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**PART 1      GENERAL**

**1.1          SUMMARY**

- .1      Section Includes.
  - .1      Requirements and procedures for final control diagrams and operation and maintenance (O&M) manual, for building Energy Monitoring and Control System (EMCS) Work.

**1.2          RELATED SECTIONS**

- .1      Section 01 78 00 - Closeout Submittals.
- .2      Section 25 01 11 - EMCS: Start-up, Verification and Commissioning.
- .3      Section 25 05 01 - EMCS: General Requirements.
- .4      Section 25 05 02 - EMCS: Submittals and Review Process.

**1.3          DEFINITIONS**

- .1      BECC - Building Environmental Control Centre.
- .2      OWS - Operator Work Station.
- .3      For additional acryonyms and definitions refer to Section 25 05 01 - EMCS: General Requirements

**1.4          SUBMITTALS**

- .1      Submittals in accordance with Section 01 78 00 - Closeout Procedures, supplemented and modified by requirements of this Section.
- .2      Submit Record Documents, As-built drawings, Operation and Maintenance Manual to Department Representative in English.
- .3      Provide soft copies and hard copies in hard-back, 50 mm 3 ring, D-ring binders.
  - .1      Binders to be 2/3 maximum full.
  - .2      Provide index to full volume in each binder.
  - .3      Identify contents of each manual on cover and spine.
  - .4      Provide Table of Contents in each manual.
  - .5      Assemble each manual to conform to Table of Contents with tab sheets placed before instructions covering subject.

## **1.5 AS-BUILTS**

- .1 Provide 1 copy of detailed shop drawings generated in Section 25 05 02 - EMCS: Submittals and Review Process and include:
  - .1 Changes to contract documents as well as addenda and contract extras.
  - .2 Changes to interface wiring.
  - .3 Routing of conduit, wiring and control air lines associated with EMCS installation.
  - .4 Locations of obscure devices to be indicated on drawings.
  - .5 Listing of alarm messages.
  - .6 Panel/circuit breaker number for sources of normal/emergency power.
  - .7 Names, addresses, telephone numbers of each sub-contractor having installed equipment, local representative for each item of equipment, each system.
  - .8 Test procedures and reports: provide records of start-up procedures, test procedures, checkout tests and final commissioning reports as specified in Section 25 01 11 - EMCS: Start-up, Verification and Commissioning.
  - .9 Basic system design and full documentation on system configuration.
- .2 Submit for final review by Department Representative.
- .3 Provide before acceptance 4 hard and 1 soft copy incorporating changes made during final review.

## **1.6 O&M MANUALS**

- .1 Custom design O&M Manuals (both hard and soft copy) to contain material pertinent to this project only, and to provide full and complete coverage of subjects referred to in this Section.
- .2 Provide 2 complete sets of hard and soft copies prior to system or equipment tests.
- .3 Include complete coverage in concise language, readily understood by operating personnel using common terminology of functional and operational requirements of system. Do not presume knowledge of computers, electronics or in-depth control theory.
- .4 Functional description to include:
  - .1 Functional description of theory of operation.
  - .2 Design philosophy.
  - .3 Specific functions of design philosophy and system.
  - .4 Full details of data communications, including data types and formats, data processing and disposition data link components, interfaces and operator tests or self-test of data link integrity.
  - .5 Explicit description of hardware and software functions, interfaces and requirements for components in functions and operating modes.

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- .6 Description of person-machine interactions required to supplement system description, known or established constraints on system operation, operating procedures currently implemented or planned for implementation in automatic mode.
  - .5 System operation to include:
    - .1 Complete step-by-step procedures for operation of system including required actions at each OWS.
    - .2 Operation of computer peripherals, input and output formats.
    - .3 Emergency, alarm and failure recovery.
    - .4 Step-by-step instructions for start-up, back-up equipment operation, execution of systems functions and operating modes, including key strokes for each command so that operator need only refer to these pages for keystroke entries required to call up display or to input command.
  - .6 Software to include:
    - .1 Documentation of theory, design, interface requirements, functions, including test and verification procedures.
    - .2 Detailed descriptions of program requirements and capabilities.
    - .3 Data necessary to permit modification, relocation, reprogramming and to permit new and existing software modules to respond to changing system functional requirements without disrupting normal operation.
    - .4 Software modules, fully annotated source code listings, error free object code files ready for loading via peripheral device
    - .5 Complete program cross reference plus linking requirements, data exchange requirements, necessary subroutine lists, data file requirements, other information necessary for proper loading, integration, interfacing, program execution.
    - .6 Software for each Controller and single section referencing Controller common parameters and functions.
  - .7 Maintenance: document maintenance procedures including inspection, periodic preventive maintenance, fault diagnosis, repair or replacement of defective components, including calibration, maintenance, repair of sensors, transmitters, transducers, controller and interface firmware, plus diagnostics and repair/replacement of system hardware.
  - .8 System configuration document:
    - .1 Provisions and procedures for planning, implementing and recording hardware and software modifications required during operating lifetime of system.
    - .2 Information to ensure co-ordination of hardware and software changes, data link or message format/content changes, sensor or control changes in event that system modifications are required.
  - .9 Programmer control panel documentation: provide where panels are independently interfaced with BECC, including interfacing schematics, signal identification, timing diagrams, fully commented source listing of applicable driver/handler.

**PART 2      PRODUCTS (NOT USED)**

**PART 3      EXECUTION (NOT USED)**

**END OF SECTION**