

PART 1 GENERAL**1.1 ADMINISTRATIVE REQUIREMENTS**

- .1 Demonstrate scheduled operation and maintenance of equipment and systems to Owner's personnel two weeks prior to date of interim completion.
- .2 Owner: provide list of personnel to receive instructions, and co-ordinate their attendance at agreed-upon times.
- .3 Preparation:
 - .1 Verify conditions for demonstration and instructions comply with requirements.
 - .2 Verify designated personnel are present.
 - .3 Ensure equipment has been inspected and put into operation in accordance with Section 01 91 13.
 - .4 Ensure testing, adjusting, and balancing has been performed in accordance with Section 01 91 13 - GENERAL COMMISSIONING REQUIREMENTS and equipment and systems are fully operational.
- .4 Demonstration and Instructions:
 - .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at scheduled times, at the equipment location.
 - .2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.
 - .3 Review contents of manual in detail to explain aspects of operation and maintenance.
 - .4 Prepare and insert additional data in operations and maintenance manuals when needed during instructions.
- .5 Time Allocated for Instructions: ensure amount of time required for instruction of each item of equipment or system.
 - .1 Section 14 - Elevators: 14 hours of instruction spread over several formations.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for Departmental Representative's approval.
- .3 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.
- .4 Give time and date of each demonstration, with list of persons present.
- .5 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

1.3 QUALITY ASSURANCE

- .1 When specified in individual Sections requiring manufacturer to provide authorized representative to demonstrate operation of equipment and systems:
 - .1 Instruct Owner's personnel.
 - .2 Provide written report that demonstration and instructions have been completed.

PART 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 GENERAL**1.1 TRAINEES**

- .1 Trainees: personnel selected for operating and maintaining this facility. Includes Facility Manager, building operators, maintenance staff, security staff, and technical specialists as required.
- .2 Trainees will be available for training during later stages of construction for purposes of familiarization with systems.

1.2 INSTRUCTORS

- .1 Consultant will provide:
 - .1 Descriptions of systems.
 - .2 Instruction on design philosophy, design criteria, and design intent.
- .2 Contractor and certified factory-trained manufacturers' personnel: to provide instruction on the following:
 - .1 Start-Up, operation, shut-down of equipment, components and systems.
 - .2 Control features, reasons for, results of, implications on associated systems of, adjustment of set points of control and safety devices.
 - .3 Instructions on servicing, maintenance and adjustment of systems, equipment and components.
- .3 Contractor and equipment manufacturer to provide instruction on:
 - .1 Start-up, operation, maintenance and shut-down of equipment they have certified installation, started up and carried out PV tests.

1.3 TRAINING OBJECTIVES

- .1 Training to be detailed and duration to ensure:
 - .1 Safe, reliable, cost-effective, energy-efficient operation of systems in normal and emergency modes under all conditions.
 - .2 Effective on-going inspection, measurements of system performance.
 - .3 Proper preventive maintenance, diagnosis and trouble-shooting.
 - .4 Ability to update documentation.
 - .5 Ability to operate equipment and systems under emergency conditions until appropriate qualified assistance arrives.

1.4 TRAINING MATERIALS

- .1 Instructors to be responsible for content and quality.
 - .2 Training materials to include:
 - .1 "As-Built"; Contract Documents.
 - .2 Operating Manual.
 - .3 Maintenance Manual.
 - .4 Management Manual.
 - .5 TAB and PV Reports.
 - .3 Project Manager, Commissioning Manager and Facility Manager will review training manuals.
 - .4 Training materials to be in a format that permits future training procedures to same degree of detail.
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- .5 Supplement training materials:
 - .1 Transparencies for overhead projectors.
 - .2 Multimedia presentations.
 - .3 Manufacturer's training videos.
 - .4 Equipment models.

1.5 SCHEDULING

- .1 Include in Commissioning Schedule time for training.
- .2 Deliver training during regular working hours, training sessions to be 3 hours in length.
- .3 Training to be completed prior to acceptance of facility.

1.6 RESPONSIBILITIES

- .1 Be responsible for:
 - .1 Implementation of training activities,
 - .2 Coordination among instructors,
 - .3 Quality of training, training materials,
- .2 Departmental Representative will evaluate training and materials.
- .3 Upon completion of training, provide written report, signed by Instructors, witnessed by Departmental Representative.
- .4 Extent of training: estimate length of training required for the equipment or system of elevators in Division 14 according to the following indications:
 - .1 3 general safety trainings of 2 hours each.
 - .2 1 in-depth training for SPAC-OACI of 2 hours.
 - .3 2 trainings for the programming of 3 hours each.

1.7 TRAINING CONTENT

- .1 Training to include demonstrations by Instructors using the installed equipment and systems.
 - .2 Content includes:
 - .1 Review of facility and occupancy profile.
 - .2 Functional requirements.
 - .3 System philosophy, limitations of systems and emergency procedures.
 - .4 Review of system layout, equipment, components and controls.
 - .5 Equipment and system start-up, operation, monitoring, servicing, maintenance and shut-down procedures.
 - .6 System operating sequences, including step-by-step directions for starting up, shut-down, operation of valves, dampers, switches, adjustment of control settings and emergency procedures.
 - .7 Maintenance and servicing.
 - .8 Trouble-shooting diagnosis.
 - .9 Inter-Action among systems during integrated operation.
 - .10 Review of O&M documentation.
 - .3 Provide specialized training as specified in relevant Technical Sections of the construction specifications.
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1.8 VIDEO-BASED TRAINING

- .1 Manufacturer's videotapes to be used as training tool with Departmental Representative's review and written approval 1 month prior to commencement of scheduled training.

PART 2 PRODUCTS**2.1 NOT USED**

- .1 Not Used.

PART 3 EXECUTION**3.1 NOT USED**

- .1 Not Used.

END OF SECTION

PART 1 GENERAL**1.1 GENERAL**

- .1 Cx is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. Cx is performed after systems and integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved. Objectives:
 - .1 Verify installed equipment, systems and integrated systems operate in accordance with Contract Documents and design criteria and intent.
 - .2 Ensure appropriate documentation is compiled into the BMM.
 - .3 Effectively train O&M staff.
- .2 Contractor assists in Cx process, operating equipment and systems, troubleshooting and making adjustments as required.
 - .1 Systems to be operated at full capacity under various modes to determine if they function correctly and consistently at peak efficiency. Systems to be interactively with each other as intended in accordance with Contract Documents and design criteria.
 - .2 During these checks, adjustments to be made to enhance performance to meet environmental or user requirements.
- .3 Design Criteria: as per client's requirements or determined by designer. To meet Project functional and operational requirements.

1.2 COMMISSIONING OVERVIEW

- .1 Section 01 91 13.13 - Commissioning Plan.
- .2 For Cx responsibilities refer to Section 01 91 13.13 - Commissioning Plan.
- .3 Cx to be a line item of Contractor's cost breakdown.
- .4 Cx activities supplement field quality and testing procedures described in relevant technical sections.
- .5 Cx is conducted in concert with activities performed during stage of project delivery. Cx identifies issues in Planning and Design stages which are addressed during Construction and Cx stages to ensure the built facility is constructed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements. Cx activities includes transfer of critical knowledge to facility operational personnel.
- .6 Departmental Representative will issue Interim Acceptance Certificate when:
 - .1 Completed Cx documentation has been received, reviewed for suitability and approved by Departmental Representative.
 - .2 Equipment, components and systems have been commissioned.
 - .3 O&M training has been completed.

1.3 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS

- .1 Should equipment, system components, and associated controls be incorrectly installed or malfunction during Cx, correct deficiencies, re-verify equipment and components within the unfunctional system, including related systems as deemed required by Departmental Representative, to ensure effective performance.
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- .2 Costs for corrective work, additional tests, inspections, to determine acceptability and proper performance of such items to be borne by Contractor. Above costs to be in form of progress payment reductions or hold-back assessments.

1.4 PRE-CX REVIEW

- .1 Before Construction:
 - .1 Review Contract Documents, confirm by writing to Departmental Representative.
 - .1 Adequacy of provisions for Cx.
 - .2 Aspects of design and installation pertinent to success of Cx.
- .2 During Construction:
 - .1 Co-ordinate provision, location and installation of provisions for Cx.
- .3 Before start of Cx:
 - .1 Have completed Cx Plan up-to-date.
 - .2 Ensure installation of related components, equipment, sub-systems, systems is complete.
 - .3 Fully understand Cx requirements and procedures.
 - .4 Have Cx documentation shelf-ready.
 - .5 Understand completely design criteria and intent and special features.
 - .6 Submit complete start-up documentation to Departmental Representative.
 - .7 Have Cx schedules up-to-date.
 - .8 Ensure systems have been cleaned thoroughly.
 - .9 Complete TAB procedures on systems, submit TAB reports to Departmental Representative for review and approval.
 - .10 Ensure "As-Built" system schematics are available.
- .4 Inform Departmental Representative in writing of discrepancies and deficiencies on finished works.

