Chamber from the sensor location, depending on the technology of the sensor used. When a vessel is detected, the animation shall depict reflection from a Vessel.”

2. Delete **Paragraph 1.04 B.7.g** in its entirety and replace it as follows:

“(Deleted)”

3. Delete **Paragraph 1.04 E.2.j** in its entirety and replace it as follows:

“j. **VDS Validation (applicable only to LMCS):** This file shall contain the logic necessary to validate the presence of a vessel and sensor health.”

The changes indicated above will result in a reduction of USD 914,123.00 of the Contract Price.

(Refer to RFI-372, Letters IAE-UPC-0863, GUPC-IAE-1072, IAE-UPC-0978, GUPC-IAE-1159, IAE-UPC-1034, GUPC-IAE-1356, IAE-UPC-1288, GUPC-IAE-1572, IAE-UPC-1526, GUPC-IAE-1951, IAE-UPC-1646, GUPC-IAE-2092, GUPC-IAE-2362)

4. Eliminate the pedestrian semaphores (8 semaphores in total for both sites) including supply/installation of all components and systems testing services (FIT and FFIT), on the Rolling Gates located in Lock Heads 2 and 3, as follows:

Volume II, Part 2, Section 35 10 00 [Waterway and Marine Signaling and Control Equipment]

1. - Delete Paragraph 1.03.A.2.c. in its entirety and replace it as follows:

"(Deleted)"

2. Delete Paragraph 1.03 D.5.b in its entirety and replace it as follows:

"(Deleted)"

3. - Delete Paragraph 1.04 C.7 in its entirety and replace it as follows:

"(Deleted)"

The changes indicated above will result in a reduction of USD 13,001.60 of the Contract Price.

(Refer to RFI-466, Letters IAE-UPC-1280, GUPC-IAE-1824, IAE-UPC-1483, GUPC-IAE-1945, IAE-UPC-1574, GUPC-IAE-1983)


5. To change the NEMA ratings for floor mounted cabinets for Process Control Systems (PCSs), as follows:

Volume II, Part 2, Section 27 11 16 [Cabinets, Racks, Frames and Enclosures]

1. Delete Paragraph 1.02 B.1.b in its entirety and replace it as follows:

"b. The enclosures to be installed in non-air conditioned environments shall

be heavy-duty, dust-tight, watertight, corrosion resistant, NEMA 4X per NEMA 250, designed to house electrical control equipment, constructed of code gauge steel sheet metal, with all seams welded and all doors with neoprene gaskets. Enclosures to be installed in air-conditioned environment shall be



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NEMA 12. Enclosure dimensions shall be adequate for the application and conform to applicable codes and standards."

2. Delete **Paragraph 1.02 B.1.e** in its entirety and replace it as follows:

"e. All doors of wall mounted cabinets shall have continuous hinges. The width of each door section shall not exceed 610 mm (24") and 800 mm (31.5") for wall and floor mounted units, respectively."

3. Delete **Paragraph 1.02 B.1.g** in its entirety and replace it as follows:

"g. Cabinets shall be for floor or wall mounting. Floor mounted cabinets shall be adequately sized for the application. Wall mounted cabinets shall be no larger than 914 mm (36") high and 305 mm (12") deep."

4. Delete **Paragraph 1.02 B.1.h** in its entirety and replace it as follows:

"h. All control cabinets and wiring boxes to be installed in non-air-conditioned environments shall be supplied with a dry heater for operation from 120 VAC, 60 Hz, single phase, with a suitable watt rating to keep humidity from condensing."

5. Delete **Paragraph 1.02 B.1.n.6 (Lines 1-3)** in its entirety and replace it as follows:

"6. **Temperature Control:** Control cabinets to be installed in non-air-conditioned environments shall include a PLC/RIO controlled cabinet temperature control loop using a thermostat for temperature sensing, a heat exchanger, to cool down the cabinet to..."

6. **Paragraph 1.03 A.5 remains as changed in Variation No. 072.**

The changes indicated above will result in a reduction of USD 300,002.00 of the Contract Price.

(Refer to RFI-400, RFV-106A, Letters IAE-UPC-1108, GUPC-IAE-1379, IAE-UPC-1214, GUPC-IAE-1404, IAE-UPC-1234, GUPC-IAE-1441, IAE-UPC-1292, GUPC-IAE-1554)

The total of all the changes reflected in this Variation No. 078, will result in a reduction of USD1,756,226.87 of the Contract Price. There is no time impact to the Locks Contract as a consequence of this Variation.

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January 28, 2014

DCN: IAE-UPC-1887

Mr. Bernardo Gonzalez
Grupo Unidos por el Canal, S.A.
Building 22B, Brujas Road
Cocoli, Republic of Panama

Reference: Contract No. CMC-221427, Design and Construction of the Third Set of Locks,
Panama Canal

Subject: Variation No. 078

Dear Mr. Gonzalez:

Enclosed is Variation No. 078 to the above referenced contract, which supersedes previous Variation No. 078 dated December 13, 2013, transmitted with the Employer's letter No. IAE-UPC-1812.

Please sign Item 13 and complete Item 14 (Date Signed) on the Variation form enclosed. The duly signed variation agreement shall be returned promptly to Ms. Tere Abadia, or Mr. Elis A. Vargas G., Contract Specialists.

Sincerely yours,

Jorge de la Guardia
Employer's Representative
Locks Project Management Division

Enclosure