1.5 CONFLICTS

- .1 Report conflicts between requirements of this section and other sections to Departmental Representative before start-up and obtain clarification.
- .2 Failure to report conflict and obtain clarification will result in application of most stringent requirement.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Submit no later than 4 weeks after award of Contract:
 - .1 Name of Contractor's Cx agent.
 - .2 Draft Cx documentation.
 - .3 Preliminary Cx schedule.
 - .2 Request in writing to Departmental Representative for changes to submittals and obtain written approval at least 3 weeks prior to start of Cx.
 - .3 Submit proposed Cx procedures to Departmental Representative where not specified and obtain written approval at least 3 weeks prior to start of Cx.
 - .4 Provide additional documentation relating to Cx process required by Departmental Representative.

1.7 COMMISSIONING DOCUMENTATION

- .1 Refer to Section 01 91 13.16 - Commissioning Forms: Installation Check Lists and Product Information (PI)/Performance Verification (PV) Forms for requirements and instructions for use.
- .2 Departmental Representative to review and approve Cx documentation.
- .3 Provide completed and approved Cx documentation to Departmental Representative.

1.8 COMMISSIONING SCHEDULE

- .1 Provide detailed Cx schedule as part of construction schedule in accordance with Section 01 32 16.19 - Construction Progress Schedule - Bar (GANTT) Chart.
- .2 Provide adequate time for Cx activities prescribed in technical sections and commissioning sections including:
 - .1 Approval of Cx reports.
 - .2 Verification of reported results.
 - .3 Repairs, retesting, re-commissioning, re-verification.
 - .4 Training.

1.9 COMMISSIONING MEETINGS

- .1 Convene Cx meetings following project meetings: this section and as specified herein.
- .2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.
- .3 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.
- .4 At 60 % construction completion stage. Departmental Representative to call a separate Cx scope meeting to review progress, discuss schedule of equipment start-up activities and prepare for Cx. Issues at meeting to include:
 - .1 Review duties and responsibilities of Contractor and subcontractors, addressing delays and potential problems.
 - .2 Determine the degree of involvement of trades and manufacturer's representatives in the commissioning process.
- .5 Thereafter Cx meetings to be held until project completion and as required during equipment start-up and functional testing period.
- .6 Meeting will be chaired by Departmental Representative, who will record and distribute minutes.
- .7 Ensure subcontractors and relevant manufacturer representatives are present at 60 % and subsequent Cx meetings and as required.

1.10 STARTING AND TESTING

- .1 Contractor assumes liabilities and costs for inspections. Including disassembly and re-assembly after approval, starting, testing and adjusting, including supply of testing equipment.

1.11 WITNESSING OF STARTING AND TESTING

- .1 Provide 14 days notice prior to commencement.
 - .2 Consultant to witness of start-up and testing.
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- .3 Contractor's Cx Agent to be present at tests performed and documented by sub-trades, suppliers and equipment manufacturers.

1.12 MANUFACTURER'S INVOLVEMENT

- .1 Factory testing: manufacturer to:
 - .1 Coordinate time and location of testing.
 - .2 Provide testing documentation for approval by Departmental Representative.
 - .3 Arrange for Departmental Representative to witness tests.
 - .4 Obtain written approval of test results and documentation from Departmental Representative before delivery to site.
- .2 Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems and review with Departmental Representative.
 - .1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.
 - .2 Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.
- .3 Integrity of warranties:
 - .1 Use manufacturer's trained start-up personnel where specified elsewhere in other divisions or required to maintain integrity of warranty.
 - .2 Verify with manufacturer that testing as specified will not void warranties.
- .4 Qualifications of manufacturer's personnel:
 - .1 Experienced in design, installation and operation of equipment and systems.
 - .2 Ability to interpret test results accurately.
 - .3 To report results in clear, concise, logical manner.

1.13 PROCEDURES

- .1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing and Cx.
- .2 Conduct start-up and testing in following distinct phases:
 - .1 Included in delivery and installation:
 - .1 Verification of conformity to specification, approved shop drawings and completion of PI report forms.
 - .2 Visual inspection of quality of installation.
 - .2 Start-up: follow accepted start-up procedures.
 - .3 Operational testing: document equipment performance.
 - .4 System PV: include repetition of tests after correcting deficiencies.
 - .5 Post-substantial performance verification: to include fine-tuning.
- .3 Correct deficiencies and obtain approval from Departmental Representative after distinct phases have been completed and before commencing next phase.
- .4 Document require tests on approved PV forms.
- .5 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by Departmental Representative. If results reveal that equipment start-up was not in accordance with requirements, and resulted in damage to equipment, implement following:
 - .1 Minor equipment/systems: implement corrective measures approved by Consultant.
 - .2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by Consultant.

- .3 If evaluation report concludes that major damage has occurred, Departmental Representative shall reject equipment.
 - .1 Rejected equipment to be remove from site and replace with new.
 - .2 Subject new equipment/systems to specified start-up procedures.

1.14 START-UP DOCUMENTATION

- .1 Assemble start-up documentation and submit to Departmental Representative for approval before commencement of commissioning.
- .2 Start-up documentation to include:
 - .1 Factory and on-site test certificates for specified equipment.
 - .2 Pre-start-up inspection reports.
 - .3 Signed installation/start-up check lists.
 - .4 Start-up reports,
 - .5 Step-by-step description of complete start-up procedures, to permit Departmental Representative to repeat start-up at any time.

1.15 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS

- .1 After start-up, operate and maintain equipment and systems as directed by equipment/system manufacturer.
- .2 With assistance of manufacturer develop written maintenance program and submit Departmental Representative for approval before implementation.
- .3 Operate and maintain systems for length of time required for commissioning to be completed.
- .4 After completion of commissioning, operate and maintain systems until issuance of certificate of interim acceptance.

1.16 TEST RESULTS

- .1 If start-up, testing and/or PV produce unacceptable results, repair, replace or repeat specified starting and/or PV procedures until acceptable results are achieved.
- .2 Provide manpower and materials, assume costs for re-commissioning.

1.17 START OF COMMISSIONING

- .1 Notify Departmental Representative at least 21 days prior to start of Cx.
- .2 Start Cx after elements of building affecting start-up and performance verification of systems have been completed.

1.18 INSTRUMENTS/EQUIPMENT

- .1 Submit to Departmental Representative for review and approval:
 - .1 Complete list of instruments proposed to be used.
 - .2 Listed data including, serial number, current calibration certificate, calibration date, calibration expiry date and calibration accuracy.
 - .2 Provide the following equipment as required:
 - .1 2-way radios.
 - .2 Ladders.
 - .3 Equipment as required to complete work.
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1.19 COMMISSIONING PERFORMANCE VERIFICATION

- .1 Carry out Cx:
 - .1 Under actual operating conditions, over entire operating range, in all modes.
 - .2 On independent systems and interacting systems.
- .2 Cx procedures to be repeatable and reported results are to be verifiable.
- .3 Follow equipment manufacturer's operating instructions.
- .4 EMCS trending to be available as supporting documentation for performance verification.

1.20 WITNESSING COMMISSIONING

- .1 Departmental Representative to witness activities and verify results.

1.21 AUTHORITIES HAVING JURISDICTION

- .1 Where specified start-up, testing or commissioning procedures duplicate verification requirements of authority having jurisdiction, arrange for authority to witness procedures so as to avoid duplication of tests and to facilitate expedient acceptance of facility.
- .2 Obtain certificates of approval, acceptance and compliance with rules and regulation of authority having jurisdiction.
- .3 Provide copies to Departmental Representative within 5 days of test and with Cx report.

1.22 COMMISSIONING CONSTRAINTS

- .1 Since access into secure or sensitive areas will be very difficult after occupancy it is necessary to complete Cx of occupancy, weather, and seasonal sensitive equipment and systems in these areas before issuance of the Interim Certificate, using, if necessary, simulated thermal loads.

1.23 EXTRAPOLATION OF RESULTS

- .1 Where Cx of weather, occupancy, or seasonal-sensitive equipment or systems cannot be conducted under near-rated or near-design conditions, extrapolate part-load results to design conditions when approved by Departmental Representative in accordance with equipment manufacturer's instructions, using manufacturer's data, with manufacturer's assistance and using approved formulae.

1.24 EXTENT OF VERIFICATION

- .1 Elsewhere:
 - .1 Provide manpower and instrumentation to verify up to 30 % of reported results, unless specified otherwise in other sections.
 - .2 Number and location to be at discretion of Departmental Representative.
 - .3 Conduct tests repeated during verification under same conditions as original tests, using same test equipment, instrumentation.
 - .4 Review and repeat commissioning of systems if inconsistencies found in more than 20 % of reported results.
 - .5 Perform additional commissioning until results are acceptable to Departmental Representative.
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1.25 REPEAT VERIFICATIONS

- .1 Assume costs incurred by Departmental Representative for third and subsequent verifications where:
 - .1 Verification of reported results fail to receive Departmental Representative's approval.
 - .2 Repetition of second verification again fails to receive approval.
 - .3 Departmental Representative deems Contractor's request for second verification was premature.

1.26 SUNDRY CHECKS AND ADJUSTMENTS

- .1 Make adjustments and changes which become apparent as Cx proceeds.
- .2 Perform static and operational checks as applicable and as required.

1.27 DEFICIENCIES, FAULTS, DEFECTS

- .1 Correct deficiencies found during start-up and Cx to satisfaction of Departmental Representative.
- .2 Report problems, faults or defects affecting Cx to Departmental Representative in writing. Stop Cx until problems are rectified. Proceed with written approval from Departmental Representative.

1.28 COMPLETION OF COMMISSIONING

- .1 Upon completion of Cx leave systems in normal operating mode.
- .2 Except for warranty and seasonal verification activities specified in Cx specifications, complete Cx prior to issuance of Interim Certificate of Completion.
- .3 Cx to be considered complete when contract Cx deliverables have been submitted and accepted by Departmental Representative.

1.29 ACTIVITIES UPON COMPLETION OF COMMISSIONING

- .1 When changes are made to baseline components or system settings established during Cx process, provide updated Cx form for affected item.

1.30 TRAINING

- .1 In accordance with Section 01 79 00.13 - Demonstration and Training for Building Commissioning.

1.31 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS

- .1 Supply, deliver, and document maintenance materials, spare parts, and special tools as specified in contract.

1.32 OCCUPANCY

- .1 Cooperate fully with Departmental Representative during stages of acceptance and occupancy of facility.
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1.33 INSTALLED INSTRUMENTATION

- .1 Use instruments installed under Contract for TAB and PV if:
 - .1 Accuracy complies with these specifications.
 - .2 Calibration certificates have been deposited with Departmental Representative.
- .2 Calibrated EMCS sensors may be used to obtain performance data provided that sensor calibration has been completed and accepted.

1.34 PERFORMANCE VERIFICATION TOLERANCES

- .1 Application tolerances:
 - .1 Specified range of acceptable deviations of measured values from specified values or specified design criteria. Except for special areas, to be within +/- 10 % of specified values.
- .2 Instrument accuracy tolerances:
 - .1 To be of higher order of magnitude than equipment or system being tested.
- .3 Measurement tolerances during verification:
 - .1 Unless otherwise specified actual values to be within +/- 2 % of recorded values.

1.35 OWNER'S PERFORMANCE TESTING

- .1 Performance testing of equipment or system by Departmental Representative will not relieve Contractor from compliance with specified start-up and testing procedures.

PART 2 PRODUCTS**2.1 NOT USED**

- .1 Not Used.

PART 3 EXECUTION**3.1 NOT USED**

- .1 Not Used.

END OF SECTION

PART 1 GENERAL**1.1 GENERAL**

- .1 Provide a fully functional :
 - .1 Systems, equipment and components meet user's functional requirements before date of acceptance, and operate consistently at peak efficiencies and within specified energy budgets under normal loads.
 - .2 O&M personnel have been fully trained in aspects of installed systems.
 - .3 Optimized life cycle costs.
 - .4 Complete documentation relating to installed equipment and systems.
- .2 Term Cx; in this section means Commissioning.
- .3 Use this Cx Plan as master planning document for Cx:
 - .1 Outlines organization, scheduling, allocation of resources, documentation, pertaining to implementation of Cx.
 - .2 Communicates responsibilities of team members involved in Cx Scheduling, documentation requirements, and verification procedures.
 - .3 Sets out deliverables relating to O&M, process and administration of Cx.
 - .4 Describes process of verification of how built works meet Owner requirements.
 - .5 Produces a complete functional system prior to issuance of Certificate of Occupancy.
 - .6 Management tool that sets out scope, standards, roles and responsibilities, expectations, deliverables, and provides:
 - .1 Overview of Cx.
 - .2 General description of elements that make up Cx Plan.
 - .3 Process and methodology for successful Cx.
- .4 Acronyms:
 - .1 Cx - Commissioning.
 - .2 BMM - Building Management Manual.
 - .3 EMCS - Energy Monitoring and Control Systems.
 - .4 WHMIS Safety Data Sheets (SDS).
 - .5 PI - Product Information.
 - .6 PV - Performance Verification.
 - .7 TAB - Testing, Adjusting and Balancing.
 - .8 WHMIS - Workplace Hazardous Materials Information System.
- .5 Commissioning terms used in this Section:
 - .1 Bumping: short term start-up to prove ability to start and prove correct rotation.
 - .2 Deferred Cx - Cx activities delayed for reasons beyond Contractor's control due to lack of occupancy, weather conditions, need for heating/cooling loads.

1.2 DEVELOPMENT OF 100% CX PLAN

- .1 Cx Plan to take into account:
 - .1 Approved shop drawings and product data.
 - .2 Approved changes to contract.
 - .3 Contractor's project schedule.
 - .4 Cx schedule.
 - .5 Contractor's, sub-contractor's, suppliers' requirements.
 - .6 Project construction team's and Cx team's requirements.
 - .2 Submit completed Cx Plan to Departmental Representative and obtain written approval.
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1.3 REFINEMENT OF CX PLAN

- .1 During construction phase, revise, refine and update Cx Plan to include:
 - .1 Changes resulting from Client program modifications.
 - .2 Approved design and construction changes.
- .2 Revise, refine and update every 4 weeks during construction phase. At each revision, indicate revision number and date.
- .3 Submit each revised Cx Plan to Departmental Representative for review and obtain written approval.
- .4 Include testing parameters at full range of operating conditions and check responses of equipment and systems.

1.4 COMPOSITION, ROLES AND RESPONSIBILITIES OF CX TEAM

- .1 Departmental Representative to maintain overall responsibility for project and is sole point of contact between members of commissioning team.
- .2 Project Manager will select Cx Team consisting of following members:
 - .1 Design Quality Review Team: during construction, will conduct periodic site reviews to observe general progress.
 - .2 Quality Assurance Commissioning Manager: ensures Cx activities are carried out to ensure delivery of a fully operational project including:
 - .1 Review of Cx documentation from operational perspective.
 - .2 Review for performance, reliability, durability of operation, accessibility, maintainability, operational efficiency under conditions of operation.
 - .3 Protection of health, safety and comfort of occupants and O&M personnel.
 - .4 Monitoring of Cx activities, training, development of Cx documentation.
 - .5 Work closely with members of Cx Team.
 - .3 Departmental Representative is responsible for:
 - .1 Organizing Cx.
 - .2 Monitoring operations Cx activities.
 - .3 Witnessing, certifying accuracy of reported results.
 - .4 Witnessing and certifying TAB and other tests.
 - .5 Developing BMM.
 - .6 Ensuring implementation of final Cx Plan.
 - .7 Performing verification of performance of installed systems and equipment.
 - .8 Implementation of Training Plan.
 - .4 Construction Team: contractor, subcontractors, suppliers and support disciplines, is responsible for construction/installation in accordance with Contract Documents, including:
 - .1 Testing.
 - .2 TAB.
 - .3 Performance of Cx activities.
 - .4 Delivery of training and Cx documentation.
 - .5 Assigning one person as point of contact with Consultant and Cx Manager for administrative and coordination purposes.
 - .5 Contractor's Cx agent implements specified Cx activities including:
 - .1 Demonstrations.
 - .2 Training.
 - .3 Testing.
 - .4 Preparation, submission of test reports.
 - .6 Property Manager: represents lead role in Operation Phase and onwards and is responsible for:
 - .1 Receiving facility.

- .2 Day-To-Day operation and maintenance of facility.

1.5 CX PARTICIPANTS

- .1 Employ the following Cx participants to verify performance of equipment and systems:
 - .1 Installation contractor/subcontractor:
 - .1 Equipment and systems except as noted.
 - .2 Equipment manufacturer: equipment specified to be installed and started by manufacturer.
 - .1 To include performance verification.
 - .3 Specialist subcontractor: equipment and systems supplied and installed by specialist subcontractor.
 - .4 Client: responsible for intrusion and access security systems.
 - .5 Ensure that Cx participant:
 - .1 Could complete work within scheduled time frame.
 - .2 Available for emergency and troubleshooting service during first year of occupancy by user for adjustments and modifications outside responsibility of O&M personnel, including:
 - .1 Modify ventilation rates to meet changes in off-gassing.
 - .2 Changes to heating or cooling loads beyond scope of EMCS.
 - .3 Changes to EMCS control strategies beyond level of training provided to O&M personnel.
 - .4 Redistribution of electrical services.
 - .5 Modifications of fire alarm systems.
 - .6 Modifications to voice communications systems.
 - .6 Provide names of participants to Departmental Representative and details of instruments and procedures to be followed for Cx 1 month prior to starting date of Cx for review and approval.

1.6 EXTENT OF CX

- .1 Cx Structural and Architectural Systems:
 - .1 Architectural and structural:
 - .1 Vertical transportation systems:
 - .1 Elevators 1, 2, 2S, 3, 4, 5.
 - .2 Real-Mode elevator operation testing with fire alarm systems and emergency power.
 - .2 Commission mechanical systems and associated equipment:
 - .1 Plumbing and drainage networks
 - .2 HVAC and exhaust air systems
 - .1 Bi-block cooling systems
 - .3 Fire and life safety systems
 - .1 Underwater sprinkler systems (modified).
 - .4 Seismic protection and earthquake protection measures
 - .1 Compliance reports to be provided
 - .5 Control / regulation / control systems for IAQ and ambient conditions
 - .1 Control / regulation / control systems for ambient conditions in redeveloped areas.
- .3 EMS
- .4 Integration with existing EMS. Commission electrical systems and equipment:
 - .1 Low voltage below 750 V:
 - .1 Low voltage equipment.

- .2 Low voltage distribution systems.
- .2 Lighting systems:
 - .1 Lighting equipment.
 - .2 Distribution systems.
 - .3 Emergency lighting systems, including battery packs.
- .3 Fire alarm systems, equipment.

1.7 DELIVERABLES RELATING TO O&M PERSPECTIVES

- .1 General requirements:
 - .1 Compile French documentation.
 - .2 Documentation to be computer-compatible format ready for inputting for data management.
- .2 Provide deliverables:
 - .1 Warranties.
 - .2 Project record documentation.
 - .3 Inventory of spare parts, special tools and maintenance materials.
 - .4 Maintenance Management System (MMS) identification system used.
 - .5 WHMIS information.
 - .6 WHMIS Safety Data Sheets (SDS).
 - .7 Electrical Panel inventory containing detailed inventory of electrical circuitry for each panel board. Duplicate of inventory inside each panel.

1.8 DELIVERABLES RELATING TO THE CX PROCESS

- .1 General:
 - .1 Start-up, testing and Cx requirements, conditions for acceptance and specifications form part of relevant technical sections of these specifications.
- .2 Definitions:
 - .1 Cx as used in this section includes:
 - .1 Cx of components, equipment, systems, subsystems, and integrated systems.
 - .2 Factory inspections and performance verification tests.
- .3 Deliverables: provide:
 - .1 Startup, pre-Cx activities and documentation for systems, and equipment.
 - .2 Completed installation checklists (ICL).
 - .3 Completed product information (PI) report forms.
 - .4 Completed performance verification (PV) report forms.
 - .5 Results of Performance Verification Tests and Inspections.
 - .6 Tests of following witnessed by Design Quality Review Team:
 - .1 Heatpump.
 - .7 Training Plans.
 - .8 Cx Reports.
 - .9 Prescribed activities during warranty period.
- .4 Consultant to witness and certify tests and reports of results provided to Departmental Representative.
- .5 Departmental Representative to participate.

1.9 PRE-CX ACTIVITIES AND RELATED DOCUMENTATION

- .1 Items listed in this Cx Plan include the following:
 - .1 Pre-Start-Up inspections: by General Contractor prior to permission to start up and rectification of deficiencies to Departmental Representative's satisfaction.

- .2 General Contractor to use approved check lists.
 - .3 Consultant will monitor some of these pre-start-up inspections.
 - .4 Include completed documentation with Cx report.
 - .5 Conduct pre-start-up tests: conduct pressure, static, flushing, cleaning, and "bumping" during construction as specified in technical sections. To be witnessed and certified by Departmental Representative and does not form part of Cx specifications.
 - .6 Consultant will monitor some of these inspections and tests.
 - .7 Include completed documentation in Cx report.
 - .2 Pre-Cx activities - ARCHITECTURAL AND STRUCTURAL:
 - .2 Vertical transportation:
 - .1 Elevators 1, 2, 2S, 3, 4, 5.
 - .3 Pre-Cx activities - MECHANICAL:
 - .1 Plumbing systems:
 - .1 N/A.
 - .2 HVAC equipment and systems:
 - .1 "Bump" each item of equipment in its "stand-alone" mode.
 - .2 At this time, complete pre-start-up checks and complete relevant documentation.
 - .3 After equipment has been started, test related systems in conjunction with control systems on a system-by-system basis.
 - .4 Perform TAB on systems. TAB reports to be approved by Consultant.
 - .3 EMCS:
 - .1 EMCS trending to be available as supporting documentation for performance verification.
 - .2 Perform point-by-point testing in parallel with start-up.
 - .3 Carry out point-by-point verification.
 - .4 Demonstrate performance of systems, to be witnessed by Departmental Representative prior to start of 30 day Final Acceptance Test period.
 - .5 Perform final Cx and operational tests during demonstration period and 30 day test period.
 - .6 Only additional testing after foregoing have been successfully completed to be "Off-Season Tests".
 - .4 Pre-Cx activities - LIFE SAFETY SYSTEMS
 - .3 N/A.
 - .5 Pre-Cx activities - ELECTRICAL:
 - .1 Low voltage distribution systems under 750 V:
 - .1 Requires independent testing agency to perform pre- energization and post-energization tests.
 - .2 Perform a phase balance check (on load) for the distribution elements designated by the customer. Provide the load test procedure beforehand for approval.
 - .2 Emergency power generation systems.
 - .1 N/A.
 - .3 Lighting systems:
 - .1 Emergency lighting systems:
 - .1 Tests to include verification of lighting levels and coverage, initially by disrupting normal power.
 - .4 Fire alarm systems: test after other safety and security systems are completed. Testing to include a complete verification in accordance with ULC requirements. Witnessed and certified report, demonstrate devices and zones to Consultant.
 - .5 Low voltage systems: these include:
-

.1 N/A.

1.10 START-UP

- .1 Start up components, equipment and systems.
- .2 Equipment manufacturer, supplier, installing specialist sub-contractor, as appropriate, to start-up, under Contractor's direction, following equipment, systems:
- .3 Consultant to monitor some of these start-up activities.
 - .1 Rectify start-up deficiencies to satisfaction of Departmental Representative.
- .4 Performance Verification (PV):
 - .1 Approved Cx Agent to perform.
 - .1 Repeat when necessary until results are acceptable to Departmental Representative.
 - .2 Use procedures modified generic procedures to suit project requirements.
 - .3 Contractor to witness and certify reported results using approved PI and PV forms.
 - .4 Consultant to approve completed PV reports and provide to Departmental Representative.
 - .5 Departmental Representative will verify up to 30 % of reported results at random.
 - .6 Failure of randomly selected item shall result in rejection of PV report or report of system startup and testing.

1.11 CX ACTIVITIES AND RELATED DOCUMENTATION

- .1 Perform Cx by specified Cx agency using procedures developed by General Contractor and approved by Departmental Representative.
- .2 Consultant to monitor Cx activities.
- .3 Upon satisfactory completion, Cx agency performing tests to prepare Cx Report using approved PV forms.
- .4 General Contractor to witness, certify reported results of, Cx activities and forward to Departmental Representative.
- .5 Departmental Representative reserves right to verify a percentage of reported results at no cost to contract.

1.12 CX OF INTEGRATED SYSTEMS AND RELATED DOCUMENTATION

- .1 Cx to be performed by specified Cx specialist, using procedures developed by General Contractor and approved by Departmental Representative.
- .2 Tests to be witnessed by Consultant and/or Departmental Representative and documented on approved report forms.
- .3 Upon satisfactory completion, Cx specialist to prepare Cx Report, to be certified by Contractor and submitted to Departmental Representative for review.
- .4 Departmental Representative reserves right to verify percentage of reported results.
- .5 Integrated systems to include:
 - .1 HVAC and associated systems forming part of integrated HVAC systems.
 - .2 Fire alarm systems.
 - .3 Emergency power system (emergency supply only)

- .6 Identification:
 - .1 In later stages of Cx, before hand-over and acceptance Departmental Representative, Property Manager, Contractor and Cx Manager to co-operate to complete inventory data sheets and provide assistance in full implementation of MMS identification system of components, equipment, sub-systems, systems.

1.13 INSTALLATION CHECK LISTS (ICL)

- .1 Refer to Section 01 91 13.16 - Commissioning Forms: Installation Check Lists and Product Information (PI)/Performance Verification (PV) Forms.

1.14 PRODUCT INFORMATION (PI) REPORT FORMS

- .1 Refer to Section 01 91 13.16 - Commissioning Forms: Installation Check Lists and Product Information (PI)/Performance Verification (PV) Forms.

1.15 PERFORMANCE VERIFICATION (PV) REPORT

- .1 Refer to Section 01 91 13.16 - Commissioning Forms: Installation Check Lists and Product Information (PI)/Performance Verification (PV) Forms.

1.16 DELIVERABLES RELATING TO ADMINISTRATION OF CX

- .1 General:
 - .1 Because of risk assessment, complete Cx of occupancy, weather and seasonal-sensitive equipment and systems in these areas before building is occupied.

1.17 CX SCHEDULES

- .1 Prepare detailed Cx Schedule and submit to Departmental Representative for review and approval same time as project Construction Schedule. Include:
 - .1 Milestones, testing, documentation, training and Cx activities of components, equipment, subsystems, systems and integrated systems, including:
 - .1 Pre-TAB review: 28 days after contract award, and before construction starts.
 - .2 Cx agents' credentials: 30 days before start of Cx.
 - .3 Cx procedures: 1 month after award of contract.
 - .4 Cx Report format: 1 month after contract award.
 - .5 Discussion of heating/cooling loads for Cx: 1 month before start-up.
 - .6 Submission of list of instrumentation with relevant certificates: 21 days before start of Cx.
 - .7 Notification of intention to start TAB: 21 days before start of TAB.
 - .8 TAB: after successful start-up, correction of deficiencies and verification of normal and safe operation.
 - .9 Notification of intention to start Cx: 14 days before start of Cx.
 - .10 Notification of intention to start Cx of integrated systems: after Cx of related systems is completed 14 days before start of integrated system Cx.
 - .11 Identification of deferred Cx.
 - .12 Implementation of training plans.
 - .13 Cx reports: immediately upon successful completion of Cx.
 - .2 Detailed training schedule to demonstrate no conflicts with testing, completion of project and hand-over to Property Manager.
 - .3 6 months in Cx schedule for verification of performance in all seasons and wear conditions.
- .2 After approval, incorporate Cx Schedule into Construction Schedule.
- .3 Consultant, Contractor, Contractor's Cx agent, and Departmental Representative will monitor

progress of Cx against this schedule.

1.18 CX REPORTS

- .1 Submit reports of tests, witnessed and certified by Departmental Representative to Departmental Representative who will verify reported results.
- .2 Include completed and certified PV reports in properly formatted Cx Reports.
- .3 Before reports are accepted, reported results to be subject to verification by Departmental Representative.

1.19 PRELIMINARY AND FINAL CX

- .1 N/A.

1.20 ACTIVITIES DURING WARRANTY PERIOD

- .1 Cx activities must be completed before issuance of Interim Certificate, it is anticipated that certain Cx activities may be necessary during Warranty Period, including:
 - .1 Fine tuning of HVAC systems.
 - .2 Adjustment of ventilation rates to promote good indoor air quality and reduce deleterious effects of VOCs generated by off-gassing from construction materials and furnishings.
 - .4 Full-scale emergency evacuation exercises.
 - .5 Live mode tests of elevators on the fire alarm system.
 - .6 Live mode tests of elevators on emergency power system.

1.21 TESTS TO BE PERFORMED BY OWNER/USER

- .1 None is anticipated on this project.

1.22 TRAINING PLANS

- .1 Refer to Section 01 79 00.13 - Demonstration and Training for Building Commissioning.

1.23 FINAL SETTINGS

- .1 Upon completion of Cx to satisfaction of General Contractor lock control devices in their final positions, indelibly mark settings marked and include in Cx Reports.

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

- .1 Not Used.
-

END OF SECTION

APPENDIX

COMMISSIONING PLAN

R.095799

**Plan de mise en service
électromécanique**

Révision – SR4-Pour soumission

Le 19 janvier 2021

5209-000-SR8
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Table des matières

Abréviations	1
Introduction	2
1 Objectif de la mise en service.....	3
2 Portée de la mise en service.....	4
2.1 Systèmes architecturaux et structuraux :	4
2.2 Systèmes mécaniques :	4
2.3 Systèmes électriques :	4
3 Rôles et responsabilités.....	4
3.1 Principaux intervenants	4
3.2 Organigramme des intervenants	5
4 Phases de la mise en service	6
4.1 Préconception et conception	6
4.2 Construction	6
4.3 Manuels	7
4.4 Formation	7
4.5 Complétion significative et occupation	8
4.6 Fermeture de la mise en service	8
5 Mise en service prévue.....	9
5.1 Systèmes architecturaux	9
5.2 Systèmes mécaniques	9
5.3 Systèmes électriques	9
Annexe 1	1

Abréviations

C	Consultant
CP	Contrôle de performance
EC	Équipe de construction
ERE	Essai, réglage et équilibrage
GMAO	Gestion de maintenance assistée par ordinateur
LI	Listes d'installation et démarrage
N/A	Non applicable
MES	Mise en service
RBQ	Régie du bâtiment du Québec
RM	Représentant du Ministère
RMS	Responsable de la mise en service de l'entrepreneur
RP	Renseignements sur les produits

Introduction

Le mandat consiste à procéder à une étude de conformité et la préparation des plans et devis pour la mise aux normes des ascenseurs du bâtiment. Six (6) ascenseurs sont considérés

N° d'ascenseur.	Année de mise en service
1, 2, 3, 4	1992
2S	2005
5	2014

Le consultant s'implique en tant que concepteur en électromécanique et exerce aussi la surveillance de chantier pour ces disciplines.

Le présent plan de mise en service est publié au moment de la conception (SR4). En réponse aux exigences du devis, il précise notamment les activités associées à la mise en service durant la construction. Le plan décrit le processus, les rôles des différents intervenants ainsi que les documents associés à la mise en service du projet, de manière à l'intégrer efficacement à la construction. Le plan met aussi en la place la mise en service de l'installation en tant que telle, dont les phases clés se déroulent en fin de projet.

1 Objectif de la mise en service

La mise en service (MES) a été introduite depuis quelques décennies chez le représentant du ministère. En fonction de leur importance, elle est requise dans tous les projets.

La MES est un effort commun de l'ensemble des intervenants dont l'objectif est de s'assurer que le projet est conçu, construit et étalonné de façon à fonctionner tel que requis. Au terme du processus, le client a en mains tous les outils (documentation, formation) pour maintenir les performances de manière optimale.

La MES va plus loin qu'une surveillance traditionnelle. Elle implique un niveau accru de documentation et de démonstration et comprend notamment l'évaluation de la performance des systèmes sur une base individuelle et dans l'ensemble des interactions.

2 Portée de la mise en service

Les systèmes généralement visés peuvent être regroupés en trois (3) catégories. Dans le cadre du réaménagement, les items suivants sont cités au devis de MES :

2.1 Systèmes architecturaux et structuraux :

- Non inclus.

2.2 Systèmes mécaniques :

- Plomberie et drainage;
- Refroidissement.

2.3 Systèmes électriques :

- Éclairage;
- Éléments de distribution électrique;
- Système d'alarme incendie;
- Autres.

3 Rôles et responsabilités

3.1 Principaux intervenants

Le présent plan de mise en service s'adresse avant tout aux membres de l'équipe de mise en service. Le rôle des membres de cette équipe est décrit dans cette section.

Le Représentant du Ministère (RM)

Le Représentant du Ministère (RM) détient la responsabilité générale de la gestion du projet. Il est la personne-ressource du client, des consultants et de tous les autres membres de l'équipe du projet. En tant que Représentant du Ministère, il peut déléguer une partie de ses responsabilités. Le RM coordonne les réunions de MES et en rédige le procès-verbal. Il approuve les documents de MES, incluant les manuels et plans de formation et assiste aux essais critiques.

Le consultant (C)

Il conçoit l'installation en respectant les exigences fonctionnelles et opérationnelles et prépare les documents de construction, incluant le devis et le plan de MES. Il réalise la surveillance de chantier et dans ce contexte, assiste comme témoin aux démonstrations et essais critiques. Le consultant exerce aussi une surveillance des activités de mise en service. Il vérifie et commente les divers rapports d'essai et le plan de formation. Le consultant participe à la résolution des problèmes relatifs à la MES, révisé les manuels et plans de formation et valide les plans « tel que construit », et transmet la documentation de fin de projet et la documentation de mise en service soumise par l'Entrepreneur afin de constituer le Manuel d'Exploitation et d'entretien.

L'équipe de construction (EC)

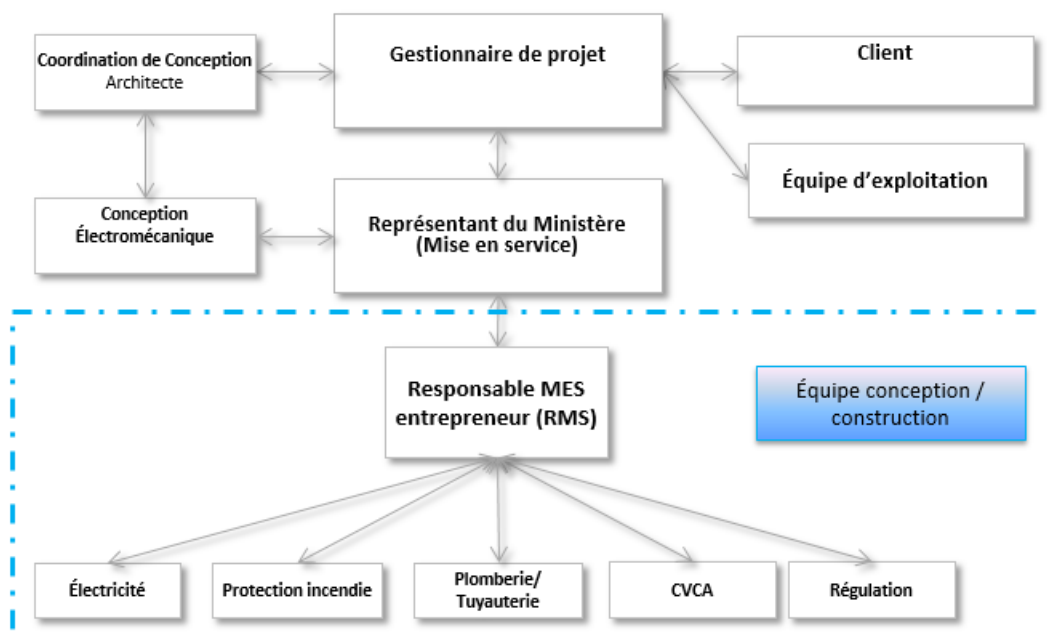
Elle est composée de l'entrepreneur, de ses fournisseurs et des divers corps de métier qui réalisent la construction conformément aux documents contractuels. Sous la coordination du responsable de la mise en service de l'entrepreneur (RMS) l'équipe accomplit aussi toutes les activités de la MES, notamment les essais et la documentation, à la satisfaction du Représentant du Ministère. L'équipe réalise la mise au point, dispense la formation et assemble les manuels et participe à la résolution des problèmes relatifs à la mise en service.

Le responsable de la mise en service de l'entrepreneur (RMS)

Il est désigné par l'entrepreneur en fonction de sa compréhension du processus de MES, dont il assure la planification et la coordination. Il révisé le plan de mise en service et les formulaires pour s'assurer de leur compréhension par les sous-traitants et de leur validité. Il fournit le calendrier de MES, et s'assure de l'exécution de toutes les activités de MES exigées. Il complète ou contresigne les fiches de mise en service pour tous les systèmes visés. Il reçoit et analyse les documents d'ERE avant de les transmettre au Consultant et au Représentant du Ministère. Il rassemble et vérifie les manuels et voit à la mise en œuvre du plan de formation. Le RMS se rend aussi disponible pour offrir un service d'urgence et de dépannage pendant la première année d'occupation pour effectuer des réglages et des modifications qui ne font pas partie des responsabilités du personnel d'exploitation et d'entretien.

3.2 Organigramme des intervenants

L'organigramme ci-dessous est la représentation graphique des différents membres de l'équipe de mise en service énoncée au point 3.1.



Les flèches représentent les canaux de communications. En cours de projet, les moyens de communication seront principalement les comptes rendus de réunions, les rapports de visites, et le courrier électronique.

4 Phases de la mise en service

La mise en service fait idéalement partie de toutes les étapes d'un projet. La subdivision présentée ici résume les principales activités et livrables des diverses phases.

4.1 Préconception et conception

Le devis présente la MES aux sections suivantes :

- 01 79 00.13 - Démonstration et formation - MES de bâtiment;
- 01 91 13 - Mise en service, exigences générales;
- 01 91 13.13 - Mise en service, plan de MES;
- 01 91 13.16 - Mise en service, documents de MES.

De plus, des procédures et critères MES sont inclus aux sections de devis des différentes disciplines par les concepteurs.

4.2 Construction

Une rencontre de démarrage de la mise en service est à prévoir le plus tôt possible. Elle permet notamment aux membres de l'équipe de mise en service de valider leur interprétation des tâches, de confirmer la liste des documents attendus et de bâtir le calendrier de MES, dont la fourniture relève du RMS. Les réunions ultérieures pourront être combinées aux réunions de chantier.

La section 01 91 13.16 du devis liste les documents de mise en service normalement applicables. Ils seront requis à l'achèvement des travaux (voir 01 78 00).

- .1 Les renseignements sur les produits sont consignés dans des fiches de RP. Il s'agit notamment des informations de la plaque signalétique.
- .2 Les essais statiques - ou de démarrage préliminaire - sont consignés dans une liste d'installation et de démarrage (LI). Les listes fournies par le manufacturier sont généralement acceptées ; valider auprès du RM. Pour la tuyauterie et les conduites de ventilation, là où des essais d'étanchéité et de pression sont prévus au devis, le rapport de test suffit à documenter l'installation/démarrage.
- .3 L'atteinte des critères d'acceptabilité des équipements décrits dans les plans et devis est validée lors d'essais de performance. Pour un équipement visé, ceci est documenté dans les formulaires de contrôle de performance (CP).

Finalement, les résultats des essais pour les systèmes intégrés sont documentés dans des formulaires de mise en service des systèmes intégrés. Ceux-ci sont produits par les concepteurs et utilisés par le RM lors des démonstrations de fonctionnalités. La forme générique est présentée en annexe du présent plan de MES.

4.2.1 Fourniture, installation et démarrage des composantes

L'objectif est de s'assurer que chaque système est complet et conforme (RP), d'utilisation sûre et prêt pour son amorçage lorsque les listes d'installation et démarrage (LI) sont complétées. Les données rassemblées à cette phase permettent aussi d'amorcer les procédures de GMAO. Cette phase statique de la mise en route est suivie par les essais de performances des équipements et sous-systèmes qui en requièrent sont ensuite réalisés et documentés (CP).

Note : Dans le cas d'appareils existants réinstallés ou modifiés, les fiches LI et CP pourraient être exigées afin d'assurer qu'ils sont bien réinstallés et pour définir leur performance actuelle. La portion RP sera à compléter si requis, en fonction des procédures de GMAO en place. Selon les résultats initiaux obtenus (échantillon mentionné au Tableau 1, paragraphe 5), le processus pourra cependant être simplifié en cours de route. Vérifier auprès des responsables de la MES.

Il est à noter que les rapports d'essai, réglage et équilibrage (ERE) font partie des documents de performance puisqu'ils permettent de confirmer les débits et pressions spécifiés au devis.

4.2.2 Mise en service des systèmes intégrés

Cette étape vise les systèmes complexes, composés de plusieurs équipements. Avant de débiter cette phase, le RP, LI et CP doivent avoir été documentés, c'est-à-dire que les fiches sont complètes, transmises et approuvées. La complétion de l'équilibrage est aussi requise.

Les essais sur les systèmes intégrés sont réalisés par le responsable MES de l'Entrepreneur, en présence de l'Ingénieur et du RM, et documenté dans des formulaires de mise en service des systèmes intégrés.

4.3 Manuels

Le manuel d'opération et entretien est présenté au concepteur aux fins de révision et d'acceptation. Des renseignements sur ces manuels sont donnés dans la section 01 92 00 du devis. Valider cette formulation auprès du Représentant du Ministère.

Le manuel d'opération et entretien est présenté au concepteur aux fins de révision et d'acceptation. Se référer à la section 01 78 00 pour les la structure générale du manuel et aux exigences de MES applicables au manuel.

Les sections du manuel devraient être utilisées lors des formations. De cette manière, elles pourront faire l'objet d'une mise au point en fonction des commentaires des personnes suivant ces formations.

4.4 Formation

Des séances de formation à l'intention de l'équipe d'exploitation sont à prévoir pour les items sélectionnés ; se référer à la section 01 79 00.13 pour les exigences en matière de formation. Le calendrier et le contenu de ces séances doivent être transmis au Consultant et au RM.

4.5 Complétion significative et occupation

Le Représentant du Ministère est le destinataire final de l'ensemble des documents de MES durant la construction. L'approbation du matériel de MES par le RM est un des prérequis à l'achèvement substantiel. Le RM sera aussi responsable du suivi durant l'occupation et de la coordination d'essais saisonniers si requis, auquel cas l'Entrepreneur et le Consultant pourront être appelés à collaborer.

4.6 Fermeture de la mise en service

La dernière étape de la MES est la revue du projet à la fin de la première année d'opération sous garantie, au moment du suivi des déficiences et de leur correction.

5 Mise en service prévue

Les documents de mise en service pour les systèmes visés sont résumés dans le tableau suivant.

Tableau 1 : Résumé des livrables MES

	Fiche de MES	Test au devis	MES intégrée
5.1 Systèmes architecturaux			
Autre	(si applicable)	N/A*	N/A*
5.2 Systèmes mécaniques			
Composants de protection incendie	non	selon NFPA	non
Composants de plomberie	non	non	non
Unité de climatisation bi-bloc	Non	Équilibrage	oui
Composantes de ventilation	Non	Étanchéité Équilibrage	oui
Autre	(si applicable)	N/A*	N/A*
5.3 Systèmes électriques			
Distribution basse tension	Oui	Équilibre des phases Fuites à la terre	N/A*
Éclairage	Non	Intégration à la régulation Programmation	N/A*
Alarme incendie	non	Par firme spécialisée	N/A*
Autre	(si applicable)	N/A*	N/A*

* N/A : non applicable

ANNEXE 1

MES des systèmes intégrés

Unité de climatisation bi-bloc									
Vérifications préfonctionnelles complétées de manière adéquate					Installation documentée	Performance des composantes	ERE Documenté	Contrôles validés (point à point)	
Notes									
Opération					Programmation complétée	Simulation / Essai réel	Résultat adéquat	Vérifié par	Note #
Notes									

Composantes de ventilation									
Vérifications préfonctionnelles complétées de manière adéquate					Installation documentée	Performance des composantes	ERE Documenté	Contrôles validés (point à point)	
Notes									
Opération					Programmation complétée	Simulation / Essai réel	Résultat adéquat	Vérifié par	Note #
Notes									

	Points divers								
	Des points seront ajoutés au besoin								
	Préalables complétés et documentés de manière satisfaisante :				Installation documentée	Performance des composantes	ERE Documenté	Contrôles validés (point à point)	
Notes									
	Séquence				Programmation complétée	Simulation / Essai réel	Résultat adéquat	Accepté par	Note #
Communication données BACnet									
Notes									

PART 1 GENERAL**1.1 INSTALLATION/START-UP CHECK LISTS**

- .1 Include the following data:
 - .1 Product manufacturer's installation instructions and recommended checks.
 - .2 Special procedures as specified in relevant technical sections.
 - .3 Items considered good installation and engineering industry practices deemed appropriate for proper and efficient operation.
- .2 Equipment manufacturer's installation/start-up check lists are acceptable for use. As deemed necessary by Consultant supplemental additional data lists will be required for specific project conditions.
- .3 Use check lists for equipment installation. Document check list verifying checks have been made, indicate deficiencies and corrective action taken.
- .4 Installer to sign check lists upon completion, certifying stated checks and inspections have been performed. Return completed check lists to Contractor. Check lists will be required during Commissioning and will be included in Building Maintenance Manual (BMM) at completion of project.
- .5 Use of check lists will not be considered part of commissioning process but will be stringently used for equipment pre-start and start-up procedures.

1.2 PRODUCT INFORMATION (PI) REPORT FORMS

- .1 Product Information (PI) forms compiles gathered data on items of equipment produced by equipment manufacturer, includes nameplate information, parts list, operating instructions, maintenance guidelines and pertinent technical data and recommended checks that is necessary to prepare for start-up and functional testing and used during operation and maintenance of equipment. This documentation is included in the BMM at completion of work.
- .2 Prior to Performance Verification (PV) of systems complete items on PI forms related to systems and obtain Departmental Representative's approval.

1.3 PERFORMANCE VERIFICATION (PV) FORMS

- .1 PV forms to be used for checks, running dynamic tests and adjustments carried out on equipment and systems to ensure correct operation, efficiently and function independently and interactively with other systems as intended with project requirements.
- .2 PV report forms include those developed by Contractor records measured data and readings taken during functional testing and Performance Verification procedures.
- .3 Prior to PV of integrated system, complete PV forms of related systems and obtain Consultant's approval.

1.4 SAMPLES OF COMMISSIONING FORMS

- .1 Consultant will develop and provide to Contractor required project-specific Commissioning forms in electronic format complete with specification data.
 - .2 Revise items on Commissioning forms to suit project requirements.
-

- .3 Samples of Commissioning forms and a complete index of produced to date will be attached to this section.

1.5 CHANGES AND DEVELOPMENT OF NEW REPORT FORMS

- .1 When additional forms are required, but are not available from Consultant develop appropriate verification forms and submit to Departmental Representative for approval prior to use.
 - .1 Additional commissioning forms to be in same format as provided by Consultant

1.6 COMMISSIONING FORMS

- .1 Use Commissioning forms to verify installation and record performance when starting equipment and systems.
- .2 Strategy for Use:
 - .1 Consultant provides Contractor project-specific Commissioning forms with Specification data included.
 - .2 Contractor will provide required shop drawings information and verify correct installation and operation of items indicated on these forms.
 - .3 Confirm operation as per design criteria and intent.
 - .4 Identify variances between design and operation and reasons for variances.
 - .5 Verify operation in specified normal and emergency modes and under specified load conditions.
 - .6 Record analytical and substantiating data.
 - .7 Verify reported results.
 - .8 Form to bear signatures of recording technician and reviewed and signed off by Contractor.
 - .9 Submit immediately after tests are performed.
 - .10 Reported results in true measured SI unit values.
 - .11 Provide Consultant with originals of completed forms.
 - .12 Maintain copy on site during start-up, testing and commissioning period.
 - .13 Forms to be both hard copy and electronic format with typed written results in Building Management Manual in accordance with Section 01 78 00 - Facility Operation.

1.7 LANGUAGE

- .1 To suit the language profile of the awarded contract.

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION

APPENDIX

COMMISSIONING FORMS

TABLE DES MATIÈRES

FICHES DE MISE EN SERVICE 1

1.1 Fiche de renseignement de produit (RP) 1

1.2 Essais de tuyauterie ou de conduits 2

1.3 Unité bi-bloc..... 3

1.4 Essai de fuite à la terre 4

FICHES DE MISE EN SERVICE

1.1 FICHE DE RENSEIGNEMENT DE PRODUIT (RP)

PROJET/ PROJECT	Nom : <i>Name:</i>			
	Bâtiment : <i>Building:</i>			
	Numéro de Projet : <i>Project number:</i>			
IDENTIFICATION	Équipement : <i>Equipment:</i>			
	Description sommaire : <i>Summary:</i>			
	Identification aux plans : <i>No. On Drawings:</i>		Identification système de contrôle du bâtiment : <i>MSS Identifier:</i>	
	Équipement relié au système : <i>Equipment linked to system:</i>			
RENSEIGNEMENT	Fabriquant : <i>Man'fr:</i>			
	Modèle : <i>Model:</i>			
	No série <i>Serial no.:</i>			
	Capacité : <i>Capacity:</i>		Taille : <i>Size:</i>	
	Efficacité : <i>Efficiency:</i>			
	Tension : <i>Voltage:</i>	Volt ./ #Ø / Fréquence		
	Courant : <i>Current:</i>	FLA/LRA		
	Autres : <i>Other:</i>			
ACHAT/ PURCHASE	Fournisseur : <i>Contractor:</i>	Nom/adresse <i>Name/address</i>		
	Distributeur : <i>Distributor:</i>	Nom/adresse <i>Name/address</i>		
	Garantie : <i>Guarantee:</i>			
	Date d'achat : <i>Purchase date:</i>			
	Garantie spécifique : <i>Specific guarantee:</i>			
	Date de démarrage : <i>Date of start-up:</i>			
	Remplacé le : <i>Replaced:</i>			

1.2 ESSAIS DE TUYAUTERIE OU DE CONDUITS

IDENTIFICATION	Service :	Localisation :	Fluide :
	CARACTÉRISTIQUES SPÉCIFIÉES		

Préalables (cocher pour confirmer que le préalable est documenté)

DOCUMENTATION	<input type="checkbox"/> Dessin d'ateliers reçus	<input type="checkbox"/> Installation complétée et documenté (fiche jointe)
	Commentaires:	

MESURES	PROPRIÉTÉS	INSTRUMENT (Portable/BAS/Local)	PRESCRIT	MESURÉ 1	MESURÉ 2
	Pression initiale (kPa – PSI)				
	Pression après 30 minutes (kPa – PSI)				
	<ul style="list-style-type: none"> Pression rétablie à la pression initiale (kPa – PSI) 				
	Pression après 1 heure (kPa – PSI)				
	<ul style="list-style-type: none"> Pression rétablie à la pression initiale (kPa – PSI) 				
	Pression stabilisée à _____ (kPa – PSI)				
	<ul style="list-style-type: none"> Heure de début Heure de fin Durée, heures/minutes 				
	Commentaires Essai concluant ou non, avec description				

Participants à la réalisation (R), la validation (V) et l'approbation (A) des essais :

Autorité/Compagnie	Nom	Activité	Signature	Date
Plomberie				
Ventilation				
Contrôles				
Balancement				
Témoin (entrepreneur général)		V		
Agent de mise en service				

1.3 UNITE BI-BLOC

IDENTIFICATION	N° au plan :	Service :	Localisation :
	Manufacturier :	Modèle :	No de série :
	Caractéristiques spécifiées		
	Capacité	Type	Réfrigérant
	Efficacité chauffage	Refroidissement	Volume de Réfrigérant :

Préalables (cocher pour confirmer que le préalable est documenté)

DOCUMENTATION	<input type="checkbox"/> Dessin d'ateliers reçus	<input type="checkbox"/> Liste d'installation complétée	<input type="checkbox"/> Rapport de test en usine (si applicable)
	<input type="checkbox"/> Installation conforme documentée	<input type="checkbox"/> ERE hydronique complété	<input type="checkbox"/> ERE hydronique approuvé (Date____)
	<input type="checkbox"/> Séquence de régulation active	<input type="checkbox"/> ERE aéraulique complété	<input type="checkbox"/> ERE aéraulique approuvé (Date____)
	Commentaires:		

PERFORMANCES	Élément de performance	Valeur Prescrite	Valeur mesurée
	Côté air		
	- Débit, l/s		
	- Température à l'entrée, °C		
	- Température à la sortie, °C		
	- Perte de pression, kPa		
	Ampérage moteur compresseur ($T_1 / T_2 / T_3$)		
	Voltage moteur compresseur ($T_1 - T_2 / T_2 - T_3 / T_3 - T_1$)		
	Commentaires		

1.4 ESSAI DE FUITE A LA TERRE

L'essai vise les prises installées près d'un appareil de plomberie.

Présenter les résultats sous forme de tableau et faire approuver la formulation par le responsable de la MES

1.5 ELEVATOR : TEST DATA FORM - ELEVATOR**PERFORMANCE VERIFICATION (PV)**

Elevator no : _____

Date : _____

Test Description	Result
Nominal Speed	m/s
Full load speed	m/s
Speed governor	Type _____
- Tripping speed :	_____ m/s
- Overspeed switch :	_____ m/s
Car safeties overspeed test – nominal load	
- Tripping speed :	_____ m/s
- Stopping distance :	_____ mm
- Platform level	___ mm/meter
Car buffer test at nominal loads & speed	
Counterweight buffer test	
Break test at nominal loads & speed – down direction	mm
Auxiliary break (rope gripper) – operation	
Safety switch	
Final terminal stopping devices (up & down)	
Pit stop switch	
Top of car stop switch	
Top of car inspection unit	

Top of car emergency exit switch	
Overspeed stop by 'Drive'	
Overspeed stop by PLC or CPU	
Overspeed stop by auxiliary PLC or CPU	
Electrical security circuit check	
Emergency light	
Emergency Recall Operation - Phase I	
Emergency In-Car Operation - Phase II	
Communication system	
Emergency power operation	
Currents measurement (AC currents at controller) :	
Ascending – no load	UP
Descending – no load	DOWN
Ascending – balanced loads	UP
Descending – balanced loads	DOWN
Ascending – nominal loads	UP
Descending – nominal loads	DOWN
Ascending start at nominal loads	UP
Descending start at nominal loads	DOWN

Note: Fill the table and check if the result is correct

Note : Table continued on next page

TEST DATA FORM – ELEVATOR (CONTINUED)**PERFORMANCE VERIFICATION (PV)**

Elevator no : _____

Date : _____

Test Description	Result
Setting & Clearance:	
Operating Time – up	m/s
Operating Time – down	m/s
Door Open Time	sec
Door Close Time	sec
Door Dwell - Car Call	sec
Door Dwell – Hall Call	sec
Door Nudging Time	sec
Ambient Noise Level	dBa
Door Noise Level	dBa
Running Noise Level	dBa
Door Force (door closing pressure)	lbs
Leveling	mm
Pre-Opening	mm
Counterweight balancing	%
Load weight system setting	%

Top clearance	mm
Bottom clearance	mm
Top runby	mm
Bottom runby	mm

Note: Fill the table and check if the result is correct

Identification & signature :

Elevator – Name & Title

Compagny name

1.6 ELEVATOR :TEST DATA FORM – HYDRAULIC MACHINE & CYLINDER**PERFORMANCE VERIFICATION (PV)**

Elevator no : _____

Date : _____

Test Description	Result
Equipment visual check	
Sealing of joints and pipes	
Cylinder end limit test (make a run up and stop at full speed on the piston end stop)	
PVC pressure test	
Check of top & bottom oil level	
Check of top & bottom runby	
Check of car starts & stops	
Check of operation speed : low & full speed	
Check of levelling (floor levelling)	

Note: Fill the table and check if the result is correct

Identification & signature :

Elevator – Name & Title_____
Compagny name

1.7 ELEVATOR :TEST DATA FORM – HYDRAULIC OIL COOLER**PERFORMANCE VERIFICATION (PV)**

Elevator no : _____

Date : _____

Test Description	Result
Equipment visual check	
Sealing of joints and pipes	
Checking the operation of the oil cooler in automatic mode	

Note: Fill the table and check if the result is correct

Identification & signature :

Elevator – Name & Title_____
Compagny name

1.8 ELEVATOR : TEST DATA FORM – INTERCOMMUNICATION SYSTEM**PERFORMANCE VERIFICATION (PV)**

System : _____

Elevator no : _____

Date : _____

Test Description	Result
Check the functionality of the following items (master station):	
Selection for calls to each car;	
Selection for calls in the machine rooms;	
Indicate the origin of the calls;	
Indicate lines on hold;	
Indicate the status of the AC power;	
Indicate the status of the battery;	
Indicate the status of the telephone line;	
Make an alarm when the system is operating.	
Check the operation of the master station at CCS (wall)	
Check the operation of the master station at CCS (desk)	
Check the operation of the master station in machine room	
Check the operation in car	
Manufacturer / Model	
Incoming call number	

Emergency call number	
Phone activation	
Dialing the correct number	
Confirmation of recorded message	
Sound quality	
Sound level	
Phone deactivation	
Compliance of operations	
Telephone line monitoring module (B44-10 and +)	

Note: Fill the table and check if the result is correct

Identification & signature :

Elevator – Name & Title

Compagny name

1.9 ELEVATOR : TEST DATA FORM : FIRE ALARM / EMERGENCY POWER**PERFORMANCE VERIFICATION (PV)**

Elevator no : _____

Date : _____

Test Description	Result
Connecting the fire alarm signals	
Connecting the emergency power signals	
Emergency Recall Operation – Phase I	
Recall activated by fire alarm (General alarm)	
Recall activated by fire alarm (Designated floor)	
Recall activated by fire alarm (Each floor)	
Recall activated by fire alarm (Hoistway)	
Recall activated by fire alarm (MR)	
Recall activated by key switch - Hall	
Recall activated by key switch - CCS	
Conformity of car maneuvers	
Conformity of of signage	
Closing doors at reduced speed	
Emergency In-Car Operation – Phase II	
Operation of the key switch	
Operation of the open & close buttons	
Other door reopening devices	

Conformity of car maneuvers	
Conformity of of signage	
Emergency power	
Operation of the telephone in the car	
Operation of the key switch	
Operation of the indicator lights	
Operation of the car	
Conformity of of signage	

Note: Check if the result is correct

Following the elevator modernization work performed in this building, we certify that the fire alarm and emergency power tests were carried out successfully.

Identification & signature :

Elevator – Name & Title

Compagny name

Fire alarm – Name & Title

Compagny name

Emergency power – Name & Title

Compagny name

1.10 ELEVATOR : COMMISSIONING PLAN (95%)

[illegible]

PART 1 GENERAL**1.1 GENERAL REQUIREMENTS**

- .1 Standard letter size paper 216 mm x 279 mm.
- .2 Methodology used to facilitate updating.
- .3 Drawings, diagrams and schematics to be professionally developed.
- .4 Electronic copy of data to be in a format accepted and approved by Departmental Representative.

1.2 APPROVALS

- .1 Prior to commencement, co-ordinate requirements for preparation, submission and approval with Departmental Representative.

1.3 GENERAL INFORMATION

- .1 Provide Contractor the following for insertion into appropriate Part and Section of BMM:
 - .1 Complete list of names, addresses and telephone and fax numbers of the contractor and of the subcontractors who participated in the performance of the work - Tab A of the manual.
 - .2 Letters of guarantee - Tab B
 - .3 Approved shop drawings - Tab C
 - .4 Test reports, including ERA, commissioning checklists, duly completed, including Product Information (PR) and Performance Check (PC) report forms, reviewed and accepted by the MES manager of the Contractor and / or the Consultant. Tab D.
 - .5 Final sequences of operations for these systems after commissioning - Tab E.
 - .1 If necessary, the consultant may attach brief descriptions of the mechanical, electrical and fire protection systems installed and put into service.
 - .6 Information on the operation and maintenance of systems installed and commissioned, including preventive and corrective maintenance and maintenance schedules - Tab F.
 - .7 Construction drawings - Tab G.
 - .8 EMIS forms duly completed, by the Owner's staff in collaboration with the Contractor's MES manager - Tab H.
 - .9 Inspection reports - Tab I.
 - .10 Commissioning reports. - J.

1.4 SUPPORTING DOCUMENTATION FOR INSERTION INTO SUPPORTING APPENDICES

- .1 Provide Departmental Representative supporting documentation relating to installed equipment and system, including:
 - .1 General:
 - .1 Finalized commissioning plan.
 - .2 WHMIS information manual.
 - .3 Procedures used during commissioning.
 - .4 Cross-Reference to specification sections.
 - .2 Fire prevention, suppression and protection:
 - .1 Test reports.
 - .3 Mechanical:
 - .1 Piping pressure test certificates.
 - .2 Ducting leakage test reports.

- .3 TAB and PV reports.
- .4 Charts of valves and steam traps.
- .5 Copies of posted instructions.
- .4 Electrical:
 - .1 TAB and PV reports.
 - .2 Electrical work log book.
 - .3 Charts and schedules.
 - .4 Locations of cables and components.
 - .5 Copies of posted instructions.

- .2 Assist Consultant with preparation of BMM.

1.5 LANGUAGE

- .1 English and French Language to be in separate binders.

1.6 IDENTIFICATION OF FACILITY

- .1 When submitting information to Departmental Representative for incorporation into BMM, use following system for identification of documentation:
 - .1 See Section 23 05 53 - Identification.
- .2 Vertical transport system
 - .1 Section 0 - General
 - .1 List of suppliers
 - .2 Description of inspections and maintenance
 - .3 Statement of Work Compliance Document (RBQ) and Test Forms
 - .4 Letters of Guarantee
 - .5 Key Training
 - .2 Section 1 - Controllers
 - .1 Product Description
 - .2 User's Manual
 - .3 Electrical plans
 - .4 Adjustment - drive / control parameters
 - .5 Other
 - .3 Section 2 - Traction Machine
 - .1 Traction machine equipment
 - .2 Measurement of cables
 - .3 Other
 - .4 Section 3 - Hydraulic Machine
 - .1 Hydraulic equipment
 - .2 Other
 - .5 Section 4 - Door Equipment
 - .1 Door Operator
 - .2 Equipment for landing and car doors
 - .3 Door Reopening Device
 - .4 Other
 - .6 Section 5 - Hoistway Equipment
 - .1 Position reader
 - .2 Inspection Device
 - .3 Hoistway Switches
 - .4 Other

- .7 Section 6 - Accessories
 - .1 Car and floors fixtures
 - .2 Voice Announcer
 - .3 Car and CCS Communication System
 - .4 CCS Keyed Console
 - .5 Computer Console
 - .6 Load Measurement Device - Description / Adjustment
 - .7 Parts Catalog
 - .8 Complete list of spare parts.
 - .9 Other
- .8 Section 7 - Plans " As Built "
- .9 Section 8 - Miscellaneous

1.7 USE OF CURRENT TECHNOLOGY

- .1 Use current technology for production of documentation. Emphasis on ease of accessibility at all times, maintain in up-to-date state, compatibility with user's requirements.
- .2 Obtain Departmental Representative's approval before starting Work.

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION
