

**CONSULTANT – SEAL & SIGNATURE**

**Electrical**  
Stantec Consulting Ltd.



(Professional's Seal and Signature)

Jan 27 2017

Date

**Mechanical**  
Stantec Consulting Ltd.



(Professional's Seal and Signature)

Jan 27 2017

Date

**END OF SECTION**

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**END OF SECTION**

**Part 1            General**

**1.1                WORK COVERED BY CONTRACT DOCUMENTS**

- .1        Work of this Contract comprises the installation and testing of life safety systems and public address systems at various buildings on the Victoria Coast Guard Base located at 25 Huron Street, Victoria BC V8V 4V9.

**1.2                PERMITS**

- .1        Make application and pay all fees in respect to all permits required to complete work including the Building Permit.
- .2        Arrange for inspection of all work by the authorities having jurisdiction. On completion of work, furnish final unconditional certificates of approval by the inspecting authorities.

**1.3                WORK SEQUENCE**

- .1        Construct Work in stages to accommodate Owner's use of premises during construction.
- .2        Co-ordinate Progress Schedule and co-ordinate with Owner occupancy during construction.
- .3        Maintain fire access/control.

**1.4                CONTRACTOR USE OF PREMISES**

- .1        Limit use of site and premises for Work, for storage, and for access, to allow:
  - .1        Owner occupancy.
  - .2        Public usage.
- .2        Co-ordinate use of premises under direction of Owner.
- .3        Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
- .4        Remove or alter existing work to prevent injury or damage to portions of existing work which remain.
- .5        Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Owner and Consultant. This includes drywall finishes, flooring and ceilings. Sand and prime coat finishes for final painting by others.
- .6        At completion of operations condition of existing work: equal to or better than that which existed before new work started.

**1.5                OWNER OCCUPANCY**

- .1        Owner will occupy premises during entire construction period for execution of normal operations.
- .2        Co-operate with Owner in scheduling operations to minimize conflict and to facilitate Owner and public usage.

**1.6 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING**

- .1 Execute work with least possible interference or disturbance to facility operations, building operations, occupants, public and normal use of premises. Arrange with Owner to facilitate execution of work. After hours work may be required.

**1.7 EXISTING SERVICES**

- .1 Notify Owner, Consultant and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give Owner 7 calendar days notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to pedestrian, vehicular traffic and tenant operations.
- .3 Establish location and extent of service lines in area of work before starting Work. Notify Owner and Consultant of findings.
- .4 Submit schedule to and obtain approval from Owner for any shut-down or closure of active service or facility. Adhere to approved schedule and provide notice to affected parties.
- .5 Provide temporary services when directed by Owner to maintain critical building and tenant systems.
- .6 Where unknown services are encountered, immediately advise Owner and Consultant and confirm findings in writing.
- .7 Protect, relocate or maintain existing active services as required to facilitate work. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .8 Record locations of maintained, re-routed and abandoned service lines.

**1.8 DOCUMENTS REQUIRED**

- .1 Maintain at job site, one copy each document as follows:
  - .1 Contract Drawings.
  - .2 Specifications.
  - .3 Addenda.
  - .4 Reviewed Shop Drawings.
  - .5 List of Outstanding Shop Drawings.
  - .6 Change Orders.
  - .7 Other Modifications to Contract.
  - .8 Field Test Reports.
  - .9 Copy of Approved Work Schedule.
  - .10 Health and Safety Plan and Other Safety Related Documents.
  - .11 Other documents as specified.

**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                DESCRIPTION OF WORK**

- .1        Work under this Contract consists primarily of replacement and relocation of electrical distribution equipment, installation of back-up generator and automatic transfer switch and life safety systems in the Victoria Coast Guard Base Workshops Building.
- .2        Provide materials, equipment and plant, of specified design, performance and quality; and, current models with published certified ratings for which replacement parts are readily available. Provide project management and on-site supervision to undertake administration, meet schedules, ensure timely performance, ensure co-ordination, and establish orderly completion and the delivery of a fully commissioned installation.
- .3        The drawings are diagrammatic and are a guide to establishing quality of equipment, materials, workmanship and performance. All work shall be in accordance with the Project drawings and Specifications and their intent, complete with all necessary components, including those not normally shown or specified, but required for a complete installation.
- .4        The term “Provide” shall mean “Supply and Install” for all products and services specified. “As Indicated” means that the item(s) specified are shown on the drawings.

**1.2                DOCUMENTS REQUIRED**

- .1        Maintain at job site, one copy each of the following:
  - .1        Contract drawings
  - .2        Specifications
  - .3        Addenda
  - .4        Reviewed shop drawings
  - .5        Change orders
  - .6        Other modifications to Contract
  - .7        Field test reports
  - .8        Copy of approved work schedule
  - .9        Manufacturers' installation and application instructions
  - .10      Referenced Codes and Standards listed in the Specification
- .2        Where the Contract Documents do not contain sufficient information for the proper selection of equipment for bidding, notify the Consultant during the Tendering period. If clarification is not obtainable, allow for the most expensive arrangement. Failure to do this shall not relieve the Contractor of responsibility to provide the intended equipment.

**1.3                PROJECT CO-ORDINATION**

- .1        Co-ordinate progress of the Work, progress schedules, submittals, use of site, temporary utilities and construction facilities.

- .2 All Contractors are advised to perform an on-site examination prior to commencing Work and notify the Consultant and General Contractor in writing of any deviation from the Contract Documents. Commencement of Work shall indicate acceptance of existing field conditions.
- .3 The responsibility as to which sub-trade supplies and installs any and all materials rests solely with the Prime Contractor.
- .4 Extras to the contract will not be considered based on grounds of difference in interpretation of plans and specifications as to which trade involved shall be responsible for certain materials, installation or specialties.
- .5 The Contractor shall do all cutting and remedial Work that may be required to make the several parts of the Work come together properly. Co-ordinate the schedule to ensure that as much as possible is built into the Work and that this requirement is kept to a minimum.

#### **1.4 CONSTRUCTION SCHEDULE**

- .1 Immediately following Award of Contract, the Contractor will meet with the Consultant and the Owner to establish parameters of scheduling preparatory to preparing a firm Construction Progress Schedule.
- .2 The Contractor shall:
  - .1 prepare and submit to the Consultant within ten (10) Working Days of the contract award by the Owner, a horizontal bar chart construction schedule indicating the timing (start and completion date of activities noting the first work day of each week) of all major activities of the Work, providing a separate bar for each trade or operation including Mechanical and Electrical work, and provides details of the critical events and their inter-relationship to demonstrate the Work will be performed in conformance with the Contract Time; and
  - .2 submit one opaque reproduction (plus four copies) to the Consultant, who will review the schedule for conformity to the conditions of the Contract or as stipulated by the Contract Documents, and will return one reviewed copy to the Contractor within ten (10) Working Days after receipt; and
  - .3 monitor the progress of the Work relative to the construction schedule and update the schedule on a monthly basis for Consultant review at time of submission for application for payment and as stipulated by the Contract documents; and
  - .4 promptly advise the Consultant of any revisions required to the schedule as a result of extensions of the Contract ;and
  - .5 indicate changes occurring since previous submission of schedule such as major changes in scope, activities modified since previous submission, revised projections of progress and completion, other identifiable changes; and
  - .6 provide a narrative report to define problem areas, anticipated delays, the impact on the schedule, corrective action recommended and its effect, the effect of changes on schedules of Other Contractors, where present; and
  - .7 distribute copies of the Consultant approved revised schedule to the Owner, Consultant, Job Site office, Subcontractors, other concerned parties etc.; and



- .8 instruct recipients of the revised schedule to report to the Contractor within five (5) Working Days, any problems anticipated by the time frames noted in the schedule.
- .3 The Schedule shall clearly show a complete and detailed sequence of operations for all trades and an orderly performance and completion of the various parts of the Work to attain the Completion Date.
- .4 Incorporate within the Construction Schedule, a complete and realistic schedule, integrated with, and recognizing the reliance on, other divisions of the work. Take into account the lead time for the review of operating and maintenance manuals, commissioning, verification of system operation by the Consultant and the demonstration and instruction to the Owner.
- .5 The Schedule shall indicate submission and approval dates for shop drawings and dates for preparing and submitting project close out documentation.
- .6 Periods of shift working and premium time work shall be clearly indicated on the Schedule.
- .7 The approved Construction Schedule shall be monitored on a monthly basis to indicate construction progress. Should the Contractor fall behind the Schedule indicated by the Construction Schedule such as to jeopardize any of the Completion Dates: the Contractor shall rework the Construction Schedule to show a reorganization of the remaining Work to bring the Work back on schedule and to achieve the specified Completion Dates.
- .8 If the Schedule is revised as per the previous clause, resubmit the revised Schedule for approval and reissue.
- .9 Commence Work immediately upon official notification of acceptance of offer and complete the Work by April 30, 2016.

## **1.5 COST BREAKDOWN**

- .1 Submit detailed price breakdowns (labour and materials) for each section of work within seven days after the award of contract. Breakdown of Contract Price in various trades shall be agreeable to the Consultant. After approval, cost breakdown will be used as a basis for progress draws.
- .2 In particular cases more detail may be necessary to properly assess a change order or progress claim. This additional information shall be supplied when requested by the Consultant. Mark-up information is required for change orders.
- .3 The cost breakdown of each trade shall exclude the GST/HST. The GST/HST for the total shall be shown as a separate item on the breakdown.

## **1.6 CERTIFICATES & TRANSCRIPTS**

- .1 Submittals prior to start of construction:
  - .1 Certified copy of Insurance.
  - .2 List of subtrades and subtrade prices.
  - .3 Letter of compliance with Workers' Compensation Act.
- .2 Submittals prior to initial progress claims:

- .1 Detailed cost breakdowns.
- .3 Submittals during construction:
  - .1 Contractor's Statutory Declaration on forms approved by C.C.A. is to accompany all progress claims subsequent to initial claim. Declaration is to certify that all past claims have been paid as certified or as noted and must be properly signed and notarized.
- .4 Submittals prior to Substantial Performance:
  - .1 Occupancy Permit and Inspection Certificates from authorities having jurisdiction and as required for equipment items to comply with governing Codes and Regulations.
  - .2 All other submittal requirements listed herein.
- .5 Submittals at Total Performance:
  - .1 Refer to Clause "Project Close-out".

## **1.7 BUILDING OPERATION DURING CONSTRUCTION**

- .1 In order to minimize operational difficulties for the building staff, the various trades must cooperate with the Owner throughout the entire construction period and particularly ensure that noise is minimized.
- .2 Convenient access for the Staff to the building must be maintained at all times. Minor inconvenience and interruption of services will be tolerated, provided advance notice is given, but the Contractor will be expected to co-ordinate his work, in consultation with the Owner so that the operation of the facility can be maintained as nearly normal as possible.
- .3 The Contractor shall require his employees to comply with the rules and regulations in force governing the conduct of the Owner's Employees and shall conduct the work in such a manner as not to hinder, impede, nor injure the Owner's operations, or conduct any work being carried out by the Owner.
- .4 The Contractor in performing the Work shall ensure that in no way is there any undue interference with the conduct of the Owner's Business. Prior to commencement of the Work the Contractor shall liaise with the Owner to ensure planned work procedures meet with the Owner's requirements.

## **1.8 ACCESS TO THE WORK**

- .1 The Owner and/or his representative shall have access to the Work, or other places work is being fabricated in connection with the Contract, at all times for the purposes of inspection and examination of workmanship and materials.
- .2 The Owner will designate a representative for the Project. All contact with the Owner shall be forwarded through the Owner's Representative. Maintain contact as required to co-ordinate all Owner/Contractor requirements. The Owner's Representative shall have access to the work at all times.

**1.9 CONTRACTOR'S USE OF SITE**

- .1 Do not unreasonably encumber site with materials and equipment.
- .2 Move stored products, trailers or equipment which interfere with operations of the Owner.

**1.10 CODES AND STANDARDS**

- .1 Perform work in accordance with the Building Code of British Columbia, Workers' Compensation Board of B.C., and any other code of provincial or local application provided that in any case of conflict or discrepancy, the more stringent requirements shall apply.
- .2 Meet or exceed requirements of specified standard, codes and referenced documents.

**1.11 PERMITS**

- .1 Make application and pay all fees in respect to all permits required to complete Work, including the Building Permit.
- .2 The Owner will pay all Development Cost Charges. These are not to be included in the Tender Price.
- .3 Arrange for inspection of all work by the authorities having jurisdiction. On completion of work, furnish final unconditional certificates of approval by the inspecting authorities.

**1.12 DRAWINGS AND MEASUREMENTS**

- .1 Drawings are generally diagrammatic and are intended to indicate the scope and general arrangement of work and are not detailed installation drawings. Do not scale the drawings. Obtain accurate dimensions from the Architectural and Structural drawings.
- .2 Consult the architectural drawings and details for exact locations of fixtures and equipment. Obtain this information from the Consultant where definite locations are not indicated.
- .3 Take field measurements, where equipment and material dimensions are dependent upon building dimensions.
- .4 Where imperial units have been indicated in [brackets] following the requirements in SI units, the conversion is approximate and provided for convenience. The SI units shall govern.

**1.13 PROJECT MEETINGS**

- .1 Notify all parties concerned of meetings and ensure attendance by appropriate personnel.
- .2 The Contractor will arrange project meetings and assume responsibility for setting times and recording and distributing minutes.
- .3 Meetings will take place regularly and at a frequency mutually agreed between the Consultant and the Contractor.

**1.14 SETTING OUT OF WORK**

- .1 Assume full responsibility for and execute complete layout of Work to locations, lines and elevations indicated.
- .2 Ensure that equipment does not transmit noise and/or vibration to other parts of the building, as a result of poor installation practice.
- .3 Provide devices needed to lay out and construct Work.

**1.15 CONSTRUCTION AREA**

- .1 Provide barricades and dust-proof screens for the inside and outside work as required to progress the Work. Access shall be restricted to the Public. Safety is the primary concern.
- .2 Fencing shall be 1525mm high and of durable construction. Provide access gates as required.
- .3 Existing fences/materials may be used for construction fencing, at the Contractor's discretion.

**1.16 LOCATION OF EQUIPMENT AND FIXTURES**

- .1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.
- .2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.
- .3 If any doubt exists, inform Consultant of impending installation and obtain his approval for actual location.

**1.17 SAFETY MEASURES**

- .1 Construction Safety:
  - .1 Observe and enforce construction safety measures required by the B.C. Building Code, Workers' Compensation Board of B.C. and municipal statutes and authorities.
  - .2 In event of conflict between any provisions of above authorities the most stringent provision will apply.
  - .3 Ensure no part of Work is subjected to a load which will endanger its safety or will cause permanent deformation.
  - .4 Design and construct falsework in accordance with CSA S269.1
  - .5 Design and construct scaffolding in accordance with CSA S269.2
  - .6 Maintain safety helmets and eye protection on the jobsite, ready for use.
- .2 Fire Safety:
  - .1 Comply with requirements of "Fire Safety Requirements During Building Construction Operations" - Fire Protection Engineering Standards No. 301.

- .3 For purposes of the Workers Compensation Act and Occupational Health & Safety Regulations, the successful Tenderer will be designated as the "Prime Contractor" for all work associated with this construction project.

#### **1.18 HOUSEKEEPING & SITE CLEANLINESS**

- .1 Housekeeping is to be of the highest standards and all trades are required to police themselves. Should housekeeping be observed to deteriorate and in the opinion of the Consultant, adversely affect the quality of progress of the Project, he shall be free to order steps taken to rectify matters.

#### **1.19 CONCEALMENT**

- .1 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

#### **1.20 ASBESTOS**

- .1 All new material / products installed shall be free of asbestos.
- .2 If any Contractor, during renovations / demolition, should discover asbestos (or material suspected to be asbestos) on piping, ductwork, etc., he shall immediately cease all work in that area and advise the Prime Contractor. The Prime Contractor shall take immediate appropriate action to verify presence of friable asbestos, contain any fibres that have been disturbed, and advise the Consultant and the Owner's representative.
- .3 The Contractor is responsible for coordinating and scheduling any hazardous waste removal work.
- .4 The Contractor will not be entitled to a claim for any delays resulting from the investigation of or removal of asbestos.

#### **1.21 EXISTING SERVICES AND SURFACE FEATURES**

- .1 Protect all existing services encountered. Every effort has been made to show the known existing services and features. Notwithstanding any other provisions of this Contract, the Contractor shall be solely responsible for satisfying himself to the existence, extent and location of surface features either shown or not on the drawings, and the effect they will have on the work. Surface features shall include but not necessarily limited to trees, shrubbery, ornamental features and fences. Unless specifically noted otherwise in the Contract Documents, no additional compensation will be made for restoration of surface features or for the effect they may have upon the Work.
- .2 The removal of concealing surfaces may reveal other existing services. Work with the Owner's staff to trace the originating source and points served. Obtain instructions from the Consultant when existing services require relocation or modifications, other than those already indicated in the Contract Documents.
- .3 Arrange work to avoid shutdowns of existing services. Where shutdowns are unavoidable, obtain the Owner's approval of the timing, and work to minimize any interruptions.
- .4 Shutdowns, to permit connections, will be carried out by maintenance staff.

- .5 In order to maintain existing services in operation, temporary relocations and/or bypasses of piping and ductwork may be required.
- .6 Be responsible for any damages to existing systems by this work.
- .7 The interruption of utility services to permit tie-ins shall be arranged through the owners representative. Application must be received in writing at least seven (7) calendar days prior to the date required for the shutdown. Service shutdowns shall only be carried out by maintenance staff and will normally be scheduled to occur during evenings or weekends. The Owner reserves the right to withhold permission for a reasonable period with respect to any shutdown, if the shutting-off of a service will interfere with important operations.

#### **1.22 CUTTING, CORING, FITTING AND PATCHING**

- .1 All cutting, patching and painting shall be included in the Tender. All surfaces shall be returned to "as good or better" than original.
- .2 The intent is to have a clean installation at project completion.
- .3 Execute cutting, coring, fitting and patching required to make Work fit properly together. Verify the location of existing service runs and structural components within existing concrete floor and walls prior to core drilling and/or cutting. Provide X-ray investigation as necessary. A repair to existing services and structural components damaged as a result of core drilling and cutting is included in the work.
- .4 Making good is defined as matching the adjacent surfaces such that there be no visible difference between existing and new surfaces when viewed from 1.5 m in the ambient light, and includes painting the whole surface to the next change of plane.
- .5 Obtain Consultant's approval before cutting, boring or sleeving load-bearing members.
- .6 Make cuts with clean, true, smooth edges. Make patches inconspicuous in final assembly.
- .7 Fit work airtight to pipes, sleeves, ducts and conduits.
- .8 At penetrations of fire rated assemblies, with any services or ducts completely seal voids with fire resistive material specified in other Sections for the full thickness of the construction element and to comply with Code requirements.
- .9 Patching shall include for the provision of base materials to match adjacent floor/wall base at all pipe/duct furring locations at floor level.
- .10 Patching shall include for cutting, fitting and re-installation of lay-in acoustic tile grid and ceilings where penetrated by pipe furrings.

#### **1.23 ADDITIONAL DRAWINGS**

- .1 Consultant may furnish additional drawings to assist proper execution of Work. These drawings will be issued for clarifications only. Such drawings shall have same meaning and intent as if they were included with Plans referred to in Contract Documents.

#### **1.24 RECORD DRAWINGS**

- .1 As Work progresses, maintain accurate records to show all deviations from the Contract Drawings. In all instances the Contractor is wholly responsible for the accuracy of the record drawings produced. As-built information shall be recorded by the Contractor as Changes occur, and at completion supply one set of all drawings to the Consultant with all deviations clearly marked.
- .2 One set of prints will be provided for this purpose. Keep prints in clean condition and identify as "Project Record Set."
- .3 Conversion of this information onto the CAD drawings will be the responsibility of the Contractor. Refer to Specification Sections for individual disciplines.

#### **1.25 WORKMANSHIP**

- .1 Workmanship shall be of the best quality, executed by workers experienced and skilled in the respective duties for which they are employed. Immediately notify the Consultant if required Work is such as to make it impractical to produce these results.
- .2 Do not employ any unfit person or anyone unskilled in their required duties.
- .3 Decisions as to the quality or fitness of workmanship in cases of dispute, rest solely with the Consultant whose decision is final.

#### **1.26 MATERIAL AND EQUIPMENT**

- .1 Material and Equipment:
  - .1 Use new material and equipment unless otherwise specified.
  - .2 Preference shall be given to British Columbia products for all materials and supplies used in the construction of the building, plant or site, where the quality, services and prices are equal. The decision of equality shall be made by the Consultant.
  - .3 Provide material and equipment of specified design and quality, performing to published ratings and for which replacement parts are readily available.
  - .4 Use products of one manufacturer for equipment or material of same type or classification unless otherwise specified.
- .2 Concrete, Poured-in-Place:
  - .1 Refer to Structural Specifications.
- .3 Manufacturer's Instructions:
  - .1 Unless otherwise specified, comply with manufacturer's latest printed instructions for materials and installation methods.
  - .2 Notify Consultant in writing of any conflict between these specifications and manufacturer's instruction. Consultant will designate which document is to be followed.
- .4 Fastenings, General:
  - .1 Provide metal fastenings and accessories in same texture, colour and finish as base metal in which they occur. Prevent electrolytic action between dissimilar

- metals. Use non-corrosive fasteners, anchors and spacers for securing exterior work.
- .2 Space anchors within limits of load bearing or shear capacity and ensure that they provide positive permanent anchorage. Wood plugs not acceptable.
  - .3 Keep exposed fastenings to minimum, space evenly and lay out neatly.
  - .4 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.
- .5 Obtain Consultant's approval before using explosive actuated fastening devices. If approval is obtained comply with CSA Z166.
- .6 Fastenings, Equipment:
- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
  - .2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.
  - .3 Bolts may not project more than one diameter beyond nuts.
  - .4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur and resilient washers with stainless steel.
- .7 Delivery and Storage:
- .1 Deliver, store and maintain packaged material and equipment with manufacturer's seals and labels intact.
  - .2 Prevent damage, adulteration and soiling of material and equipment during delivery, handling and storage. Immediately remove rejected material and equipment from site.
  - .3 Store material and equipment in accordance with supplier's instructions.
  - .4 Touch-up damaged factory finished surfaces to Consultant's satisfaction. Use primer or enamel to match original. Do not paint over name plates.
- .8 Construction Equipment and Plant:
- .1 Maintain construction equipment and plant in good operating order.

## **1.27 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES**

- .1 Submit to Consultant, for review, shop drawings and product data, and samples specified.
- .2 Shop Drawings:
  - .1 Drawings to be prepared by Contractor, sub-contractor, supplier or distributor, which illustrate appropriate portion of Work; showing fabrication, layout, setting or erection details as specified in appropriate sections.
  - .2 Drawings to be prepared in SI metric units.
  - .3 Electronic submissions are encouraged over paper. If paper, provide eight copies of all shop drawings. Each sheet must have 75 mm x 125 mm clear space for review stamp.
- .3 Product Data:



- .1 Certain specification sections specify that manufacturer's standard schematic drawings, catalogue sheets, diagrams, schedules, performance charts, illustrations and other standard descriptive data will be accepted in lieu of shop drawings, provided that the product concerned is clearly identified. Submit in sets, not as individual submissions.
- .4 Samples:
  - .1 Submit samples in sizes and quantities specified.
  - .2 Where colour is criterion, submit full range of colours.
  - .3 Submit all samples as soon as possible after the Contract is awarded, to facilitate production of complete colour scheme by the Consultant.
- .5 Submission Requirements:
  - .1 Schedule submissions at least 20 days before dates reviewed submissions will be needed.
  - .2 Electronic submissions are encouraged.
- .6 Coordination of Submissions:
  - .1 Review shop drawings, product data and samples prior to submission.
  - .2 Coordinate with field construction criteria.
  - .3 Verify catalogue numbers and similar data.
  - .4 Coordinate each submittal with requirements of the Work of all trades and Contract Documents.
  - .5 Responsibility for errors and omissions in submittals is not relieved by Consultant's review of submittals.
  - .6 Responsibility for deviations in submittals from requirements of Contract Documents is not relieved by Consultant's review of submittals.
  - .7 Notify Consultant, in writing at time of submission, of deviations in submittals from requirements of Contract Documents.
  - .8 After Consultant's review, distribute copies.
- .7 Work affected by submittal shall not proceed until review is completed.

## **1.28 TESTING AND INSPECTION SERVICES**

- .1 Particular requirements for inspection and testing to be carried out by testing service or laboratory designated by Consultant are specified under various sections.
- .2 The Owner will appoint, on the recommendation of the Consultant, services of a testing laboratory except for the following:
  - .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
  - .2 Inspection and testing performed exclusively for Contractor's conveniences.
  - .3 Testing, adjustment and balancing of conveying systems, mechanical and electrical equipment and systems.
  - .4 Mill tests and certificates of compliance.

- .5 Tests specified to be carried out by Contractor under the supervision of the Consultant.
- .6 Tests required to obtain specified roofing guarantee.
- .3 Where tests or inspections performed by the testing service reveal Work is not in accordance with the Contract requirements, Contractor shall pay costs for additional tests or inspections as Consultant may require to verify acceptability of corrected Work.
- .4 Pay costs for uncovering and making good Work that is covered before required inspection or testing is completed and approved by Consultant.
- .5 Provide Consultant with three copies of testing laboratory reports as soon as they are available. Additional copies of all test results for concrete and compaction shall be sent directly to the Structural Consultant Engineer.
- .6 Furnish labour and facilities to:
  - .1 Provide access to Work to be inspected and tested.
  - .2 Facilitate inspections and tests.
  - .3 Make good Work disturbed by inspection and test.
- .7 Notify Consultant sufficiently in advance, one working day minimum, of operations to allow for assignment of laboratory personnel and scheduling of test.
- .8 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.
- .9 The cost of providing testing services other than exceptions described in clause .2 above shall be paid for from Cash Allowance for Testing.

### **1.29 SLEEVES, HANGERS AND INSERTS**

- .1 Provide and set sleeves where conduits pass through masonry or concrete. Pack sleeves with material approved for use in fire separations. Obtain Consultant's approval before cutting for sleeves. Provide and install hangers and inserts where required.

### **1.30 MAINTENANCE MANUAL**

- .1 On completion of Project submit to Consultant, four (4) hard copies of the Operations and Maintenance Manual, made up as follows:
  - .1 Bind data in 215 mm x 280 mm vinyl hard covered 3 ring loose leaf binder.
  - .2 Enclose title sheet, labeled "Operation and Maintenance Data", project name, data and list of contents, names of Contractor, sub-contractors, consultants and sub-consultants.
  - .3 Bind in copies of all guarantees.
  - .4 Enclose one reproducible copy of all reviewed shop drawings updated to include any site revisions.
  - .5 Organize contents into applicable sections of Work to parallel project specification breakdown. Mark each section by labeled tabs protected with celluloid covers fastened to hard paper dividing sheets.
  - .6 Refer to Mechanical and Electrical Divisions for specific details of Mechanical and Electrical data.

- .7 Digital manuals shall be supplied on (3) three CD-ROMs in digital format. The information shall be organized into sections in a user-friendly format that is easy to search for specific information. An indexing system shall be included that remains on an expandable portion of the screen and allows the end user to scroll through the manual information that appears on the main portion of the screen. The digital version content and organization for each manual shall be arranged in a manner identical to the hard copy version.
- .2 Submit manuals to Consultant 2 weeks prior to anticipated date of Substantial Performance of the Work.

### **1.31 ENVIRONMENTAL PROTECTION**

- .1 Fires and burning of rubbish on site not permitted.
- .2 Do not bury rubbish and waste materials on site.
- .3 Do not dispose of waste or volatile materials such as oil, paint thinner or mineral spirits into waterways, storm or sanitary sewers or on site.
- .4 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.
- .5 Control disposal of run-off of water containing suspended materials or other harmful substances in accordance with local authority requirements.
- .6 Protect trees and plants on site as designated by Consultant.
- .7 Cover or wet down dry materials and rubbish to prevent blowing dust and debris.

### **1.32 CLEANING**

- .1 Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
- .2 Vacuum clean interior building areas when ready to receive finish painting and continue vacuum cleaning on an as-needed basis until building is sufficiently completed or ready for occupancy.
- .3 In preparation for interim and final inspections, examine all sight exposed interior and exterior surfaces and concealed spaces. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials, from sight exposed interior and exterior finished surfaces including glass and other polished surfaces. Broom clean paved surfaces; rake clean other surfaces of grounds. Remove snow and ice from access to building.
- .4 Use cleaning materials and methods in accordance with instructions of manufacturer of surface to be cleaned.

### **1.33 PAINTING**

- .1 Clean exposed bare metal surfaces, including those supplied under Divisions 15 and 16, removing all dirt, dust, grease and millscale. Apply at least one coat of corrosion resistant primer paint to all supports and equipment fabricated from ferrous metal.
- .2 Paint all non-plated hangers and exposed sleeves with a rust inhibiting primer, as they are installed.

- .3 Repaint all marred factory finished equipment, including those supplied under Division 26, to match the original factory finish.
- .4 Paint all equipment, piping and materials, including those supplied under Division 26, installed exposed inside finished areas of the building or exposed outside the building with colours as selected by the Owner.

**1.34 Taxes**

- .1 Pay all taxes levied by law, including Federal, Provincial, Municipal and GST/HST.
- .2 GST/HST is to be shown as a separate item on all Progress Claims.

**1.35 Temporary Facilities**

- .1 Access:
  - .1 Provide and maintain complete access to project site.
- .2 Contractor's Site Office:
  - .1 Provide office of size to accommodate site meetings and Contractor's operations.
  - .2 Locate in consultation with Owner.
  - .3 Provide telephone and fax services for the duration of the project. The Owner will not provide telephone and fax lines for use by the Contractor.
- .3 Storage Sheds:
  - .1 It should be understood that storage space on site may be unobtainable. There shall be no obligation on the part of the Owner to provide storage space. All materials on site shall be held in secure, dry storage.
  - .2 Provide adequate weathertight sheds with raised floors, for storage of materials, tools, and equipment which are subject to damage by weather.
- .4 Sanitary Facilities:
  - .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances. Maintain in clean and sanitary condition.
- .5 Enclosure of Structure:
  - .1 Provide temporary weathertight enclosures and protection for exterior openings until permanently enclosed. Design enclosures to withstand wind pressure. Provide lockable entry as required for moving personnel during construction period.
  - .2 Provide temporary enclosures to secure building from entry of unauthorized personnel during construction period.
- .6 Power:
  - .1 Arrange, pay for and maintain temporary electrical power supply sufficient for construction purposes. Pay for all electricity used.
- .7 Water Supply:
  - .1 Arrange, pay for and maintain temporary water supply. Pay all charges.

- .8 Heating and Ventilating:
  - .1 Pay for costs of temporary heat and ventilation required for construction purposes including costs of installation, fuel, operation, maintenance and removal of equipment. Use of direct fired heaters discharging waste products into work areas will not be permitted.
  - .2 Maintain minimum 5°C temperature unless specified otherwise.
- .9 Communication Equipment:
  - .1 Provide telephone for Contractor's use. Pay all charges.
  - .2 Provide a facsimile machine for Contractor's use. Pay all charges.
- .10 Removal of Temporary Facilities:
  - .1 Remove temporary facilities from site at the completion of the Work or when directed by Consultant.

### **1.36 SALVAGE**

- .1 All piping, ducting and equipment, which becomes redundant and is no longer required due to the work in this Contract shall be completely removed.
- .2 All existing items which need to be removed, and which have a reasonable salvage value, such as fans and motors, air terminals, plumbing fixtures, and valves, shall be carefully removed and handed over to the Owner. Handing over to the Owner includes moving to Owner's designated storage place on site. These items shall not become the property of the Contractor. The Owner has first right to the salvaged equipment. Obtain a written receipt from the Owner detailing each of the items handed over.
- .3 All items not required by the Owner shall be removed from the site.

### **1.37 RESTORATION**

- .1 All building surfaces shall be restored to original condition or better, including painting where applicable.
- .2 All hard and soft landscaping, including concrete, asphalt, gravel, sod, shrubs, etc., shall be restored to original condition or better.

### **1.38 REPAIR OF PAVED SURFACES**

- .1 Existing pavement which must be removed for the work shall be cut by an approved method. Ripping of asphalt will not be permitted.
- .2 Paved surfaces which have been cut to allow for excavation or otherwise damaged by the actions of the Contractor, shall be restored to at least a condition equivalent to that which existed prior to the start of the work.
- .3 Trenches shall be backfilled above the pipe zone with compacted backfill. This material shall be brought to a suitable height below the finished paved grade and compacted to 95% Modified Proctor density.
- .4 On top of this material shall be placed 300 millimetres 150 mm minus pit-run compacted to 100%, and 100 millimetres 19 mm crush gravel compacted to 95% Modified Proctor density.

- .5 The paved surface shall then be repaired with a compacted layer of hot mix asphaltic concrete 75 millimetres thick. The asphaltic concrete shall conform to current municipal standards.
- .6 Equipment employed by the Contractor, mixing procedure, storage of liquid asphalt, transportation of mixture, spreading of mixture, compaction and finishing of asphaltic concrete mat, requirement of finished surface and all other technical requirements of the work under this section shall conform to current municipal standards.

### **1.39 SUBSTANTIAL PERFORMANCE PROCEDURE**

- .1 Prior to application for Certificate of Substantial Performance, carefully inspect the Work and ensure it is complete, that major and minor construction deficiencies are complete, defects are corrected and the building is clean and in condition for occupancy.
- .2 The Contractor may make application to the Consultant for a Certificate of Substantial Performance when the Work is ready for use by the Owner for the purpose intended and when the following items have been provided (where applicable) to the Consultant. Notify the Consultant in writing that the building is ready for inspection for Substantial Performance.:
  - .1 All required manufacturer's inspections, certifications, guarantees, warranties as specified in the Contract Documents;
  - .2 All maintenance manuals, operating instructions, maintenance and operating tools, replacement parts or materials as specified the Contract Documents;
  - .3 Certification by all permit issuing authorities indicating approval of all permitted installations;
  - .4 Certification by all testing, cleaning, or Inspection Authorities or Associations as specified in the Contract Documents;
  - .5 Results of all tests required by the Contract Documents;
  - .6 All required "as-built" or "as-installed" record drawings in the form specified in the Contract Documents;
  - .7 Certification by WorkSafeBC that the Contractor and all Subcontractors are in good standing;
  - .8 Completed "Statutory Declaration" certifying payment of all sub-contractors.
  - .9 Statement indicating reconciliation of all Change Orders or claims to the Contract;
  - .10 Occupancy permit from the Local Authority;
  - .11 A list of major items to be completed or corrected, including the time required to perform the Work as well as the proposed completion date.
  - .12 Sign off all items on Consultant field reports to the satisfaction of the Consultant. Any items not completed must be accompanied by a realistic completion schedule.
- .3 When the Work is substantially performed, remove surplus products, tools, construction machinery and equipment not required for the performance of the remaining Work.

- .4 Remove waste materials and debris from the site at regularly scheduled times or dispose of as directed by the Consultant. Do not burn waste materials on site unless approved by the Consultant.
- .5 Do final cleaning as follows:
  - .1 Leave the Work broom clean before the inspection process commences.
  - .2 Clean and polish finish surfaces including glass, mirrors, hardware, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, mechanical and electrical fixtures where affected by work. Replace broken, scratched or disfigured glass.
  - .3 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fittings, walls and ceilings where affected by work.
  - .4 Vacuum clean and dust building interiors, behind grilles, louvres and screens where affected by work.
  - .5 Seal floor finishes as recommended by the manufacturer where affected by work.
  - .6 Broom clean and wash exterior walks, steps and surfaces where affected by work.
  - .7 Remove dirt and other disfigurations from exterior surfaces where affected by work.
- .6 Demonstration and Inspection to Owner:
  - .1 Prior to Substantial Performance, demonstrate to and instruct the Owner's designated representative on the complete systems operating and maintenance procedures using the assistance of specialist sub-trades and manufacturer's representatives.
  - .2 Submit a program for approval to the Owner. When approval is obtained from the Design Authority and the Owner's designated representatives, arrange an acceptable time for the instruction periods.
  - .3 Obtain a signed statement from the Owner's designated representatives certifying that the demonstration and instruction have been given to his satisfaction.
- .7 During the Consultant Inspection, a list of deficiencies and defects will be tabulated.
- .8 A deficiency holdback will be established. This holdback shall be retained until all items on the deficiency list are completed. No interim payments will be released.
- .9 Deficiency items shall be confirmed completed by all parties prior to Total Performance.
- .10 Should the Consultant perform re-inspection due to failure of the Work to comply with the claims of status of completion made by the Contractor:
- .11 Owner will compensate the Consultant for such additional services.
- .12 Owner will deduct the amount of such compensation from the final payment to the Contractor.
- .13 Submit operation and maintenance data, record (as-built) drawings and results of all Tests required by the Specification.

- .14 Consultant will issue a final change order reflecting approved adjustments to contract price not previously made.

**1.40 WARRANTY**

- .1 Provide a written warranty statement stating that any defects found in materials, workmanship and equipment shall be satisfactorily repaired and/or replaced at no cost to the Owner for one year after the date of Substantial Completion.
- .2 Include the warranty statement in the Operating & Maintenance Manuals.

**1.41 PROJECT CLOSE OUT**

- .1 Notify the Consultant in writing that all deficiencies have been corrected and that the building is ready for Final Inspection.
- .2 Submit a final Statement of Account showing total adjusted Contract Price, previous payments and any other adjustments and monies due.
- .3 Submit a current Statutory Declaration.
- .4 Submit a WorkSafeBC Certificate of Compliance.
- .5 Submit a current dated Land Title Search extract.
- .6 Consultant will issue a final change order reflecting approved adjustments to contract price not previously made.

**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                RELATED SECTIONS**

- .1            Section 01 11 00 – Summary of Work.

**1.2                USE OF SITE AND FACILITIES**

- .1            Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Owner to facilitate work as stated.
- .2            Provide temporary construction hoarding or suitable dust barrier to prevent dust and contaminants from entering food preparation areas.
- .3            Maintain existing services to building and provide for personnel and vehicle access.
- .4            Owner will assign sanitary facilities for use by Contractor's personnel. Keep facilities clean.
- .5            Closures: protect work temporarily until permanent enclosures are completed.

**1.3                ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING**

- .1            Execute work with least possible interference or disturbance to building operations, occupants, public and normal use of premises. Arrange with Owner and Consultant to facilitate execution of work.

**1.4                EXISTING SERVICES**

- .1            Notify Owner, Consultant and utility companies of intended interruption of services and obtain required permission.
- .2            Where Work involves breaking into or connecting to existing services, give Owner 7 days of notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out interruptions after normal working hours of occupants and public use of premises.
- .3            Provide for personnel, pedestrian and vehicular traffic.

**1.5                SPECIAL REQUIREMENTS**

- .1            Submit schedule in accordance with Section 01 32 16 - Construction Progress Schedules - Bar (GANNT) Chart. Provide 2 week notice before starting work.
- .2            Ensure that Contractor personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.
- .3            Keep within limits of work and avenues of ingress and egress.

**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                RELATED SECTIONS**

- .1            Section 01 33 00 – Submittal Procedures.

**1.2                PRECONSTRUCTION MEETING**

- .1            Within 10 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2            Representatives of the Owner, Consultant, Contractor, major Subcontractors, field inspectors and supervisors will be in attendance.
- .3            Establish time and location of meeting and notify parties concerned minimum 10 days before meeting.
- .4            Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.
- .5            Agenda to include:
  - .1            Appointment of official representative of participants in the Work.
  - .2            Schedule of Work in accordance with Section 01 32 16 - Construction Progress Schedules - Bar (GANTT) Chart.
  - .3            Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
  - .4            Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00 - Construction Facilities.
  - .5            Delivery schedule of specified equipment.
  - .6            Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
  - .7            Owner provided products.
  - .8            Record drawings in accordance with Section 01 33 00 - Submittal Procedures.
  - .9            Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.
  - .10          Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Closeout Submittals.
  - .11          Monthly progress claims, administrative procedures, photographs, hold backs.
  - .12          Appointment of inspection and testing agencies or firms.

**1.3                PROGRESS MEETINGS**

- .1            During course of Work and 2 weeks prior to project completion, schedule progress meetings weekly.
- .2            Contractor, major Subcontractors involved in Work, Consultant and Owner are to be in attendance.
- .3            Notify parties minimum 5 days prior to meetings.

- .4 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within 3 days after meeting.
- .5 Agenda to include the following:
  - .1 Review, approval of minutes of previous meeting.
  - .2 Review of Work progress since previous meeting.
  - .3 Field observations, problems, conflicts.
  - .4 Problems which impede construction schedule.
  - .5 Review of off-site fabrication delivery schedules.
  - .6 Corrective measures and procedures to regain projected schedule.
  - .7 Revision to construction schedule.
  - .8 Progress schedule, during succeeding work period.
  - .9 Review submittal schedules: expedite as required.
  - .10 Maintenance of quality standards.
  - .11 Review proposed changes for affect on construction schedule and on completion date.
  - .12 Other business.

**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 RELATED SECTIONS**

- .1 Section 01 11 00 – Summary of Work.
- .2 Section 01 31 19 – Project Meetings.
- .3 Section 01 91 13 – General Commissioning (cx) Requirements.

### **1.2 DEFINITIONS**

- .1 Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.
- .2 Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally Bar Chart should be derived from commercially available computerized project management system.
- .3 Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.
- .4 Construction Work Week: Monday to Friday, inclusive, will provide five day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.
- .5 Duration: number of work periods (not including holidays or other nonworking periods) required to complete activity or other project element. Usually expressed as work days or work weeks.
- .6 Master Plan: summary-level schedule that identifies major activities and key milestones.
- .7 Milestone: significant event in project, usually completion of major deliverable.
- .8 Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.
- .9 Project Planning, Monitoring and Control System: overall system operated by Consultant to enable monitoring of project work in relation to established milestones.

### **1.3 REQUIREMENTS**

- .1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.
- .2 Plan to complete Work in accordance with prescribed milestones and time frame.
- .3 Limit activity durations to maximum of approximately 2 working days, to allow for progress reporting.

- .4 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

#### **1.4 SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to Consultant within 10 working days of Award of Contract Bar (GANNT) Chart as Master Plan for planning, monitoring and reporting of project progress.
- .3 Submit Project Schedule to Consultant within 5 working days of receipt of acceptance of Master Plan.

#### **1.5 MASTER PLAN**

- .1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANNT).
- .2 Consultant will review and return revised schedules within 5 working days.
- .3 Revise impractical schedule and resubmit within 5 working days.
- .4 Accepted revised schedule will become Master Plan and be used as baseline for updates.

#### **1.6 PROJECT SCHEDULE**

- .1 Develop detailed Project Schedule derived from Master Plan.
- .2 Ensure detailed Project Schedule includes as a minimum milestone and activity types as follows:
  - .1 Award.
  - .2 Shop Drawings, Samples.
  - .3 Permits.
  - .4 Mobilization.
  - .5 Plumbing.
  - .6 Piping.
  - .7 Testing and Commissioning.
  - .8 Supplied equipment long delivery items.

#### **1.7 PROJECT SCHEDULE REPORTING**

- .1 Update Project Schedule on a weekly basis reflecting activity changes and completions, as well as activities in progress.
- .2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.

#### **1.8 PROJECT MEETINGS**

- .1 Discuss Project Schedule at regular site meetings, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule

are those with projected start or completion dates later than current approved dates shown on baseline schedule.

- .2 Weather related delays with their remedial measures will be discussed and negotiated.

**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                RELATED SECTIONS**

- .1        Section 01 78 00 – Closeout Submittals.

**1.2                ADMINISTRATIVE**

- .1        Submit to Consultant submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2        Do not proceed with Work affected by submittal until review is complete.
- .3        Present shop drawings, product data, samples and mock-ups in Metric units.
- .4        Where items or information is not produced in Metric units converted values are acceptable.
- .5        Review submittals prior to submission to Consultant. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .6        Notify Consultant, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7        Verify field measurements and affected adjacent Work are coordinated.
- .8        Contractor's responsibility for errors and omissions in submission is not relieved by Consultant's review of submittals.
- .9        Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Consultant review.
- .10      Keep one reviewed copy of each submission on site.

**1.3                SHOP DRAWINGS AND PRODUCT DATA**

- .1        The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2        Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .3        Allow 10 working days for Consultant's review of each submission.



- .4 Adjustments made on shop drawings by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with Work.
- .5 Make changes in shop drawings as Consultant may require, consistent with Contract Documents. When resubmitting, notify Consultant in writing of revisions other than those requested.
- .6 Accompany submissions with transmittal letter, containing:
  - .1 Date.
  - .2 Project title and number.
  - .3 Contractor's name and address.
  - .4 Identification and quantity of each shop drawing, product data and sample.
  - .5 Other pertinent data.
- .7 Submissions include:
  - .1 Date and revision dates.
  - .2 Project title and number.
  - .3 Name and address of:
    - .1 Subcontractor.
    - .2 Supplier.
    - .3 Manufacturer.
  - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
  - .5 Details of appropriate portions of Work as applicable:
    - .1 Fabrication.
    - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
    - .3 Setting or erection details.
    - .4 Capacities.
    - .5 Performance characteristics.
    - .6 Standards.
    - .7 Operating weight.
    - .8 Wiring diagrams.
    - .9 Single line and schematic diagrams.
    - .10 Relationship to adjacent work.
- .8 After Consultant's review, distribute copies.
- .9 Submit 1 electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by Consultant where shop drawings will not be prepared due to standardized manufacture of product.
- .10 Submit 1 electronic copy of test reports for requirements requested in specification Sections and as requested by Consultant.

- .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
- .11 Submit 1 electronic copy of certificates for requirements requested in specification Sections and as requested by Consultant.
  - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
  - .2 Certificates must be dated after award of project contract complete with project name.
- .12 Submit 1 hard copy of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Consultant for review prior to preparing 4 hard copies for final submission.
- .13 Delete information not applicable to project.
- .14 Supplement standard information to provide details applicable to project.
- .15 If upon review by Consultant, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

#### **1.4 CERTIFICATES AND TRANSCRIPTS**

- .1 Immediately after award of Contract, submit Workers' Compensation Board status.
- .2 Submit transcription of insurance immediately after award of Contract.

#### **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                SECTION INCLUDES**

- .1            Health and safety considerations required to ensure due diligence towards health and safety on construction site.

**1.2                RELATED SECTIONS**

- .1            Section 01 31 19 – Project Meetings.
- .2            Section 01 33 00 – Submittal Procedures.

**1.3                REFERENCES**

- .1            Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2            Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1            Material Safety Data Sheets (MSDS).
- .3            Province of British Columbia
  - .1            Workers Compensation Act, RSBC 1996 - Updated 2006.

**1.4                SUBMITTALS**

- .1            Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2            Submit site-specific Health and Safety Plan: Within 5 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
  - .1            Results of site specific safety hazard assessment.
  - .2            Results of safety and health risk or hazard analysis for site tasks and operation.
- .3            Submit 1 copy of Contractor's authorized representative's work site health and safety inspection reports to Consultant and authority having jurisdiction, weekly.
- .4            Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .5            Submit copies of incident and accident reports.
- .6            Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 02 81 01 - Hazardous Materials.
- .7            Consultant's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.

**1.5                FILING OF NOTICE**

- .1            File Notice of Project with Provincial authorities prior to beginning of Work.

**1.6 SAFETY ASSESSMENT**

- .1 Perform site specific safety hazard assessment related to project.

**1.7 MEETINGS**

- .1 Schedule and administer Health and Safety meeting with Consultant prior to commencement of Work.

**1.8 REGULATORY REQUIREMENTS**

- .1 Do Work in accordance with Section 01 41 00 - Regulatory Requirements.

**1.9 GENERAL REQUIREMENTS**

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
- .2 Consultant may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

**1.10 RESPONSIBILITY**

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

**1.11 COMPLIANCE REQUIREMENTS**

- .1 Comply with Workers Compensation Act, B.C.

**1.12 UNFORSEEN HAZARDS**

- .1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Consultant verbally and in writing.

**1.13 HEALTH AND SAFETY CO-ORDINATOR**

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:
  - .1 Have working knowledge of occupational safety and health regulations.
  - .2 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
  - .3 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.

- .4 Be on site during execution of Work and report directly to and be under direction of site supervisor.

**1.14 POSTING OF DOCUMENTS**

- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province having jurisdiction, and in consultation with Consultant.

**1.15 CORRECTION OF NON-COMPLIANCE**

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Consultant.
- .2 Provide Consultant with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Consultant may stop Work if non-compliance of health and safety regulations is not corrected.

**1.16 WORK STOPPAGE**

- .1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.

**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 RELATED SECTIONS**

- .1 Requirements applicable to all sections within Division 26.

**1.2 REFERENCES**

- .1 Canadian Construction Documents Committee (CCDC)
  - .1 CCDC 2- Stipulated Price Contract.

**1.3 INSPECTION BY AUTHORITY**

- .1 Refer to CCDC 2, GC 2.3.
- .2 Allow Authorities Having Jurisdiction access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .3 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals, instructions, or law of Place of Work.
- .4 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.

**1.4 REVIEW BY CONSULTANT**

- .1 Consultant may order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of additional review and correction. If such Work is found in accordance with Contract Documents, Owner shall pay cost of examination and replacement.

**1.5 ACCESS TO WORK**

- .1 Allow inspection/testing agencies access to Work
- .2 Co-operate to provide reasonable facilities for such access.

**1.6 PROCEDURES**

- .1 Notify appropriate agency and Consultant in advance of requirement for tests, in order that attendance arrangements can be made.
- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

**1.7 REJECTED WORK**

- .1 Refer to CCDC, GC 2.4.
- .2 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Consultant as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .3 Make good other Contractor's work damaged by such removals or replacements promptly.
- .4 If in opinion of Consultant it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Consultant.
- .5 The Contractor shall rectify, in a manner acceptable to the Owner and the Consultant, all defective work and deficiencies throughout the Work, whether or not they are specifically identified by the Owner or the Consultant.

**1.8 REPORTS**

- .1 Submit 1 electronic copy of inspection and test reports to Consultant.

**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 RELATED SECTIONS**

- .1 Section 01 52 00 – Construction Facilities.

**1.2 INSTALLATION AND REMOVAL**

- .1 Provide temporary utilities controls in order to execute work expeditiously.
- .2 Remove from site all such work after use.

**1.3 TEMPORARY COMMUNICATION FACILITIES**

- .1 Provide and pay for temporary telephone, fax, data, high speed internet hook up, lines and equipment necessary for own use.

**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 RELATED SECTIONS**

- .1 Section 01 51 00 – Temporary Utilities.

**1.2 REFERENCES**

- .1 Canadian Construction Documents Committee (CCDC)
  - .1 CCDC 2, Stipulated Price Contract.
- .2 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-Z321, Signs and Symbols for the Occupational Environment.

**1.3 INSTALLATION AND REMOVAL**

- .1 Provide construction facilities in order to execute work expeditiously.
- .2 Remove from site all such work after use.

**1.4 SCAFFOLDING**

- .1 Scaffolding in accordance with CAN/CSA-S269.2.
- .2 Provide and maintain scaffolding, ramps, ladders, platforms and temporary stairs.

**1.5 HOISTING**

- .1 Provide, operate and maintain hoists required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for their use of hoists.
- .2 Hoists to be operated by qualified operator.

**1.6 SITE STORAGE/LOADING**

- .1 Refer to CCDC 2, GC 3.12.
- .2 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.
- .3 Do not load or permit to load any part of Work with weight or force that will endanger Work.

**1.7 CONSTRUCTION PARKING**

- .1 Parking will be permitted on site provided it does not disrupt performance and activities of the facility.
- .2 Provide and maintain adequate access to project site.

**1.8 EQUIPMENT, TOOL AND MATERIALS STORAGE**

- .1 Locate tools, equipment, and materials in area designated by owner.

- .2 Provide and maintain, in clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials to be stored in a designated area outside.

**1.9 SANITARY FACILITIES**

- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
- .2 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.
- .3 Take note that the contractor is not allowed to use the sites existing sanitary facilities

**1.10 CLEAN-UP**

- .1 Remove construction debris, waste materials, packaging material from work site daily.
- .2 Clean dirt or mud tracked onto paved or surfaced roadways.
- .3 Store materials resulting from demolition activities that are salvageable.
- .4 Stack stored new or salvaged material not in construction facilities.

**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 RELATED SECTIONS**

- .1 Requirements applicable to all sections within Division 26.

**1.2 QUALITY**

- .1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .2 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .3 Should disputes arise as to quality or fitness of products, decision rests strictly with Consultant based upon requirements of Contract Documents.
- .4 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .5 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

**1.3 AVAILABILITY**

- .1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify Consultant of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.
- .2 In event of failure to notify Consultant at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Consultant reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

**1.4 STORAGE, HANDLING AND PROTECTION**

- .1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3 Store products subject to damage from weather in weatherproof enclosures.
- .4 Remove and replace damaged products at own expense and to satisfaction of Consultant.
- .5 Touch-up damaged factory finished surfaces to Consultant's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

**1.5 TRANSPORTATION**

- .1 Pay costs of transportation of products required in performance of Work.

**1.6 MANUFACTURER'S INSTRUCTIONS**

- .1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
- .2 Notify Consultant in writing, of conflicts between specifications and manufacturer's instructions, so that Consultant will establish course of action.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Consultant to require removal and re-installation at no increase in Contract Price or Contract Time.

**1.7 QUALITY OF WORK**

- .1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Consultant if required Work is such as to make it impractical to produce required results.
- .2 Do not employ anyone unskilled in their required duties. Consultant reserves right to require dismissal from site, workers deemed incompetent or careless.
- .3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Consultant, whose decision is final.

**1.8 CO-ORDINATION**

- .1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.
- .2 Be responsible for coordination and placement of openings, sleeves and accessories.

**1.9 CONCEALMENT**

- .1 Before installation inform Consultant if there is interference. Install as directed by Consultant.

**1.10 REMEDIAL WORK**

- .1 Refer to CCDC 2.
- .2 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Co-ordinate adjacent affected Work as required.
- .3 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

**1.11 LOCATION OF FIXTURES**

- .1 Consider location of fixtures, outlets and mechanical and electrical items indicated as approximate.
- .2 Inform Consultant of conflicting installation. Install as directed.

**1.12 FASTENINGS**

- .1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.
- .2 Prevent electrolytic action between dissimilar metals and materials.
- .3 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.
- .4 Keep exposed fastenings to a minimum, space evenly and install neatly.

**1.13 FASTENINGS - EQUIPMENT**

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .2 Use heavy hexagon heads, semi-finished unless otherwise specified.
- .3 Bolts may not project more than one diameter beyond nuts.
- .4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

**1.14 EXISTING UTILITIES**

- .1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, building occupants and pedestrian and vehicular traffic.
- .2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

**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                RELATED SECTIONS**

- .1            Requirements applicable to all sections within Division 26.

**1.2                EXISTING SERVICES**

- .1            Before commencing work, establish location and extent of service lines in area of Work and notify Consultant of findings.

**1.3                LOCATION OF EQUIPMENT AND FIXTURES**

- .1            Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.
- .2            Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.
- .3            Inform Consultant of impending installation and obtain approval for actual location.
- .4            Submit field drawings to indicate relative position of various services and equipment when required by Consultant.

**1.4                SUBSURFACE CONDITIONS**

- .1            Promptly notify Consultant in writing if subsurface conditions at Place of Work differ materially from those indicated in Contract Documents, or a reasonable assumption of probable conditions based thereon.
- .2            After prompt investigation, should Consultant determine that conditions do differ materially, instructions will be issued for changes in Work as provided in Changes and Change Orders.

**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                RELATED SECTIONS**

- .1            Section 01 71 00 – Examination and Preparation.

**1.2                SUBMITTALS**

- .1            Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2            Submit written request in advance of cutting or alteration which affects:
  - .1            Structural integrity of elements of project.
  - .2            Integrity of weather-exposed or moisture-resistant elements.
  - .3            Efficiency, maintenance, or safety of operational elements.
  - .4            Visual qualities of sight-exposed elements.
- .3            Include in request:
  - .1            Identification of project.
  - .2            Location and description of affected Work.
  - .3            Statement on necessity for cutting or alteration.
  - .4            Description of proposed Work, and products to be used.
  - .5            Alternatives to cutting and patching.
  - .6            Effect on Work of Owner or separate contractor.
  - .7            Written permission of affected separate contractor.
  - .8            Date and time work will be executed.

**1.3                MATERIALS**

- .1            Required for original installation.
- .2            Change in Materials: Submit request for substitution in accordance with Section 01 33 00 - Submittal Procedures.

**1.4                PREPARATION**

- .1            Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
- .2            After uncovering, inspect conditions affecting performance of Work.
- .3            Beginning of cutting or patching means acceptance of existing conditions.
- .4            Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.
- .5            Provide protection from elements for areas which are to be exposed by uncovering work; maintain excavations free of water.

**1.5 EXECUTION**

- .1 Execute cutting, fitting, and patching including excavation and fill, to complete Work.
- .2 Fit several parts together, to integrate with other Work.
- .3 Uncover Work to install ill-timed Work.
- .4 Remove and replace defective and non-conforming Work.
- .5 Provide openings in non-structural elements of Work for penetrations of mechanical Work.
- .6 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .7 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.
- .8 Restore work with new products in accordance with requirements of Contract Documents.
- .9 Fit Work to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .10 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with firestopping material in accordance with Section 07 84 00 - Firestopping, full thickness of the construction element.
- .11 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.
- .12 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

**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                REFERENCES**

- .1        Canadian Construction Documents Committee (CCDC)
  - .1        CCDC 2, Stipulated Price Contract.

**1.2                PROJECT CLEANLINESS**

- .1        Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by Owner or other Contractors.
- .2        Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Consultant.
- .3        Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .4        Provide on-site containers for collection of waste materials and debris.
- .5        Dispose of waste materials and debris off site.
- .6        Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
- .7        Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .8        Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .9        Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .10      Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

**1.3                FINAL CLEANING**

- .1        Refer to CCDC 2, GC 3.13.
- .2        When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .3        Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .4        Prior to final review remove surplus products, tools, construction machinery and equipment.
- .5        Remove waste products and debris including that caused by Owner or other Contractors.
- .6        Remove waste materials from site at regularly scheduled times or dispose of as directed by Consultant.

- .7 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .8 Clean and polish hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures affected by the work.
- .9 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, walls, floors and ceilings affected by the work.
- .10 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.
- .11 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .12 Remove dirt and other disfiguration from exterior surfaces.
- .13 Sweep and wash clean paved areas.

**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                RELATED SECTIONS**

- .1    Section 01 33 00 – Submittal Procedures.
- .2    Section 01 45 00 – Quality Control.
- .3    Section 01 79 00 – Demonstration and Training.

**1.2                SUBMITTALS**

- .1    Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2    Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- .3    Copy will be returned after final inspection, with Consultant's comments.
- .4    Revise content of documents as required prior to final submittal.
- .5    Two weeks prior to Substantial Performance of the Work, submit to the Consultant four final copies of operating and maintenance manuals in English.
- .6    Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.
- .7    Furnish evidence, if requested, for type, source and quality of products provided.
- .8    Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
- .9    Pay costs of transportation.

**1.3                FORMAT**

- .1    Organize data as instructional manual.
- .2    Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
- .3    When multiple binders are used correlate data into related consistent groupings. Identify contents of each binder on spine.
- .4    Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5    Arrange content by systems, under sequence of Table of Contents.
- .6    Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7    Text: manufacturer's printed data, or typewritten data.
- .8    Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

- .9 The consultant will provide scaled CAD files in dwg format on CD. The contractor is responsible for updating these CAD files to be reflective of the final installations.

#### **1.4 CONTENTS - EACH VOLUME**

- .1 Table of Contents: provide title of project;
  - .1 Date of submission; names.
  - .2 Addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.
  - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
  - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.
- .6 Training: refer to Section 01 79 00 - Demonstration and Training.

#### **1.5 AS-BUILTS AND SAMPLES**

- .1 Maintain, in addition to requirements in General Conditions, at site for Consultant one record copy of:
  - .1 Contract Drawings.
  - .2 Specifications.
  - .3 Addenda.
  - .4 Change Orders and other modifications to Contract.
  - .5 Reviewed shop drawings, product data, and samples.
  - .6 Field test records.
  - .7 Inspection certificates.
  - .8 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Consultant.

- .6 The consultant will provide scaled CAD files in dwg format on CD. The contractor is responsible for updating these CAD files to be reflective of the final installations.

## **1.6 RECORDING ACTUAL SITE CONDITIONS**

- .1 Record information on set of black line opaque drawings, and in copy of Project Manual, provided by Consultant.
- .2 Provide felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
  - .1 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
  - .2 Field changes of dimension and detail.
  - .3 Changes made by change orders.
  - .4 Details not on original Contract Drawings.
  - .5 References to related shop drawings and modifications.
- .5 Specifications: mark each item to record actual construction, including:
  - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
  - .2 Changes made by Addenda and change orders.
- .6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.

## **1.7 EQUIPMENT AND SYSTEMS**

- .1 Each Item of Equipment and Each System: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .3 Include installed colour coded wiring diagrams.
- .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .6 Include manufacturer's printed operation and maintenance instructions.

- .7 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .8 Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.
- .9 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .10 Additional requirements: as specified in individual specification sections.

## **1.8 WARRANTIES AND BONDS**

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Warranty management plan to include required actions and documents to assure that Owner receives warranties to which it is entitled.
- .3 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .4 Submit, warranty information made available during construction phase, Consultant for approval prior to each monthly pay estimate.
- .5 Assemble approved information in binder and submit upon acceptance of work. Organize binder as follows:
  - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
  - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
  - .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
  - .4 Verify that documents are in proper form, contain full information, and are notarized.
  - .5 Co-execute submittals when required.
  - .6 Retain warranties and bonds until time specified for submittal.
- .6 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .7 Include information contained in warranty management plan as follows:
  - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
  - .2 Provide list for each warranted equipment, item, feature of construction or system indicating:
    - .1 Name of item.
    - .2 Model and serial numbers.
    - .3 Location where installed.
    - .4 Name and phone numbers of manufacturers or suppliers.

- .5 Names, addresses and telephone numbers of sources of spare parts.
  - .6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
  - .7 Cross-reference to warranty certificates as applicable.
  - .8 Starting point and duration of warranty period.
  - .9 Summary of maintenance procedures required to continue warranty in force.
  - .10 Cross-Reference to specific pertinent Operation and Maintenance manuals.
  - .11 Organization, names and phone numbers of persons to call for warranty service.
  - .12 Typical response time and repair time expected for various warranted equipment.
- .8 Respond in a timely manner to oral or written notification of required construction warranty repair work.

**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                RELATED SECTIONS**

- .1            Section 01 91 13 – General Commissioning (Cx) Requirements.

**1.2                DESCRIPTION**

- .1            Demonstrate operation and maintenance of equipment and systems to Owner's personnel two weeks prior to date of substantial performance.
- .2            Owner will provide list of personnel to receive instructions, and will co-ordinate their attendance at agreed-upon times.

**1.3                QUALITY CONTROL**

- .1            When specified in individual Sections require manufacturer to provide authorized representative to demonstrate operation of equipment and systems, instruct Owner's personnel, and provide written report that demonstration and instructions have been completed.

**1.4                SUBMITTALS**

- .1            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 Consultant'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.

**1.5                CONDITIONS FOR DEMONSTRATIONS**

- .1            Testing, adjusting, and balancing has been performed in accordance with Section 01 91 13 - General Commissioning (Cx) Requirements and equipment and systems are fully operational.
- .2            Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

**1.6                PREPARATION**

- .1            Verify that conditions for demonstration and instructions comply with requirements.
- .2            Verify that designated personnel are present.

**1.7                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
- .5 need for additional data becomes apparent during instructions.

**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 SUMMARY**

- .1 Section Includes:
  - .1 General requirements relating to commissioning of project's components and systems, specifying general requirements to PV of components, equipment, sub-systems, systems, and integrated systems.
- .2 Related Sections:
  - .1 Section 01 33 00 – Submittal Procedures.
  - .2 Section 01 79 00 – Demonstration and Training.
- .3 Acronyms:
  - .1 BMM - Building Management Manual.
  - .2 Cx - Commissioning.
  - .3 EMCS - Energy Monitoring and Control Systems.
  - .4 O&M - Operation and Maintenance.
  - .5 PI - Product Information.
  - .6 PV - Performance Verification.

**1.2 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.

### **1.3 COMMISSIONING OVERVIEW**

- .1 Cx to be a line item of Contractor's cost breakdown.
- .2 Cx activities supplement field quality and testing procedures described in relevant technical sections.
- .3 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 systems are 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.

### **1.4 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 Consultant to ensure effective performance.
- .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.

### **1.5 PRE-CX REVIEW**

- .1 Before Construction:
  - .1 Review contract documents, confirm by writing to Consultant.
    - .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 Consultant.
  - .7 Have Cx schedules up-to-date.
  - .8 Ensure systems have been cleaned thoroughly.
  - .9 Ensure "As-Built" system schematics are available.
- .4 Inform Consultant in writing of discrepancies and deficiencies on finished works.

## **1.6 CONFLICTS**

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

## **1.7 SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Submit no later than 2 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 Consultant for changes to submittals and obtain written approval at least 1 week prior to start of Cx.
  - .3 Submit proposed Cx procedures to Consultant where not specified and obtain written approval at least 1 week prior to start of Cx.
  - .4 Provide additional documentation relating to Cx process required by Consultant.

## **1.8 COMMISSIONING DOCUMENTATION**

- .1 Consultant to review and approve Cx documentation.
- .2 Provide completed and approved Cx documentation to Consultant.

## **1.9 COMMISSIONING SCHEDULE**

- .1 Provide detailed Cx schedule as part of construction schedule in accordance with Section 01 32 16 - Construction Progress Schedules - 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.

## **1.10 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 MANUFACTURER'S INVOLVEMENT**

- .1 Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems.

- .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.
- .2 Integrity of warranties:
  - .1 Verify with manufacturer that testing as specified will not void warranties.

## **1.12 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 Consultant after distinct phases have been completed and before commencing next phase.
- .4 Document required 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 Consultant. 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, Consultant 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.

## **1.13 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 to Consultant 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.

**1.14 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.

**1.15 START OF COMMISSIONING**

- .1 Notify Consultant at least 7 days prior to start of Cx.
- .2 Start Cx after elements of building affecting start-up and performance verification of systems have been completed.

**1.16 COMMISSIONING PERFORMANCE VERIFICATION**

- .1 Carry out Cx:
  - .1 Under actual operating conditions.
  - .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.

**1.17 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 Consultant within 5 days of test and with Cx report.

**1.18 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.

**1.19 DEFICIENCIES, FAULTS, DEFECTS**

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

**1.20 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 Consultant.

**1.21 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.

**1.22 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS**

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

**1.23 OWNER'S PERFORMANCE TESTING**

- .1 Performance testing of equipment or system by Consultant 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                RELATED SECTIONS**

- .1        Section 01 61 00 – Common Product Requirements
- .2        Division 26 – Electrical.

**1.2                REFERENCES**

- .1        Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1        Material Safety Data Sheets (MSDS).
- .2        Underwriter's Laboratories of Canada (ULC)
  - .1        ULC-S115, Fire Tests of Fire stop Systems.

**1.3                DEFINITIONS**

- .1        Fire Stop Material: device intended to close off opening or penetration during fire or materials that fill openings in wall or floor assembly where penetration is by cables, cable trays, conduits, ducts and pipes and poke-through termination devices, including electrical outlet boxes along with their means of support through wall or floor openings.
- .2        Single Component Fire Stop System: fire stop material that has Listed Systems Design and is used individually without use of high temperature insulation or other materials to create fire stop system.
- .3        Multiple Component Fire Stop System: exact group of fire stop materials that are identified within Listed Systems Design to create on site fire stop system.

**1.4                SUBMITTALS**

- .1        Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2        Product Data:
  - .1        Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3        Shop Drawings:
  - .1        Submit shop drawings to show location, proposed material, reinforcement, anchorage, fastenings and method of installation.
  - .2        Construction details should accurately reflect actual job conditions.
- .4        Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.
  - .1        Test reports: in accordance with CAN-ULC-S101 for fire endurance and CAN-ULC-S102 for surface burning characteristics.
    - .1        Submit certified test reports from approved independent testing laboratories, indicating compliance of applied fire stopping with



specifications for specified performance characteristics and physical properties.

- .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures.

## **1.5 QUALITY ASSURANCE**

- .1 Qualifications:
  - .1 Installer: person specializing in fire stopping installations with 5 years documented experience.

## **1.6 DELIVERY, STORAGE AND HANDLING**

- .1 Packing, shipping, handling and unloading:
  - .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
  - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
  - .3 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name, manufacturer, ULC markings.
- .2 Storage and Protection:
  - .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Replace defective or damaged materials with new.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Fire stopping and smoke seal systems: in accordance with CAN-ULC-S115.
  - .1 Asbestos-free materials and systems capable of maintaining effective barrier against flame, smoke and gases in compliance with requirements of CAN-ULC-S115 and not to exceed opening sizes for which they are intended.
- .2 Fire rated ceilings approved 3M product
- .3 Service penetration assemblies: systems tested to CAN-ULC-S115.
- .4 Service penetration fire stop components: certified by test laboratory to CAN-ULC-S115.
- .5 Fire-resistance rating of installed fire stopping assembly in accordance with British Columbia Building Code.
- .6 Fire stopping and smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal.

- .7 Fire stopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal.
- .8 Primers: to manufacturer's recommendation for specific material, substrate, and end use.
- .9 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.
- .10 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.
- .11 Sealants for vertical joints: non-sagging.

### **Part 3 Execution**

#### **3.1 MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

#### **3.2 PREPARATION**

- .1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials.
  - .1 Ensure that substrates and surfaces are clean, dry and frost free.
- .2 Prepare surfaces in contact with fire stopping materials and smoke seals to manufacturer's instructions.
- .3 Maintain insulation around pipes and ducts penetrating fire separation.
- .4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

#### **3.3 INSTALLATION**

- .1 Install fire stopping and smoke seal material and components in accordance with manufacturer's certified tested system listing.
- .2 Seal holes or voids made by through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained.
- .3 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.
- .4 Tool or trowel exposed surfaces to neat finish.
- .5 Remove excess compound promptly as work progresses and upon completion.

#### **3.4 SEQUENCES OF OPERATION**

- .1 Proceed with installation only when submittals have been reviewed by Consultant.

- .2 Mechanical pipe insulation: certified fire stop system component.
  - .1 Ensure pipe insulation installation precedes fire stopping.

### **3.5 FIELD QUALITY CONTROL**

- .1 Inspections: notify Consultant when ready for inspection and prior to concealing or enclosing fire stopping materials and service penetration assemblies.

### **3.6 CLEANING**

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
- .3 Remove temporary dams after initial set of fire stopping and smoke seal materials.

### **3.7 SCHEDULE**

- .1 Fire stop and smoke seal at:
  - .1 Penetrations through fire-resistance rated masonry, concrete, and gypsum board partitions and walls.
  - .2 Penetrations through fire-resistance rated floor slabs, ceilings and roofs.
  - .3 Around mechanical and electrical assemblies penetrating fire separations.

**END OF SECTION**

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 The fire suppression contractor shall retain the services of a Registered Professional Engineer registered in the Province of British Columbia to provide complete engineering design and field review services including signed and sealed CAD fire suppression drawings and hydraulic calculations. The fire suppression contractor shall review the existing fire suppression system hydraulics and confirm that the additional backflow prevention as specified is acceptable for the given hydraulic conditions.
- .2 The fire suppression contractor's Registered Professional Engineer shall fulfill the role of Supporting Professional Engineer as defined in the Province of BC Building Code, and shall provide signed and sealed Letters of Assurance Schedule S-B and Schedule S-C for the project.
- .3 The fire suppression contractor's Registered Professional Engineer shall provide field reviews of the work on site as the work progresses and submit signed copies of the reports to Stantec Consulting Ltd.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Product Data:
    - .1 Submit manufacturer's instructions, printed product literature and data sheets for backflow preventers and precast chambers.
  - .2 Shop drawings:
    - .1 Submit drawings stamped and signed by professional engineer registered or licensed in British Columbia, Canada.
    - .2 Drawings to show:
      - .1 Mounting arrangements.
      - .2 Operating and maintenance clearances.
    - .3 Drawings and product data accompanied by:
      - .1 Detailed drawings of bases, supports, and anchor bolts.
      - .2 Points of operation on performance curves.
      - .3 Manufacturer to certify current model production.
      - .4 Certification of compliance to applicable codes.
  - .4 In addition to transmittal letter referred to in Section 01 33 00- Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

### 1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00- Closeout Submittals.
- .2 The fire suppression contractor's Registered Professional Engineer shall fulfill the role of Supporting Professional Engineer as defined in the Province of BC Building Code, and shall provide signed and sealed Letters of Assurance Schedule S-B and Schedule S-C for the project.
- .3 Operation and Maintenance Data: submit operation and maintenance data for backflow preventers
  - .1 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
  - .2 Operation data to include:
    - .1 Operation instruction for systems and component.
    - .2 Description of actions to be taken in event of equipment failure.
    - .3 Valves schedule and flow diagram.
  - .3 Maintenance data to include:
    - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
    - .2 Data to include schedules of tasks, frequency, tools required and task time.
  - .4 Performance data to include:
    - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
    - .2 Equipment performance verification test results.
  - .5 Approvals:
    - .1 Submit 1 copy of draft Operation and Maintenance Manual to Consultant for approval. Submission of individual data will not be accepted unless directed by Consultant.
    - .2 Make changes as required and re-submit as directed by Consultant.
  - .6 Additional data:
    - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
  - .7 Site records:
    - .1 Consultant will provide 1 set of reproducible mechanical drawings. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems.
    - .2 Transfer information monthly to reproducibles, revising reproducibles to show work as actually installed.
    - .3 Use different colour waterproof ink for each service.
    - .4 Make available for reference purposes and inspection.
  - .8 As-Built drawings:

- .1 Prior to start of Testing, Adjusting and Balancing, finalize production of as-built drawings.
  - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
  - .3 Submit to Consultant for approval and make corrections as directed.
  - .4 Perform testing, adjusting and balancing using as-built drawings.
  - .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
- .9 Submit copies of as-built drawings for inclusion in final TAB report.

**1.4 MAINTENANCE MATERIAL SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00- Closeout Submittals.
- .2 Provide one set of special tools required to service equipment as recommended by manufacturers.

**1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Not used

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for use prior to the submission of tender
  - .1 Inform Consultant of unacceptable conditions immediately upon discovery.
  - .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from the Consultant

**3.2 PAINTING REPAIRS AND RESTORATION**

- .1 Prime and touch up marred finished paintwork to match original.
- .2 Restore to new condition, finishes which have been damaged.

**3.3 DEMONSTRATION**

- .1 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
- .2 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.
- .3 Instruction duration time requirements as specified in appropriate sections.

**3.4 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

**3.5 PROTECTION**

- .1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCE STANDARDS**

- .1 National Fire Prevention Association (NFPA)
  - .1 NFPA 13-2007, Standard for the Installation of Sprinkler Systems.
  - .2 NFPA 20-2007, Standard for the Installation of Stationary Pumps for Fire Protection.
  - .3 NFPA 24-2007, Standard for the Installation of Private Fire Service Mains and Their Appurtenances.
  - .4 NFPA 25-2008, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
  - .1 Provide manufacturer's printed product literature and data sheets, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in British Columbia, Canada.
  - .2 Indicate:
    - .1 Materials.
    - .2 Finishes.
    - .3 Method of anchorage
    - .4 Number of anchors.
    - .5 Supports.
    - .6 Reinforcement.
    - .7 Assembly details.
    - .8 Accessories.
- .4 Test reports:
  - .1 Submit certified test reports for wet pipe fire protection sprinkler systems from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
- .5 Certificates:
  - .1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .6 Manufacturers' Instructions:
  - .1 Provide manufacturer's installation instructions.



- .7 Field Quality Control Submittals:
  - .1 Manufacturer's Field Reports: manufacturer's field reports specified.

### **1.3 CLOSEOUT SUBMITTALS**

- .1 Provide operation, maintenance and engineering data for incorporation into manual specified in Section 01 78 00- Closeout Submittals in accordance with ANSI/NFPA 20.
- .2 Manufacturer's catalogue Data, including specific model, type, and size for:
  - .1 Pipe and fittings.
  - .2 Valves, including gate, check, and globe.
  - .3 Pipe hangers and supports.
  - .4 Backflow Prevention Stations
  - .5 Mechanical couplings.
- .3 Drawings:
  - .1 Piping system layout.
    - .1 Prepare 760 mm by 1050 mm detail working drawings of system layout in accordance with NFPA 13, "Working Drawings (Plans)" for fire protection systems being modified under this contract.
    - .2 Show data essential for proper installation of each system.
    - .3 Show details, plan view, elevations, and sections of systems supply and piping.
    - .4 Show piping schematic of systems supply, devices, valves, pipe, and fittings. Show point to point electrical wiring diagrams.
  - .2 Electrical wiring diagrams.
- .4 Design Data:
  - .1 Calculations of sprinkler system hydraulics before and after the addition of the specified back flow prevention stations
- .5 Field Test Reports:
  - .1 Preliminary tests on piping system.
- .6 Records:
  - .1 As-built drawings of each system.
    - .1 After completion, but before final acceptance, submit complete set of as-built drawings of each system for record purposes.
    - .2 Submit 760 mm by 1050 mm drawings with title block similar to full size contract drawings.
- .7 Operation and Maintenance Manuals:
  - .1 Provide Contractors Material and Test Certificate for aboveground and underground piping and other documentation for incorporation into manual in accordance with NFPA 13.

## **1.4 QUALITY ASSURANCE**

- .1 Qualifications:
  - .1 Installer: company or person specializing in wet sprinkler systems with documented experience.
  - .2 Supply grooved joint couplings, fittings, valves, grooving tools and specialties from a single manufacturer. Use date stamped castings for coupling housings, fittings, valve bodies, for quality assurance and traceability.

## **1.5 MAINTENANCE MATERIAL SUBMITTALS**

- .1 Extra Materials:
  - .1 Provide maintenance materials in accordance with Section 01 78 00- Closeout Submittals.

## **1.6 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions
- .2 Delivery and Acceptance Requirements:
  - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Storage and Protection:
  - .1 Store materials indoors, in a dry location.
  - .2 Store and protect materials from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

## **Part 2 Products**

### **2.1 DESIGN REQUIREMENTS**

- .1 Design for modifications to the existing automatic wet pipe fire suppression sprinkler systems in accordance with required and advisory provisions of NFPA 13, with consideration for hydraulic calculations for uniform distribution of water over design area
- .2 Include with each system materials, accessories, and equipment inside and outside building to provide each system complete and ready for use.
- .3 Design and provide each system to give full consideration to blind spaces, piping, electrical equipment, ducts, and other construction and equipment in accordance with detailed shop drawings.
- .4 Devices and equipment for fire protection service: ULC approved for use in wet pipe sprinkler systems.
- .5 Design systems for earthquake protection for buildings in seismic zones 3.

## **2.2 ABOVE GROUND PIPING SYSTEMS**

- .1 Provide fittings for changes in direction of piping and for connections.
  - .1 Make changes in piping sizes through tapered reducing pipe fittings, bushings will not be permitted.

## **2.3 PIPE, FITTINGS AND VALVES**

- .1 Pipe:
  - .1 Ferrous: to NFPA 13.
- .2 Fittings and joints to NFPA 13:
  - .1 Ferrous: screwed, welded, flanged or roll grooved.
    - .1 Grooved joints designed with two ductile iron housing segments, pressure responsive gasket, and zinc-electroplated steel bolts and nuts. Cast with offsetting angle-pattern bolt pads for rigidity and visual pad-to-pad offset contact.
  - .2 Plain-end fittings with mechanical couplings and fittings which use steel gripping devices to bite into pipe when pressure is applied will not be permitted.
  - .3 Rubber gasketed grooved-end pipe and fittings with mechanical couplings are permitted in pipe sizes 32 mm and larger.
  - .4 Fittings: ULC approved for use in wet pipe sprinkler systems.
  - .5 Ensure fittings, mechanical couplings, and rubber gaskets are supplied by same manufacturer.
  - .6 Sprinkler pipe and fittings: metal.
- .3 Valves:
  - .1 ULC listed for fire protection service.
  - .2 Gate valves: open by counter clockwise rotation.
  - .3 Provide OS &Y rising stem valve beneath each alarm valve in each riser when more than one alarm valve is supplied from same water supply pipe.
  - .4 Check valves: flanged clear opening swing or spring actuated check type with flanged inspection and access cover plate for sizes 10 cm and larger.
- .4 Pipe hangers:
  - .1 ULC listed for fire protection services in accordance with NFPA.

## **2.4 ALARM CHECK VALVE**

- .1 Alarm check valve to NFPA 13 and ULC listed for fire service.
- .2 Relocate existing alarm check valves as indicated on the drawings

## **2.5 SUPERVISORY SWITCHES**

- .1 General: to NFPA 13 and ULC listed for fire service.
- .2 Valves:

- .1 Mechanically attached to valve body, with normally open and normally closed contacts and supervisory capability.
- .3 Pressure or flow switch type:
  - .1 With normally open and normally closed contacts and supervisory capability.
  - .2 Provide switch with circuit opener or closer for automatic transmittal of alarm over facility fire alarm system.
  - .3 Connect into building fire alarm system.
  - .4 Connection of switch: Section 28 31 00- Addressable Fire Alarm System.
  - .5 Alarm actuating device: mechanical diaphragm controlled retard device adjustable from 10 to 60 seconds and instantly recycle.
- .4 Pressure alarm switch:
  - .1 With normally open and normally closed contacts and supervisory capability.

## **2.6 BURIED WATER PIPING SYSTEM**

- .1 Pipe and Fittings:
  - .1 Provide outside-coated, cement-mortar lined, ductile-iron pipe, and fittings, in accordance with NFPA 24, for piping under building and outside of building walls.
  - .2 Anchor joints in accordance with NFPA 24.
  - .3 Provide concrete thrust block at elbow where pipe turns up toward the floor, and restrain pipe riser with steel rods from elbow to flange above floor.
  - .4 Minimum pipe size: 150 mm.
  - .5 Minimum depth of cover: 1.0 metre at finish grade.
- .2 Buried Utility Warning and Identification Tape:
  - .1 Provide detectable aluminum foil plastic backed tape manufactured specifically for warning and identification of buried piping detectable by electronic detection instrument.
  - .2 Provide tape in rolls, 7.6 cm minimum width, colour coded in accordance with local utility, with warning and identification imprinted in bold black letters continuously and repeatedly over entire tape length.
  - .3 Warning and identification: to read "CAUTION BURIED WATER PIPING BELOW".
  - .4 Use permanent code and letter colouring unaffected by moisture and other substances contained in trench backfill material.

## **2.7 PIPE SLEEVES**

- .1 Provide pipe sleeves where piping passes through walls or floors.
- .2 Secure sleeves in position and location during construction.
- .3 Provide sleeves of sufficient length to pass through entire thickness of floors or walls.

- 4 Provide 2.5 cm minimum clearance between exterior of piping and interior of sleeve or core-drilled hole.
  - .1 Firmly pack space with mineral wool insulation.
  - .2 Seal space at both ends of sleeve or core-drilled hole with plastic waterproof cement which will dry to firm but pliable mass, provide mechanically adjustable segmented elastomeric seal.
  - .3 In fire walls and fire floors, seal both ends of pipe sleeves or core-drilled holes with ULC listed fill, void, or cavity material.

## **2.8 SIGNS**

- .1 Attach properly lettered Bilingual and approved metal signs to each valve and alarm device to NFPA 13.

## **2.9 BACK FLOW PREVENTERS**

- .1 Preventers: to CSA-B64 Series, application double check valve assembly
- .2 ULC Listed double check valve assembly (DCVA) complete with O.S. & Y. inlet and outlet shut-off valves.
- .3 Isolation valves shall be provided with supervisory switches connected to supervisory signals at the fire alarm system.

## **Part 3 Execution**

### **3.1 MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

### **3.2 INSTALLATION**

- .1 Install, inspect and test to acceptance in accordance with NFPA 13 and NFPA 25.

### **3.3 PIPE INSTALLATION**

- .1 Install piping straight and true to bear evenly on hangers and supports. Do not hang piping from plaster ceilings.
- .2 Keep interior and ends of new piping and existing piping thoroughly cleaned of water and foreign matter.
- .3 Keep piping systems clean during installation by means of plugs or other approved methods. When work is not in progress, securely close open ends of piping to prevent entry of water and foreign matter.
- .4 Inspect piping before placing into position.

### **3.4 BACKFLOW PREVENTION STATIONS**

- .1 Install backflow prevention stations in complete accordance with CSA-B64 Series, application double check valve assembly
- .2 Complete testing of all backflow prevention devices shall be carried out under this Section of the work prior to final acceptance of fire suppression systems. Submit a certificate duly signed and witnessed that testing was satisfactorily completed and include a copy in the project Mechanical Operation and Maintenance Manual.

### **3.5 ELECTRICAL CONNECTIONS**

- .1 Provide electrical work associated with this section under Section 26 05 00- Common Work Results for Electrical.
- .2 Provide fire alarm system under Section 28 31 00- Addressable Fire Alarm System.
- .3 Provide control and fire alarm wiring, including connections to fire alarm systems, in accordance with National Electrical Code.
- .4 Provide wiring in rigid metal conduit or intermediate metal conduit.

### **3.6 CONNECTIONS TO EXISTING WATER SUPPLY SYSTEMS**

- .1 Notify Contracting Officer in writing at least 15 days prior to connection date.
- .2 Bolt sleeves around main piping.
- .3 Bolt valve to branch connection. Open valve, attach drilling machine, make tap, close valve, and remove drilling machine, without interruption of service.
- .4 Furnish materials required to make connections into existing water supply systems, and perform excavating, backfilling, and other incidental labour as required.

### **3.7 BURIED PIPING SYSTEM**

- .1 Bury tape with printed side up at depth of 30 cm below the top surface of earth or top surface of subgrade under pavements.

### **3.8 FIELD QUALITY CONTROL**

- .1 Site Test, Inspection:
  - .1 Perform test to determine compliance with specified requirements in presence of Consultant.
  - .2 Test, inspect, and approve piping before covering or concealing.
  - .3 Preliminary Tests:
    - .1 Hydrostatically test each system at 200 psig for a 2-hour period with no leakage or reduction in pressure.
    - .2 Flush piping with potable water in accordance with NFPA 13.
    - .3 Piping above suspended ceilings: tested, inspected, and approved before installation of ceilings.
    - .4 Test alarms and other devices.

- .5 Test water flow alarms by flowing water through inspector's test connection. When tests have been completed and corrections made, submit signed and dated certificate in accordance with NFPA 13.
- .4 Formal Tests and Inspections:
  - .1 Do not submit request for formal test and inspection until preliminary test and corrections are completed and approved.
  - .2 Submit written request for formal inspection at least 15 days prior to inspection date.
  - .3 Repeat required tests as directed.
  - .4 Correct defects and make additional tests until systems comply with contract requirements.
- .2 Manufacturer's Field Services:
  - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
  - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
  - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

### **3.9 CLEANING**

- .1 Clean in accordance with Section 01 74 11- Cleaning.
  - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

**Part 1            General**

**1.1                ACTION AND INFORMATIONAL SUBMITTALS**

- .1        Submit in accordance with Section 01 33 00- Submittal Procedures.
- .1        Product Data:
  - .1            Submit manufacturer's instructions, printed product literature and data sheets for backflow preventers and precast chambers.
- .2        Shop drawings:
  - .1            Submit drawings stamped and signed by professional engineer registered or licensed in British Columbia, Canada.
  - .2            Drawings to show:
    - .1                Mounting arrangements.
    - .2                Operating and maintenance clearances.
  - .3            Drawings and product data accompanied by:
    - .1                Detailed drawings of bases, supports, and anchor bolts.
    - .2                Points of operation on performance curves.
    - .3                Manufacturer to certify current model production.
    - .4                Certification of compliance to applicable codes.
  - .4            In addition to transmittal letter referred to in Section 01 33 00- Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

**1.2                CLOSEOUT SUBMITTALS**

- .1        Submit in accordance with Section 01 78 00- Closeout Submittals.
- .2        Operation and Maintenance Data: submit operation and maintenance data for backflow preventers
  - .1            Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
  - .2            Operation data to include:
    - .1                Operation instruction for systems and component.
    - .2                Description of actions to be taken in event of equipment failure.
    - .3                Valves schedule and flow diagram.
  - .3            Maintenance data to include:
    - .1                Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
    - .2                Data to include schedules of tasks, frequency, tools required and task time.
  - .4            Performance data to include:



- .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
- .2 Equipment performance verification test results.
- .5 Approvals:
  - .1 Submit 1 copy of draft Operation and Maintenance Manual to Consultant for approval. Submission of individual data will not be accepted unless directed by Consultant.
  - .2 Make changes as required and re-submit as directed by Consultant.
- .6 Additional data:
  - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
- .7 Site records:
  - .1 Consultant will provide 1 set of reproducible mechanical drawings. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems.
  - .2 Transfer information monthly to reproducibles, revising reproducibles to show work as actually installed.
  - .3 Use different colour waterproof ink for each service.
  - .4 Make available for reference purposes and inspection.
- .8 As-Built drawings:
  - .1 Prior to start of Testing, Adjusting and Balancing, finalize production of as-built drawings.
  - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
  - .3 Submit to Consultant for approval and make corrections as directed.
  - .4 Perform testing, adjusting and balancing using as-built drawings.
  - .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
- .9 Submit copies of as-built drawings for inclusion in final TAB report.

### **1.3 MAINTENANCE MATERIAL SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00- Closeout Submittals.
- .2 Provide one set of special tools required to service equipment as recommended by manufacturers.

### **1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not used.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for use prior to the submission of tender
  - .1 Inform Consultant of unacceptable conditions immediately upon discovery.
  - .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from the Consultant

**3.2 PAINTING REPAIRS AND RESTORATION**

- .1 Prime and touch up marred finished paintwork to match original.
- .2 Restore to new condition, finishes which have been damaged.

**3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

**3.4 PROTECTION**

- .1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCE STANDARDS**

- .1 American Society of Mechanical Engineers International (ASME)
  - .1 ANSI/ASME B16.18-12, Cast Copper Alloy Solder Joint Pressure Fittings.
- .2 National Sanitation foundation (NSF)
  - .1 NSF/ANSI 61-13, Drinking Water System Components-Health Effects.
- .3 National Research Council (NRC)
  - .1 National Plumbing Code of Canada (NPC) 2015.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data
  - .1 Provide manufacturer's printed product literature and datasheets for insulation and adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Closeout Submittals:
  - .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00- Closeout Submittals.

**Part 2 Products**

**2.1 PIPING**

- .1 Domestic hot, cold and recirculation systems, within building.
  - .1 Above ground:
    - .1 Type 'K' hard drawn seamless copper tubing to ASTM B88 or copper pipe to ASTM B42. All copper water tubing shall be certified by the Canadian Standards Association or Warnock Hersey Professional Services Ltd. to ASTM B88.
  - .2 Buried or embedded:
    - .1 75 mm and smaller.
      - .1 Type 'K' seamless soft copper tubing to ASTM B88 or copper pipe to ASTM B42 with cast brass or wrought copper fittings and silver soldered joints all encased in a polyethylene piping system.
    - .2 100 mm and larger.

- .1 Ductile iron cement lined Class 50 or 52 pipe with rubber ring, or mechanical type joints for 1380 kPa 200 psig working pressure to AWWA C151.
  - .2 Polyvinyl chloride (PVC) AWWA C-900 (905) pressure water pipe to CSA B137.3
  - .3 All fittings shall be provided with integral tie lugs. Weld on lugs are not acceptable.
  - .4 Tie rods, bolts and nuts shall conform to the requirements of ASTM specifications for steel bridges and buildings, serial designation A-7. All bolts shall have American Standard course screw threads with a Class 2 free fit. Rolled threads are unacceptable.
- .3 Fittings:
- .1 All fittings shall be provided with integral tie lugs where thrust blocks are unable to be used. Weld on lugs are unacceptable.
  - .2 NPS 3 and larger mechanical joints or flanged: to ANSI/AWWA C110/A21.10.
  - .3 Flange gaskets shall be 3.175 mm thick manufactured from natural rubber with lead tip and a layer of cotton on both sides.
  - .4 Rubber gaskets for mechanical joints or flanges: to ANSI/AWWA C111/A21.11.
  - .5 Bolts, nuts, hex head with washers: to ASTM A307, heavy series
  - .6 Tie rods, bolts and nuts shall conform to the requirements of ASTM specifications for steel bridges and buildings, serial designation A-7. All bolts shall have American Standard course screw threads with a Class 2 free fit. Rolled threads are unacceptable.
  - .7 Tie rods as well as thrust blocks shall be used at all directional change fittings; elbows, tees, etc. where the water pipe installation is of plastic; PVC, etc. materials. The tie rods shall extend from the fittings to just beyond the next subsequent pipe joint.

## 2.2 FITTINGS

- .1 NPS 2 and larger:
  - .1 ANSI/ASME B16.18 or ANSI/ASME B16.22 roll grooved to CSA B242.
- .2 NPS 1 ½ and smaller:
  - .1 Wrought copper to ANSI/ASME B16.22 or cast copper to ANSI/ASME B16.18; Suitable for operating pressure to 1380kPa.

## 2.3 JOINTS

- .1 Rubber gaskets, latex-free 1.6mm thick: to AWWA C111.
- .2 Bolts, nuts, hex head and washers: to ASTM A307, heavy series.

- .3 Solder: tin copper alloy 95/5.
- .4 Teflon tape: for threaded joints.
- .5 Grooved couplings: designed with angle bolt pads to provide rigid joint, complete with EPDM gasket.
- .6 Dielectric connections between dissimilar metals: dielectric fitting, complete with thermoplastic liner.

## **2.4 BALL VALVES**

- .1 NPS 2 and under, screwed:
  - .1 Class 150.
  - .2 Bronzebody, stainless steelball, PTFE adjustable packing, brass gland and PTFE seat, steel lever handle
- .2 NPS 2 and under, soldered:
  - .1 To ANSI/ASME B16.18, Class 150.
  - .2 Bronzebody, stainless steelball, PTFE adjustable packing, brass gland and PTFE seat, steel lever handle
- .3 NPS 2 and under, mechanical:
  - .1 To CSA B137.5 and ASTM F1960.
  - .2 Lead free brass body.

## **Part 3 Execution**

### **3.1 PREPARATION**

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

### **3.2 INSTALLATION**

- .1 Install in accordance with National Plumbing Code.
- .2 Assemble piping using fittings manufactured to ANSI and Standard Council of Canada (SCC) standards.
- .3 Provide continuous supervision during start-up.
- .4 Start-up procedures:
  - .1 Establish circulation and ensure that air is eliminated.
  - .2 Check pressurization to ensure proper operation and to prevent water hammer, flashing and/or cavitation.
  - .3 Check control, limit, safety devices for normal and safe operation.
- .5 Rectify start-up deficiencies.

### **3.3 PERFORMANCE VERIFICATION**

- .1 Scheduling:
  - .1 Verify system performance after pressure and leakage tests and disinfection are completed, and Certificate of Completion has been issued by authority having jurisdiction.
- .2 Procedures:
  - .1 Adjust pressure regulating valves while withdrawal is maximum and inlet pressure is minimum.
  - .2 Sterilize systems for Legionella control.
  - .3 Confirm water quality consistent with supply standards, and ensure no residuals remain as result of flushing or cleaning.
- .3 Reports:
  - .1 Include certificate of water flow and pressure tests conducted on incoming water service, demonstrating adequacy of flow and pressure.

**END OF SECTION**

**Part 1           General**

**1.1               REFERENCE STANDARDS**

- .1   ASTM International Inc.
  - .1     ASTM B306-02, Standard Specification for Copper Drainage Tube (DWV).
- .2   Canadian Standards Association (CSA International).
  - .1     CAN/CSA-B125.3-05, Plumbing Fittings.
- .3   National Research Council Canada (NRC)
  - .1     National Plumbing Code of Canada 2015(NPC).

**1.2               ACTION AND INFORMATIONAL SUBMITTALS**

- .1   Provide submittals in accordance with Section 01 33 00- Submittal Procedures.
- .2   Product Data:
  - .1     Provide manufacturer's printed product literature and datasheets for adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.

**1.3               DELIVERY, STORAGE AND HANDLING**

- .1   Deliver, store and handle in accordance with Section 01 61 00- Common Product Requirements.
- .2   Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

**Part 2           Products**

**2.1               INTERIOR DRAIN, WASTE AND VENT PIPE AND FITTINGS**

- .1   Buried pipe and fittings:
  - .1     Class 4000 cast iron mechanical joint pipe and fittings with mechanical joint stainless steel couplings to CSA CAN3-B70.
  - .2     Acrylonitrile-Butadiene-Styrene (ABS) Drain Waste and Vent Pipe Fittings conforming to CSA CAN 3-B181.1-M85.
  - .3     Polyvinyl Chloride (PVC) Drain Waste and Vent Pipe and Pipe Fittings conforming to CSA B181.2.
- .2   Above ground pipe and fittings:
  - .1     Class 4000 cast iron mechanical joint pipe and fittings with mechanical joint stainless steel couplings to CSA CAN3-B70 up to 200 mm [8"].
  - .2     DWV copper drainage pipe with cast brass or wrought copper drainage pattern fittings with 50/50 Sn/Pb recessed solder joints.

## **2.2 COPPER TUBE AND FITTINGS**

- .1 Above ground sanitary DWV to: ASTM B306.
  - .1 Fittings.
    - .1 Cast brass: to CAN/CSA-B125.3.
    - .2 Wrought copper: to CAN/CSA-B125.3.
  - .2 Solder: lead free, 95:5

## **2.3 CAST IRON PIPING AND FITTINGS**

- .1 Buried sanitary minimum NPS 3, to: CAN/CSA-B70, with one layer of protective coating
  - .1 Joints:
    - .1 Mechanical joints:
      - .1 Neoprene or butyl rubber compression gaskets: to CAN/CSA-B70.ASTM C564 or
      - .2 Stainless steel clamps.
- .2 Above ground sanitary: to CAN/CSA-B70.
  - .1 Joints:
    - .1 Mechanical joints:
      - .1 Neoprene or butyl rubber compression gaskets with stainless steel clamps.

## **Part 3 Execution**

### **3.1 APPLICATION**

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

### **3.2 INSTALLATION**

- .1 Install in accordance with National Plumbing Code.

### **3.3 TESTING**

- .1 Pressure test buried systems before backfilling.
- .2 Hydraulically test to verify grades and freedom from obstructions.

### **3.4 PERFORMANCE VERIFICATION**

- .1 Cleanouts:
  - .1 Ensure accessible and that access doors are correctly located.
  - .2 Open, cover with linseed oil and re-seal.
  - .3 Verify that cleanout rods can probe as far as the next cleanout, at least.



- .2 Affix applicable label (storm, sanitary, vent, pump discharge etc.) c/w directional arrows every floor or 4.5 m (whichever is less).

**END OF SECTION**

**Part 1            General**

**1.1                REFERENCE STANDARDS**

- .1    CSA International
  - .1        CSA-B64 Series-11, Backflow Preventers and Vacuum Breakers.
- .2    National Research Council Canada (NRC)
  - .1        National Plumbing Code of Canada 2015 (NPC).

**1.2                ADMINISTRATIVE REQUIREMENTS**

- .1    Pre-installation Meetings:
  - .1        Convene pre-installation meeting 1 week prior to beginning on-site installation with Consultant to:
    - .1            Verify project requirements.
    - .2            Review installation and substrate conditions.
    - .3            Co-ordination with other building construction subtrades.
    - .4            Review manufacturer's written installation instructions and warranty requirements.

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

- .1    Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2    Product Data:
  - .1        Submit manufacturer's instructions, printed product literature and data sheets for plumbing products and include product characteristics, performance criteria, physical size, finish and limitations.
- .3    Shop Drawings:
  - .1        Indicate on drawings to indicate dimensions, materials, construction and assembly details.
- .4    Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .5    Instructions: submit manufacturer's installation instructions.
- .6    Manufacturers' Field Reports: manufacturers' field reports specified.

**Part 2            Products**

**2.1                BACK FLOW PREVENTERS**

- .1    Preventers: to CSA-B64 Series, application double check valve assembly and reduced pressure principle type

- .2 Double check valve assembly (DCVA), factory assembled station to CAN/CSA-B64.10 and CAN/CSA-B64.10.1.
- .3 Reduced pressure principle backflow prevention device (RPPD), with inlet and outlet shut-off valves, double check valve assembly, differential relief outlet and repair/maintenance kit to CAN/CSA-B64.10 and CAN/CSA-B64.10.1.

### **Part 3 Execution**

#### **3.1 MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheet.

#### **3.2 INSTALLATION**

- .1 Install in accordance with National Plumbing Code of Canada (NPC)
- .2 Install in accordance with manufacturer's instructions and as specified.

#### **3.3 BACK FLOW PREVENTERS**

- .1 Install in accordance with CSA-B64 Series, where indicated and elsewhere as required by code.
- .2 Backflow prevention stations shall be in complete accordance with CAN/CSA-B64.10 and CAN/CSA-B64.10.1 Manual for the Selection and Installation of Backflow Prevention Devices/Manual for the Maintenance and Field Testing of Backflow Prevention Devices.
- .3 Complete testing of all double check valve assemblies and reduced pressure principle backflow prevention devices shall be carried out by a certified tester under this section of the work prior to final acceptance of plumbing systems. Submit a certificate for each device duly signed and witnessed that testing was successfully completed.

#### **3.4 START-UP**

- .1 Timing: start-up only after:
  - .1 Pressure tests have been completed.
  - .2 Disinfection procedures have been completed.
  - .3 Certificate of static completion has been issued.
- .2 Provide continuous supervision during start-up.

#### **3.5 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

**3.6 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by plumbing specialties and accessories installation.

**END OF SECTION**

**Part 1 General**

**1.1 RELATED SECTIONS**

- .1 This section covers items common to sections of Division 26. This section supplements requirements of Division 1.

**1.2 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-C22.1-15, Canadian Electrical Code, Part 1 Safety Standard for Electrical Installations latest version.
  - .2 CAN/CSA-C22.2 No. 0-10 (R2015), General requirements-Canadian electrical code, part II latest version.
  - .3 CAN/CSA-C22.3 No. 1-01(Update March 2005), Overhead Systems.
  - .4 CAN3-C235-83(R2000), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
- .2 Electrical and Electronic Manufacturer's Association of Canada (EEMAC)
  - .1 EEMAC 2Y-1-1958, Light Grey Colour for Indoor Switch Gear.
- .3 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)
  - .1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

**1.3 DEFINITIONS**

- .1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.

**1.4 DESIGN REQUIREMENTS**

- .1 Operating voltages: to CAN3-C235-83.
- .2 Equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
  - .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.
- .3 Language operating requirements: provide identification nameplates for control items in English.

**1.5 SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Detailed work schedules clearly indicating all the shutdown time.
- .3 Product Data: submit WHMIS MSDS in accordance with Section 01 35 33 – Health and Safety.

- .4 Shop drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of British Columbia, Canada.
  - .2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure coordinated installation.
  - .3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.
  - .4 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.
  - .5 If changes are required, notify Engineer Consultant of these changes before they are made.
- .5 Quality Control: in accordance with Section 01 45 00 – Quality Control.
  - .1 Provide CSA certified equipment and material.
  - .2 Where CSA certified equipment and material is not available, submit such equipment and material to inspection authorities for special approval before delivery to site.
  - .3 Submit test results of installed electrical systems and instrumentation.
  - .4 Permits and fees: in accordance with General Conditions of contract.
- .6 Manufacturer's Field Reports: submit to Departmental Representative manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 – FIELD QUALITY CONTROL.

## **1.6 QUALITY ASSURANCE**

- .1 Quality Assurance: in accordance with Section 01 45 00 – Quality Control.
- .2 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices in accordance with authorities having jurisdiction as per the conditions of Provincial Act respecting manpower vocational training and qualification.
  - .1 Employees registered in provincial apprentices program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.
  - .2 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.
- .3 Site Meetings:
  - .1 Site Meetings: as part of Manufacturer's Field Services described in Part 3 – FIELD QUALITY CONTROL, schedule site visits to review Work, at stages listed:
    - .1 After delivery and storage of products, and when preparatory Work is complete but before installation begins;
    - .2 At bi-monthly intervals for the duration of the project;
    - .3 Upon completion of Work after cleaning is carried out.

- .4 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 33 – Health and Safety.

### **1.7 DELIVERY, STORAGE AND HANDLING**

- .1 Material Delivery Schedule: provide Departmental Representative with schedule within two (2) weeks after award of Contract.
- .2 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 19 – Construction/Demolition Waste Management and Disposal.

### **1.8 SYSTEM START-UP**

- .1 Instruct Departmental Representative and operating personnel in operation, care and maintenance of systems, system equipment and components.
- .2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.
- .3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

### **1.9 OPERATING INSTRUCTIONS**

- .1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
- .2 Operating instructions to include following:
  - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
  - .2 Start up, proper adjustment and operating procedures.
  - .3 Safety precautions.
  - .4 Procedures to be followed in event of equipment failure.
  - .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.
- .3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.
- .4 Post instructions where directed.
- .5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.
- .6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

**Part 2            Products**

**2.1                SUSTAINABLE REQUIREMENTS**

- .1        Materials and products in accordance with Division 1 – Sustainable Requirements: Construction.
- .2        Do verification requirements in accordance with Section 01 45 00 – Quality Control.

**2.2                MATERIALS AND EQUIPMENT**

- .1        Provide material and equipment in accordance with Section 01 61 00 – Common Product Requirements.
- .2        Material and equipment to be CSA certified. Where CSA certified material and equipment is not available, obtain special approval from inspection authorities before delivery to site and submit such approval as described in PART 1 - SUBMITTALS.
- .3        Factory assemble control panels and component assemblies.

**2.3                ELECTRIC MOTORS, EQUIPMENT AND CONTROLS**

- .1        Verify installation and coordination responsibilities related to motors, equipment and controls, as indicated.
- .2        Control wiring and conduit: in accordance with Section 26 95 00 – Connection to Mechanical Equipment and Section 26 05 21 – Wires and Cables (0-1000 V).

**2.4                WARNING SIGNS**

- .1        Warning Signs: in accordance with requirements of Departmental Representative.
- .2        Porcelain enamel decal signs, minimum size 175mm x 250mm.

**2.5                WIRING TERMINATIONS**

- .1        Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

**2.6                EQUIPMENT IDENTIFICATION**

- .1        Identify electrical equipment with nameplates as follows:
  - .1        Nameplates: Lamacoid 3mm thick plastic engraving sheet. For normal power, black face, white lettering. Lettering accurately aligned and engraved into core mechanically attached with self-tapping screws. For emergency power, the same Lamacoid label, only red face and white lettering.



.2 Sizes as follows:

**NAMEPLATE SIZES**

Size 1	10 x 50mm	1 line	3mm high letters
Size 2	12 x 70mm	1 line	5mm high letters
Size 3	12 x 70mm	2 lines	3mm high letters
Size 4	20 x 90mm	1 line	8mm high letters
Size 5	20 x 90mm	2 lines	5mm high letters
Size 6	25 x 100mm	1 line	12mm high letters
Size 7	25 x 100mm	2 lines	6mm high letters

- .2 Labels: embossed plastic labels with 6mm high letters unless specified otherwise.
- .3 Wording on nameplates to be approved by Departmental Representative prior to manufacture.
- .4 Allow for minimum of 25 letters per nameplate.
- .5 Nameplates for terminal cabinets and junction boxes to indicate system and voltage characteristics.
- .6 Identify equipment with size 3 labels engraved "ASSET INVENTORY NO." as directed by Departmental Representative.
- .7 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .8 Terminal cabinets and pull boxes: indicate system and voltage.
- .9 Transformers: indicate capacity, primary and secondary voltages.

**2.7 WIRING IDENTIFICATION**

- .1 Identify wiring with permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour coding: to CSA C22.1.
- .4 Use colour coded wires in communication cables, matched throughout system.

**2.8 CONDUIT AND CABLE IDENTIFICATION**

- .1 Colour code conduits, boxes, and metallic sheathed cables.
- .2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15m intervals.

.3	Colours: 25mm wide prime colour and 20mm wide auxiliary colour.		
		<b>Prime</b>	<b>Auxiliary</b>
	up to 250 V	Yellow	
	up to 600 V	Yellow	Green
	Telephone	Green	
	Other Communication Systems	Green	Blue
	Fire Alarm	Red	
	Emergency	Red	Blue
	Other Security Systems	Red	Yellow

### **Part 3 Execution**

#### **3.1 INSTALLATION**

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.
- .2 Do overhead and underground systems in accordance with CSA C22.3 No.1 except where specified otherwise.

#### **3.2 NAMEPLATES AND LABELS**

- .1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

#### **3.3 CONDUIT AND CABLE INSTALLATION**

- .1 Install conduit and sleeves prior to pouring of concrete.
  - .1 Sleeves through concrete: schedule 40 steel pipe, sized for free passage of conduit, and protruding 50mm.
- .2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.
- .3 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

#### **3.4 LOCATION OF OUTLETS**

- .1 Locate outlets in accordance with Section 26 05 32 – Outlet Boxes, Conduit Boxes, and Fittings.
- .2 Do not install outlets back-to-back in wall; allow minimum 150mm horizontal clearance between boxes.
- .3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000mm, and information is given before installation.
- .4 Locate light switches on latch side of doors.
  - .1 Locate disconnect devices in mechanical and elevator machine rooms on latch side of floor.

### **3.5 MOUNTING HEIGHTS**

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.
- .3 Install electrical equipment at following heights unless indicated otherwise.
  - .1 Local switches: 1400mm.
  - .2 Wall receptacles:
    - .1 General: 300mm.
    - .2 Above top of continuous baseboard heater: 200mm.
    - .3 Above top of counters or counter splash backs: 175mm.
    - .4 In mechanical rooms: 1400mm.
  - .3 Panelboards: as required by Code or as indicated.

### **3.6 COORDINATION OF PROTECTIVE DEVICES**

- .1 Ensure circuit protective devices such as overcurrent trips, relays, circuit breakers, and fuses are installed to required values and settings, and protection devices are coordinated.

### **3.7 FIELD QUALITY CONTROL**

- .1 Load Balance:
  - .1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
  - .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
  - .3 Provide upon completion of work, load balance report as directed in PART 1 - SUBMITTALS: phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.
- .2 Conduct following tests in accordance with Section 01 45 00 – Quality Control.
  - .1 Power distribution system including phasing (phase rotation), voltage, grounding and load balancing.
  - .2 Circuits originating from branch distribution panels.
  - .3 Lighting and its control.
  - .4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
  - .5 Systems: fire alarm system and communications.
  - .6 Insulation resistance (IR) testing:
    - .1 Megger circuits, feeders and equipment up to 350V with a 500V instrument.

- .2 Megger 350-600V circuits, feeders and equipment with a 1000V instrument.
- .3 Check resistance to ground before energizing.
- .4 Other testing as defined in other sections of the contract documents.
- .3 Carry out tests in presence of Departmental Representative.
- .4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .5 Manufacturer's Field Services:
  - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
  - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
  - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

### **3.8 CLEANING**

- .1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- .2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED WORK**

- .1            This Section of the Specification is to be read, coordinated and implemented in conjunction with all other parts of the Contract Documents.

**1.2                REGULATORY REQUIREMENTS**

- .1            Restraints shall meet the requirements of the latest edition of the British Columbia Building Code and amendments.
- .2            The Seismic Consulting Engineer should be able to provide a proof of professional insurance and the related practice credentials if requested by the Electrical Consultant. The Seismic Consulting Engineer should be familiar with SMACNA, ECABC & NFPA guidelines as well as BCBC requirements and VBBL requirements.
- .3            The Contractors Seismic Consultant shall submit original signed BC Building Code “Letters of Assurance” “Schedules B, and C-B” to the Prime Consultant or Electrical Consultant.
- .4            Projects to comply with the local bylaw as applicable.
- .5            The above requirements shall not restrict or supplant the requirements of any local bylaws, codes, or other certified agencies which may have jurisdiction over all or part of the installation.

**1.3                SCOPE**

- .1            It is the responsibility of equipment manufacturers to design their equipment so that the strength and anchorage of internal components of the equipment exceeds the force level used to restrain and anchor the unit itself to the supporting structure.
- .2            Manufacturer's shop drawings to be submitted with seismic information on equipment structure, bracing and internal components and as required by Division 01.
- .3            Provide restraint on all equipment and machinery, which is part of the building electrical services and systems, to prevent injury or hazard to persons and equipment in and around the structure. Restrain all such equipment in its normal position in the event of an earthquake.

- .4 The total electrical seismic restraint design and field review and inspection will be by a B.C. registered professional structural engineer who specializes in the restraint of building elements. Contractor to allow for coordination, provision of seismic restraints, as well as all costs for the services of the Seismic Restraint Engineer. This engineer herein referred to as the Seismic Consultant, will provide normal engineering functions as they pertain to seismic restraint of electrical installations.
- .5 The Contractor shall be aware of, and comply with, all current seismic restraining requirements and make provision for those that may come into effect during construction of the project. Make proper allowance for such conditions in the tender.
- .6 The Seismic Consultant shall provide detailed seismic restraint installation shop drawings to the Contractor. Copies of the shop drawings to be included in the final project manual.
- .7 Provide seismic restraints on all equipment, and/or installations or assemblies, which are suspended, pendant, shelf mounted, freestanding and/or bolted to the building structure or support slabs.
- .8 The Seismic Consultant shall provide inspections during and after installation. The Contractor shall correct any deficiencies noted without additional cost to the contract.
- .9 Include all costs associated with the Seismic installation and certification in the base tender.

#### **1.4 SHOP DRAWINGS & SUBMITTALS**

- .1 Submit shop drawings of all seismic restraint systems including details of attachment to the structure, either tested in an independent testing laboratory or approved by the seismic consultant.
- .2 Submit all the proposed types and locations of inserts or connection points to the building structure or support slabs. Follow the directions and recommendations of the Seismic Consultant.

### **Part 2 Products**

#### **2.1 SLACK CABLE SYSTEMS**

- .1 Slack cable restraint systems shall be as designed and supplied by Vibra-Sonic Control or equal.
- .2 Slack cable restraints shall be provided on suspended and shelf mounted transformers along with associated equipment and assemblies connected to them at the points of vertical support (4 points). The restraint wires shall be oriented at approximately 90° to each other (in plan), and tied back to the ceiling slab or its structure at approximately 45°

to the slab or basic structure. The restraints shall be selected for a 1 g earthquake loading, i.e. each wire shall have a working load capacity equal to the weight of the transformer. The anchors in the structure shall be selected for a load equal to the weight of the transformers at a 45o pull.

- .3 Slack cable systems to allow normal maintenance of equipment and shall not create additional hazard by their location or configurations. Contractor shall rectify any such installations at no additional cost, all to the satisfaction of the engineer and inspection authority having jurisdiction.
- .4 Coordinate requirements of slack cables with suppliers prior to installation.

### **Part 3 Execution**

#### **3.1 GENERAL**

- .1 All seismic restraints systems shall conform to local authority having jurisdiction and all applicable code requirements.

#### **3.2 CONDUITS**

- .1 Provide restraint installation information and details on conduit and equipment as indicated below:
- .2 Vertical Conduit:
  - .1 Attachment - Secure vertical conduit at sufficiently close intervals to keep the conduit in alignment and carry the weight of the conduits and wiring. Stacks shall be supported at their bases and, if over 2 stories in height, at each floor by approved metal floor clamps.
  - .2 At vertical conduit risers, wherever possible, support the weight of the riser, at a point or points above the center of gravity of the riser. Provide lateral guides at the top and bottom of the riser, and at intermediate points not to exceed 9.2 m o.c.
  - .3 Riser joints shall be braced or stabilized between floors.
- .3 Riser joints shall be braced or stabilized between floors.
- .4 Horizontal Conduits:
  - .1 Supports - Horizontal conduit shall be supported at sufficiently close intervals to keep it in alignment and prevent sagging.
  - .2 EMT tubing - tubing shall be supported at approximately 1.2 m intervals for tubing.
- .5 Provide transverse bracing at 12.2 m o.c. maximum unless otherwise noted. Provide bracing at all 90o bend assemblies, and pull box locations.

- .6 Provide longitudinal bracing at 24.4 m o.c. maximum unless otherwise noted.
- .7 Do not brace conduit runs against each other. Use separate support and restraint system.
- .8 Support all conduits in accordance with the capability of the pipe to resist seismic load requirements indicated.
- .9 Trapeze hangers may be used. Provide flexible conduit connections where conduits pass through building seismic or expansion joints, or where rigidly supported conduits connect to equipment with vibration or seismic isolators.
- .10 A conduit system shall not be braced to dissimilar parts of a building or two dissimilar building systems that may respond in a different mode during an earthquake. Examples: wall and a roof; solid concrete wall and a metal deck with lightweight concrete fill.
- .11 Provide large enough conduit sleeves through walls or floors to allow for anticipated differential movements with fire stopping where required.
- .12 It is the responsibility of the contractor to ascertain that an appropriate size restraint device be selected for each individual piece of equipment. Submit details on shop drawings. Review with seismic consultant and submit shop drawings to consultants for their reference.

### **3.3 FLOOR MOUNTED EQUIPMENT**

- .1 Bolt all equipment, e.g. generators, free standing panel boards, control panels etc. to the structure. Design anchors and bolts for seismic force applied horizontally through the center of gravity to a seismic force of 0.5g. For equipment which may be subject to resonances, use a nominal 1.0 g seismic force.
- .2 Provide flexible conduit connections between floor mounted equipment to be restrained and its adjacent associated electrical equipment.

### **3.4 LIGHT FIXTURES**

- .1 Light fixtures in suspended ceilings shall be hung independently of the ceiling system. Fixtures shall be secured to concrete or structural deck above by at least two taugt cables which are connected to the fixture at diagonal points.
- .2 Surface and recessed style fixtures shall be hung independently of the ceiling system. Fixtures shall be secured to concrete or structural deck above by taugt cables.
- .3 Fixtures which are hung independently of ceiling systems shall have minimum of one seismic cable in addition to the chain or cable used to support the fixture. Seismic restraint cables shall be secured into the concrete or structural deck above.
- .4 Cables shall be corrosion resistant and approved for the application.



- .5 Fixtures which are rod hung shall have seismic ball alignment fittings at the ceiling and fixture.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED WORK**

- .1            This Section of the Specification forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

**1.2                SUSTAINABLE REQUIREMENTS**

- .1            Materials and products in accordance with Division 01 Sustainable Requirements: Construction.
- .2            Do verification requirements in accordance with Division 01 Sustainable Requirements: Contractor's Verification.

**1.3                WASTE MANAGEMENT AND DISPOSAL**

- .1            In accordance with Section 26 05 00 and Division 01.

**1.4                ASBESTOS**

- .1            Refer to specification Division 01 for procedures, removal and disposal of asbestos.
- .2            If during renovations / demolition, asbestos is discovered (or material suspected to be asbestos), all work in that area shall immediately cease and the General Contractor advised. The General Contractor shall take appropriate action without delay to verify presence of friable asbestos and be responsible for the removal of all friable asbestos.
- .3            This division will not be entitled to a claim for any delays resulting from the investigation of or removal of asbestos.

**1.5                PCB (POLYCHLORINATED BIPHENYLS)**

- .1            Carefully remove any electrical items containing PCB's (e.g. light fixture ballasts) from equipment or fixtures to be renovated or demolished. Removed items (containing PCB's) to be catalogued and stored on site in approved labelled storage containers in accordance with regulations.

**1.6                SCOPE**

- .1            The Electrical Division to take note that the demolition and renovation will be done in an occupied building that is normally occupied during the day. Maintain electrical and communication systems as required to minimize services disruption.
- .2            The Electrical Division to also take note of the dust containment requirements as outlined in the architectural and front end specification.
- .3            Electrical tender documents do not show all existing luminaires, wiring devices, conduit, boxes or wire. Conduit routing and wire grouping is not known. During demolition, the Electrical trade(s) are to deactivate all existing electrical and communication systems affected in such a manner that complete systems are not deactivated and system circuits

affected in party wall partitions to be reactivated immediately on a temporary or permanent basis as site conditions dictate.

- .4 Any discrepancies appearing on the drawings or in this specification are to be brought to the attention of the Consultant who will provide instruction.
- .5 Where devices are not shown on the new plans in walls that are not being removed, such devices are to be reinstated and remain.

## **1.7 SCHEDULING**

- .1 Refer to Division 01.

## **1.8 EXAMINATION**

- .1 Refer to Division 01.

## **1.9 PHASING**

- .1 Refer to Division 01.

## **1.10 PROTECTION**

- .1 Refer to Division 01.

## **Part 2 Products**

### **2.1 STANDARDS**

- .1 Refer to applicable material standards in other specification sections and/or as detailed on drawings.

## **Part 3 Execution**

### **3.1 DEMOLITION**

- .1 Demolition to be carried out in strict conformance to provincial, local and municipal authorities and Part 8 of the B.C. Building Code current edition.
- .2 All redundant electrical components in the areas of demolition excluding those specifically identified in the following clauses shall become the property of the Electrical Division and shall be removed from site.
- .3 Electrical components which are to be demolished by the Electrical Trade(s) are to be cleaned and suitably packaged where applicable, and turned over to the Owner at designated location established on site. If the Owner refuses these items they become property of the Electrical Division and are to be removed from site.

### **3.2 DISRUPTION TO OPERATIONS**

- .1 Contractor to coordinate scheduled shutdown times with Owner and all Divisions and coordinate installation of the new equipment as appropriate. All equipment installed and modified requires testing before start-up.
- .2 Contractor to provide temporary connections to all required equipment for temporary power during the installation of any new equipment.
- .3 Contractor to issue a schedule shutdown time and coordinate installation and routing of the existing and new electrical panels affected, as indicated on drawings.

### **3.3 REUSE OF EXISTING COMPONENTS**

- .1 Existing components may be reused only where so specifically indicated on the drawings or in the specifications, however in all cases all wiring shall be new and no splicing shall be permitted at any location.

### **3.4 DISTRIBUTION OF CIRCUITS**

- .1 Circuit: power, voice/data, fire alarm, control and all systems which are disrupted during demolition and are essential, to be made good immediately. The Electrical Trade(s) to identify these circuits to the Consultant. Specific tasks involving the demolition of essential circuits will require that the contractor to obtain permission from the Owner before proceeding.

### **3.5 ABANDONED CONDUIT, WIRE AND EXISTING CIRCUITS**

- .1 All abandoned conduit and wire to be removed and disposed of by the Electrical Divisions.
- .2 Remove all accessible (e.g. Surface) wiring and cables back to source.
- .3 Remove abandoned outlets and raceway, even if in or behind drywall, where they are located behind millwork or in locations unsuitable for reuse i.e. not at standard heights for switches or outlets.
- .4 All remaining circuits to be rerouted as required and suitably secured to the building structure.
- .5 Any cabling, including voice/data wiring, presently resting on any suspended ceiling system to be removed as part of the renovation process and shall be neatly bundled, protected and permanently secured to building structure. No cabling is permitted to rest on the ceiling system.

### **3.6 EXCAVATION AND CUTTING DAMAGE**

- .1 Circuits disrupted by cutting or drilling (i.e. buried or concealed conduits and cables) to be brought to the attention of the consultant. Obvious systems disturbed because due care and attention was not followed, shall be repaired immediately at no additional cost to owner.

### **3.7 FIRE ALARM SYSTEM**

- .1 Construction/demolition activities in existing building may require that certain fire alarm devices are protected from construction dust, damage etc. Coordinate with the Owners

- representative as required to protect components of the fire alarm system to prevent nuisance operation and alarms.
- .2 Provide, install and test temporary heat detectors in the area of construction where the construction area is not protected by an active supervised fire protection sprinkler system. The “construction” detectors to be removed and discarded at the end of the project.
  - .3 Provide temporary replacement of smoke detectors with heat detectors including interim programming and testing and final re-verification where deemed necessary to minimize false alarms and to ensure other occupants of the building are protected.
  - .4 Maintain existing fire alarm system in areas under construction where practical. Relocate, rewire and provide interim connections as required while installing the new system to replace the existing. Provide temporary fire alarm devices and audible signals to suit any temporary exiting provisions.
  - .5 Contractor to check in with the Owners representative at the start and end of each working day to confirm the fire alarm status in the area of work. Arrange for the related fire alarm zone card or area to be deactivated either to suit the progress of the work and/or where dust will be present on a day to day basis. Bag and protect fire detectors in dusty areas during construction. Remove any bagging at the end of the work day. Any existing detectors subject to construction dust to be immediately vacuumed and marked to be replaced at the end of the project. Any fire alarm devices subject to moisture to be replaced immediately.
  - .6 The fire alarm system is to be fully functional in the area of construction when the contractor is neither on site nor after the contractors normal work hours. (i.e. overnight, holidays, weekends)

**END OF SECTION**

**Part 1            General**

**1.1                RELATED WORK**

- .1        This Section of the Specification forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.
- .2        Refer to Division 27 & 28 for particular Communication, Electronic Safety & Security wiring systems and types.

**1.2                TERMS OF REFERENCE**

- .1        Typically use insulated 98% conductivity copper conductor wiring enclosed in EMT (steel) conduit for the general wiring systems unless otherwise indicated.
- .2        Aluminium conductors only permitted where indicated on drawings and then typically only for feeder conductors larger than 3/0 AWG. All conductor sizes indicated on drawings are based on copper conductors unless otherwise noted.
- .3        Teck cable may only be used where specifically indicated on the drawings or in the specifications. Where permitted, Teck wiring up to 750 system volts to be PVC jacketed armoured cable, multi-copper conductor type Teck90 1000 volt having a PVC jacket with FT-6 flame spread rating.
- .4        Flexible armoured cabling (BX) shall not be used for the general wiring system other than final drops to recessed light fixtures in concealed locations.
- .5        Cabling indicated to be 2-Hour Fire-Rated shall be Mineral Insulated or compliant to CAN/ULC-S139 and CSA 38-95 (Draka Lifeline, Raychem RHW, or Shawflex). Cabling shall be low smoke halogen free. Conduit to be sized and installed as per manufacturer's requirements for these specialized cables and assemblies regardless of the size indicated on drawings.
- .6        Provide all control wiring except HVAC controls as specified in Mechanical Divisions.
- .7        Refer to Equipment Schedule(s) for detailed responsibilities.
- .8        Non-metallic sheathed wiring is not to be used on this project.

**1.3                SHOP DRAWINGS AND PRODUCT DATA**

- .1        Submit shop drawings and product data in accordance with Section 26 05 00 and Division 01.

#### **1.4 WASTE MANAGEMENT AND DISPOSAL**

- .1 In accordance with Section 26 05 00 and Division 01.

#### **Part 2 Products**

##### **2.1 WIRING & CABLES – GENERAL**

- .1 Conductors: stranded for 10 AWG and larger. Minimum size #12 AWG.
- .2 Insulation to be 600 volt RW90XLPE (X link) for the general building wiring in conduit.
- .3 Use RW90XLPE for underground installations.
- .4 Site services sub-circuits, including site lighting, to be minimum #10 AWG for power and #14 for controls. Increase wiring size for lengthy and/or loaded circuits so that system will not exceed the maximum voltage drop as recommended by the Canadian Electrical Code CSA 22.1.
- .5 Main feeders to be conduit and copper insulated wiring unless otherwise noted on drawings. Provide ground wiring for all conduits in or below slabs. Increase conduit size as required.
- .6 Armoured (BX) cable may only be utilized for recessed tee bar luminaire drops from ceiling mounted outlet boxes. "Tite Bite" connectors and their counterparts of other manufacturers shall not be used. Use anti-short connectors. Cable from luminaire to luminaire is discouraged. Allow nominally 900mm [3'] extra cable looped and supported in the ceiling space to permit fixture relocations of one tile space.
- .7 TBS90 #14 AWG stranded shall be used in all switchgear assemblies. Current transformer secondary wiring shall be #12 AWG stranded. Current transformer leads shall incorporate ring type tongues for termination purposes
- .8 Conductors to be colour-coded. Conductors #10 AWG and smaller shall have colour impregnated into insulation at time of manufacture. Conductors size #8 AWG and larger may be colour-coded with adhesive colour coding tape, but only black insulated conductors shall be employed in this case, except for neutrals which shall be white wherever possible. Where colour-coding tape is utilized, it shall be applied for a minimum of 50 mm at terminations, junctions and pullboxes and conduit fittings. Conductors not to be painted.

##### **2.2 TECK 90 CABLE**

- .1 Cable: to CAN/CSA-C22.2 No. 131.

- .2 Conductors: copper and sized as indicated.
- .3 Insulation: Chemically cross-linked thermosetting polyethylene rated type RW90XLPE, 600V.
- .4 Inner jacket: polyvinyl chloride material.
- .5 Armour: flat galvanized steel.
- .6 Overall covering: PVC jacket with FT-6 flame spread rating. PVC flame retardant jacket over armour meeting requirements of Vertical Tray Fire Test of CSA C22.2 No. 0.3 with maximum flame travel of 1.2 m.
- .7 Fastenings:
  - .1 One (1) hole steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.
  - .2 Channel type supports for two (2) or more cables.
  - .3 Threaded rods: 6 mm dia. to support suspended channels.
- .8 Connectors: Watertight approved for TECK cable

**2.3 MINERAL INSULATED (MI) OR TWO HOUR FIRE RATED CABLE ASSEMBLIES**

- .1 MI Conductors: solid bare soft-annealed copper, size as indicated.
- .2 MI Insulation: compressed powdered magnesium oxide to form compact homogeneous mass throughout entire length of cable.
- .3 Overall MI covering: annealed seamless copper sheath rated 600 V.
- .4 For MI exposed and surface locations provide an F-6 PVC outer jacket: applied over sheath.
- .5 Two hour fire rating.
- .6 Cable end terminations to be done under the direction of the manufacturer's supervision or alternatively measured and factory prepared.
- .7 Alternately, where indicated 2-Hour Fire-Rated conduit and wire assemblies may be used and shall be compliant to CAN/ULC-S139 and CSA 38-95 (Draka Lifeline, Raychem RHW, or Shawflex). Cabling shall be low smoke halogen free. Conduit to be sized and installed as per manufacturer's requirements for these specialized cables and assemblies regardless of the size indicated on drawings.



## **2.4            ARMOURED CABLE (BX)**

- .1        Conductors: insulated, copper, size as indicated.
- .2        Type: AC90 600 V rated.
- .3        Armour: interlocking type fabricated from galvanized steel.
- .4        Anti-short connectors.

## **2.5            ALUMINUM SHEATHED CABLE**

- .1        Conductors: insulated copper, size as indicated.
- .2        Insulation: type RA90 rated 600 V.
- .3        Sheath: aluminum applied to form continuous smooth or corrugated seamless sheath.
- .4        Outer jacket of PVC applied over sheath for direct burial and wet locations.
- .5        Fastenings for aluminum sheathed cable:
  - .1        One hole aluminum straps to secure surface cables 25 mm and smaller. Two hole steel straps for cables larger than 25 mm. Use aluminum strap only with single conductor cable.
  - .2        Channel type supports for two or more cables.
  - .3        Threaded rods: 6 mm dia. to support suspended channels.

## **2.6            NON-METALLIC SHEATHED CABLE**

- .1        Non-metallic sheathed copper cable type: NMD-90 size as indicated.

## **2.7            LOW VOLTAGE CONTROL CABLES**

- .1        Type LVT: soft annealed copper conductors, with thermoplastic insulation, outer covering of thermoplastic jacket. Minimum size #18 AWG.
- .2        Unless otherwise specified wiring to be multicore individually identified and colour coded with grey sheath enclosed in conduit or (EMT).

## **2.8            WIRE & BOX CONNECTORS**

- .1        Pressure type wire connector current carrying parts to be copper and sized to fit conductors used.
- .2        Fixture type splicing connector current carrying parts to be copper sized to fit conductors #10 AWG or less.

- .3 Bushing stud connectors to EEMAC 1Y-2 and suitable for stranded copper conductors
- .4 Clamps or connectors for armoured cable, flexible conduit, as required.

### **Part 3 Execution**

#### **3.1 INSTALLATION**

- .1 Install all cables and wiring for all devices and systems indicated.
- .2 Conductor length for parallel feeders to be identical. Provide permanent plastic nametag indicating load fed.
- .3 Group Teck, Armoured, MI & Sheathed cables on channels wherever possible.
- .4 Lace or clip groups of feeder conductors at all distribution centres, pullboxes, and termination points.
- .5 Wiring in walls should typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls should be avoided unless indicated.
- .6 All grounding conductors and straps to be copper. All bonding conductors to have green insulation jacket.
- .7 Colour coding to be strictly in accordance with Section 26 05 00.
- .8 Provide sleeves where cables enter or exit cast concrete or masonry.
- .9 Power wiring up to and including #6 AWG shall be spliced with nylon-insulated expandable spring-type connectors. Large conductors shall be spliced using split-bolt or other compression type connectors wrapped with cambric tape then PVC tape.
- .10 Wires shall be sized for 3% maximum voltage drop to farthest outlet on a loaded circuit. Increase home run cable size to meet these requirements.
- .11 All branch circuit wiring for surge suppression receptacles and permanently wired computer and electronic equipment to be 2-wire circuits only, i.e. common neutrals not permitted.
- .12 Install all control cables in conduit.
- .13 Provide numbered wire collars for all control wiring. Numbers to correspond to control drawing legend. Obtain wiring diagram for control wiring of other Divisions.

### **3.2 VOLTAGE REGULATION**

- .1 The drawings are diagrammatic and indicate the general routing of conduit runs and not exact routing, either horizontally or vertically.
- .2 Branch circuit conductor sizes shall be #12 AWG or larger based on the Canadian Electrical Code CSA 22.1 Section 8, which allows a maximum 3% voltage drop for branch circuits.

### **3.3 WIRE & BOX CONNECTORS**

- .1 Remove insulation carefully from ends of conductors and:
  - .1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No.65
  - .2 Install fixture type connectors and tighten. Replace insulating cap.
  - .3 Install bushing stud connectors in accordance with EEMAC 1Y-2

**END OF SECTION**

**Part 1           General**

**1.1           RELATED WORK**

- .1       This Section of the Specification forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

**1.2           REFERENCE STANDARDS**

- .1       American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)
- .2       Transformer grounding shall comply with CSA C22.2 No.41.
- .3       All grounding conductors to be stranded soft annealed copper unless otherwise noted.
- .4       Install complete grounding and bonding system in accordance with Canadian Electrical Code and local inspection authority requirements.

**1.3           TESTING REQUIREMENTS**

- .1       Perform ground continuity and resistance tests using method appropriate to site conditions. Measure ground grid resistance.
- .2       Any third party testing agency costs for the testing and reporting shall be included in the Electrical Division base tender and shall be carried out by a pre-approved testing agency.

**1.4           ADDITIONAL SCOPE**

- .1       Refer to drawings for extent of grounding in addition to code requirements.

**1.5           SHOP DRAWINGS AND PRODUCT DATA**

- .1       Submit shop drawings and product data in accordance with Section 26 05 00 and Division 01.

**1.6           WASTE MANAGEMENT AND DISPOSAL**

- .2       In accordance with Section 26 05 00 and Division 01.

**Part 2           Products**

**2.1           MATERIALS**

- .1       Grounding equipment to: CSA C22.2 No.41-M87 (R99).

## **2.2 EQUIPMENT**

- .1 Clamps, lugs, and connectors approved for grounding and bonding, size as required.
- .2 Copper conductor at least 6m [20'] long for each concrete encased electrode, bare, stranded soft annealed, size as indicated. If not indicated, use 3/0AWG which is the maximum in Table 43 CEC.
- .3 Rod electrodes, copper clad steel 20mm [3/4"] dia by 3m [10'] long or as indicated.
- .4 System and circuit, equipment, grounding conductors, bare stranded copper, soft annealed, sized as indicated. Insulation where specified to be green.
- .5 Ground bus: copper, size as indicated, complete with insulated supports, fastenings, connectors.
- .6 Non-corroding accessories necessary for grounding system, type, size material as indicated, including but not necessarily limited to:
  - .1 Grounding and bonding bushings.
  - .2 Protective type clamps.
  - .3 Bolted type conductor connectors.
  - .4 Thermit welded type conductor connectors.
  - .5 Bonding jumpers, straps.
  - .6 Pressure wire connectors.

## **2.3 STANDARDS OF ACCEPTANCE**

- .1 Acceptable manufacturers:
  - .1 Burndy Corp.
  - .2 Erico Inc
  - .3 Cadweld.

## **Part 3 Execution**

### **3.1 INSTALLATION GENERAL**

- .1 Install complete permanent, continuous grounding and bonding system including electrodes, conductors, connectors, accessories.
- .2 Provide bond wire in all conduits installed in grade or below slabs, and in all PVC conduits.
- .3 Install connectors in accordance with manufacturer's instructions.

- .4 Protect exposed grounding conductors from mechanical injury.
- .5 Make buried connections, and connections to conductive water main, electrodes, using copper welding by Thermit process or permanent mechanical connectors approved for the use.
- .6 Use mechanical connectors for grounding connections to equipment provided with lugs.
- .7 Soldered joints not permitted.
- .8 Install bonding wire for flexible conduit, connected at both end to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit. Provide a ground conductor in all flexible conduit and secure to system grounding lugs at both the equipment and source.
- .9 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.
- .10 Install separate ground conductor to each outdoor lighting standard.
- .11 Connect building structural steel and metal siding to ground by welding copper to steel.
- .12 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.
- .13 Bond single conductor, metallic armoured cables to cabinet at supply end and provide non-metallic entry plate at load end.
- .14 Ground secondary service pedestals.
- .15 Coordinate ground rod installation with local soil conditions to assure proper grounding system.
- .16 Provide a grounding/bonding bus in each electrical room and in the Generator room. Connect a #2/0cu bonding conductor or as shown on the drawings between grounding/bonding buses.
- .17 Provide a bonding conductor appropriately sized within each raceway routed within the building.
- .18 All bonding and grounding connections to be compression type unless noted otherwise.
- .19 Bond bonding bus of switchboard to the grounding grid with a #3/0 copper conductor.
- .20 Ground the secondary winding of potential and current transformers.
- .21 Supply and install complete grounding and bonding system as indicated and as required by Canadian Electrical Code and the local electrical inspection authorities.

- .22 Provide grounding/bonding bus bars mounted on standoff insulators or as shown on the drawings.
- .23 All components shall be securely and adequately bonded and where required to accomplish this, bonding jumpers, grounding studs and bushings shall be used.
- .24 Ensure that all raceways, terminal panels, etc. for fire alarm, etc. are securely and adequately bonded and provide grounding conductor to main ground bus where called for or when required.
- .25 All interior metallic gas piping which may become energized to be made electrically continuous and to be bonded in accordance with requirements of Canadian Electrical Code.
- .26 Bond all low tension equipment with #6 AWG green insulated bonding conductor.
- .27 Bond all structural steel, all concrete reinforcing steel and all metal systems with a #2 copper bonding conductor. Connect to closest ground bus or bonding point.
- .28 All metallic conduits longer than 1m in length, containing a single grounding or bonding conductor, shall be bonded as per the Canadian Electrical Code.

### **3.2 ELECTRODES**

- .1 Provide and install an artificial ground consisting typically of four 3000mm [10'] x 20mm [3/4"] copper weld ground rods, interconnected by bare stranded copper #4/0 conductor and terminating to the Main Electrical Room ground bus. Conductors shall be cad welded to the ground rods and shall be buried 600 mm below grade. Check and measure the installation to ensure an adequate resistance to ground before floor slab cover pour.
- .2 Provide additional grounding as necessary to meet the ground resistance specified.
- .3 In certain difficult circumstances, in-situ concrete encased grounding conductors ("UFER") grounding may be used to enhance grounding grid system.
- .4 Provide ground test well over one of the rods on the ground grid to allow access to the grid for testing.

### **3.3 BUILDING SERVICES BONDING**

- .1 WATER - From the main electrical room ground bus, connect 1#3/0 insulated ground conductor in 27mm [1"] conduit to water main with approved ground clamp ahead of water meter. Install 1#3/0 ground conductor jumper strapped around water meter and associated unions and valves to ground building side of water system.

- .2 METALLIC WASTE WATER PIPING - Each metallic waste water piping system to the building to be grounded by bonding it to the interior metallic water supply system by copper bonding jumper of not less than #6 AWG as per the Canadian Electrical Code
- .3 GAS PIPE GROUNDING - All interior metallic gas piping which may become energized to be made electrically continuous and to be bonded in accordance with requirements of Canadian Electrical Code.

### **3.4 GROUNDING BUSSES**

- .1 Provide a ground bus in the main electrical room. Ground bus shall consist of suitable length (min. 450mm) of 75mm x 6mm [2"x ¼"] copper bus mounted on a 25mm [1"] insulating standoffs. This bus shall be drilled and tapped to receive all the grounding conductors indicated and an engraved nameplate or tag installed above or below individual conductors indicating their function.
- .2 Provide similar ground bus in each sub electrical room and major mechanical room. Interconnect to the main ground bus with a 3/0 AWG insulated copper grounding conductor that is typically installed with the power feeders.
- .3 Provide similar ground bus in each data and voice equipment room and closet as indicated in "Data & Voice Grounding" clause.
- .4 Ground items of electrical equipment in electrical room to ground bus with individual bare stranded copper connections size 3/0 AWG or as indicated.
- .5 Copper or bronze lugs required for termination of all copper conductors at ground busses.

### **3.5 EQUIPMENT GROUNDING OR BONDING**

- .1 Install grounding or bonding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, UPS, control panels, building steel work, generators, distribution panels and outdoor lighting.
- .2 Provide a grounding conductor from the secondary of every distribution transformer to the grounding system. Ground conductor to be sized and installed in accordance with Canadian Electrical Code.
- .3 Provide grounding conductor(s) from all major switchgear to solidly ground the secondary system. This includes equipment located in the main electrical room as well as each sub-electrical room. Grounding conductors to be sized to Canadian Electrical Code and switchgear manufacturer's requirements.



### **3.6 MECHANICAL EQUIPMENT GROUNDING**

- .1 Provide a #2 ground conductor from the mechanical room ground bus to each new panel and new racks.
- .2 Ground wires to be installed in all conduit serving motor feeder circuits and to extend to ground screws on junction and outlet boxes for bonding.

### **3.7 STANDBY GENERATOR GROUNDING**

- .1 Ground unit frame, control panel and switchgear in accordance with Canadian Electrical Code (CEC).
- .2 Provide a grounding conductor in switchgear to solidly ground standby system neutral. Grounding conductor to be sized to CEC and switchgear manufacturer's recommendations.
- .3 Generator neutral ground to be connected at generator input side of generator breaker.
- .4 If a four pole automatic transfer switch is utilized provide a grounding conductor from generator switchgear to solidly ground standby system neutral. Grounding conductor to be sized to Canadian Electrical Code and switchgear manufacturer's requirements.

### **3.8 SYSTEMS GROUNDING**

- .1 Install home run a #6 AWG green insulated bonding conductor in conduit from the main ground bus to the:
  - .1 Main Fire Alarm panel
  - .2 Main Security panel.
  - .3 Sound and Communication systems head end.
  - .4 RF Television system
  - .5 Uninterruptable Power Supply (UPS) system(s)

### **3.9 DATA & VOICE GROUNDING**

- .1 Install home run green insulated ground conductor in conduit from the building main ground bus as follows:
  - .1 #2 AWG to a ground bus in the main data equipment room.
  - .2 #2 AWG to a ground bus in the main telephone equipment room.
  - .3 #2 AWG to a ground bus in each telephone backboard in equipment rooms/closets.
- .2 Unless otherwise solidly bonded, bond all data and telephone incoming and outgoing steel conduits with insulated 1#12 AWG from the nearest "Communication" ground bus.

- .3 Provide telephone grounding system in accordance with telephone company's requirements.

### **3.10 CABLE TRAY BONDING**

- .1 Install 1#6 green insulated copper bond wire to the outside of each cable tray from nearest ground bus.
- .2 Install 1#6 green insulated copper bond wire, unless shown otherwise, for full length of tray bonded to the outside of tray at 15m [50'] intervals and to ground bus at each termination point as specified.

### **3.11 SERVICE BOXES (MANHOLES)**

- .1 Install conveniently located fixed and secured corrosion resistant grounding stud in each manhole and terminate the system grounding conductors.
- .2 Install ground rod in each manhole where indicated so that top projects through bottom of manhole. Provide with lug to which grounding connection can be made.

### **3.12 POST MOUNTED LUMINAIRE BONDING**

- .1 Provide #10 AWG bonding conductor with green RW90 X-link insulation to luminaire standards. Connect to luminaire corrosion resistant ground stud or ground clamp.

### **3.13 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00.
- .2 Perform ground continuity and resistance tests using method appropriate to site conditions.
- .3 Measure ground grid resistance with earth test mega ohmmeter and install additional ground rods and conductors as required until resistance to ground complies with Code requirements and is less than  $1\Omega$ .
- .4 Carry out all tests required by the Electrical Inspection Authority and provide all required reports and copied to the Consultant. Include all associated costs.
- .5 Provide "Fall of Potential" tests and the corresponding "Touch & Step" calculations for new high voltage installations. Confirm test results in writing to the Consultant.
- .6 Ensure test results are satisfactory before energizing the electrical system.

**END OF SECTION**

**Part 1           General**

**1.1           SECTION INCLUDES**

- .1       Materials and installation of hangers and supports for electrical systems

**1.2           REFERENCES**

- .1       National Research Council of Canada (NRCC)
  - .1       National Building Code of Canada 2005 (NBC)

**1.3           WASTE MANAGEMENT AND DISPOSAL**

- .1       In accordance with Section 26 05 00 and Division 01.

**Part 2           Products**

**2.1           SUPPORT CHANNELS**

- .1       U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted or set in poured concrete walls and ceilings.

**Part 3           Execution**

**3.1           INSTALLATION**

- .1       Secure equipment to hollow masonry, tile and plaster surfaces with lead anchors or nylon shields.
- .2       Secure equipment to poured concrete with expandable inserts.
- .3       Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .4       Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.
- .5       Secure Unistruct supports in accordance seismic restraint criteria for post disaster installation in accordance with NBC.
- .6       Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .7       Fasten exposed conduit or cables to building construction or support system using straps.

- .1 One-hole malleable iron or steel straps to secure surface conduits and cables 50 mm and smaller.
- .2 Two-hole steel straps for conduits and cables larger than 50 mm.
- .3 Beam clamps to secure conduit to exposed steel work.
- .8 Suspended support systems.
  - .1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.
  - .2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.
- .9 For surface mounting of two or more conduits use channels at 1.5 m on centre spacing.
- .10 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .11 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .12 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .13 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of the Consultant.
- .14 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED WORK**

- .1            This Section of the Specification forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

**1.2                SHOP DRAWINGS AND PRODUCT DATA**

- .1            Submit shop drawings and product data for cabinets in accordance with Section 26 05 00.

**1.3                WASTE MANAGEMENT AND DISPOSAL**

- .1            In accordance with Section 26 05 00 and Division 01.

**Part 2            Products**

**2.1                SPLITTERS**

- .1            Sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.
- .2            Main and branch lugs, connection bars to match required size and number of incoming and outgoing conductors as indicated.
- .3            At least three spare terminals on each set of lugs in splitters less than 400 A.

**2.2                JUNCTION AND PULL BOXES**

- .1            Welded steel construction with screw-on flat covers for surface mounting.
- .2            Covers with 25 mm minimum extension all around, for flush-mounted pull and junction boxes.

**2.3                CABINETS**

- .1            Type E: sheet steel, hinged door and return flange overlapping sides, handle and catch, for surface mountings.
- .2            Type T: sheet steel cabinet, with full length hinged door, latch, lock, 2 keys, containing 19 mm G1S fir plywood backboard for surface or flush mounting as appropriate.
- .3            Include filtered vents and/or fan-cooling when enclosed equipment is heat producing.

## **2.4 FINISHES**

- .1 Apply finishes in accordance with Section 26 05 00.

## **Part 3 Execution**

### **3.1 SPLITTER INSTALLATION**

- .1 Install splitters as indicated and mount plumb, true and square to the building lines.
- .2 Extend splitters full length of equipment arrangement except where indicated otherwise.

### **3.2 JUNCTION AND PULL BOXES INSTALLATION**

- .1 Install pull boxes in inconspicuous but accessible spaces.
- .2 Only main junction and pull boxes are indicated. Provide pull boxes so as not to exceed 30 m of conduit run between pull boxes.
- .3 Provide pull boxes and junction boxes in locations shown on the drawings and as required to suit job conditions.
- .4 Locate pull boxes and junction boxes above removable ceilings, in electrical rooms, utility rooms or storage areas.
- .5 Junction boxes, when used, to be installed in areas that are accessible through luminaire openings, and/or access panels.
- .6 Where pull boxes are flush mounted, provide overlapping covers with flush head cover retaining screws, prime coated and painted to match wall or ceiling finish.
- .7 Where cast corrosion resistant boxes are used, covers to be of matching type and gasketed.
- .8 For special (not 100mm square or octagonal) pullboxes and/or junction boxes, paint identification for the system and provide lamicoïd nametags to box covers with a size 2 nameplate 5mm lettering identifying system.
- .9 Interior of all pullboxes and junction boxes for each system to be spray painted with colour as specified in Section 26 05 00.
- .10 All pullboxes, junction boxes and cabinets to be supported directly from building structure using one or a combination of galvanized screws, galvanized bolts, galvanized rods, and approved box clip.
- .11 Support of pullboxes, junction boxes by conduit fittings or wire is not acceptable.

**3.3 CABINETS INSTALLATION**

- .1 Mount cabinets with top not higher than 2 m [6'] above finished floor.
- .2 Cabinets shall be flush mounted in finished areas where depth can be accommodated in the walls. Provide flush trim to suit.
- .3 Provide fit up in Type T cabinets as indicated.

**3.4 IDENTIFICATION**

- .1 Install size 2 identification labels indicating system name, voltage and phase in accordance with Section 26 05 00.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED WORK**

- .1        This Section of the Specification forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

**1.2                WASTE MANAGEMENT AND DISPOSAL**

- .1        In accordance with Section 26 05 00 and Division 01.

**Part 2            Products**

**2.1                OUTLET AND CONDUIT BOXES IN GENERAL**

- .1        Size boxes in accordance with CSA C22.1.
- .2        102 mm [4"] square or larger outlet boxes as required for special devices.
- .3        Gang boxes where wiring devices are grouped. Do not use sectional boxes.
- .4        Blank cover plates for boxes without wiring devices.
- .5        Appropriate Outlet boxes for switching devices.
- .6        Combination boxes with barriers where outlets for more than one system are grouped.

**2.2                SHEET STEEL OUTLET BOXES**

- .1        Electro-galvanized steel single and multi-gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm [3" x 2" x 1.5"] or as indicated. Larger 102 mm square x 54mm deep [4"x 2"] outlet boxes (No. 52151 or 52171) to be used when more than one conduit enters one side. Provide extension and plaster rings as required.
- .2        For larger boxes use GSB solid type as required.
- .3        Boxes for surface mounted switches, receptacles, communications, telephone to be 100mm square No. 52151 or 52171 with Taylor 8300 series covers.
- .4        Lighting fixture outlets: 102 mm [4"] square outlet boxes (No 52151, 52171 or 72171) or octagonal outlet boxes (No 54151 or 54171).
- .5        102 mm [4"] square outlet boxes with extension and plaster rings for flush mounting devices in finished plaster and/or tile walls.



### **2.3 MASONRY BOXES**

- .1 Electro-galvanized steel masonry single and multi gang type MDB boxes for devices flush mounted in exposed block walls.

### **2.4 CONCRETE BOXES**

- .1 Electro-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

### **2.5 FLOOR BOXES**

- .1 Concrete tight electro-galvanized sheet steel floor boxes with adjustable finishing rings to suit floor finish with faceplate. Device mounting plate to accommodate short or long ear receptacles. Minimum depth: 28 mm [1.1"] for receptacles; 73 mm [2.9"] for communication equipment.
- .2 Cover assemblies to be die-cast aluminum, provide barriers between the power and low voltage sections. A minimum of two (2) gangs for power and two (2) gangs for communications devices.
- .3 Adjustable, watertight, concrete tight, cast floor boxes with openings drilled and tapped for 16 mm [0.5"] and 21 mm [0.75"] conduit. Minimum size: 73 mm [2.9"] deep.

### **2.6 SURFACE CONDUIT BOXES**

- .1 Cast FS or FD aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacles.

### **2.7 FITTINGS – GENERAL**

- .1 Bushing and connectors with nylon insulated throats.
- .2 Knock-out fillers to prevent entry of foreign materials.
- .3 Conduit outlet bodies for conduit up to 35 mm [1.25"]. Use pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.

### **2.8 STANDARD OF ACCEPTANCE**

- .1 Thomas & Betts.
- .2 Pre-approved Equal.

**Part 3 Execution**

**3.1 INSTALLATION**

- .1 Typical outlet box mounting heights are indicated in Section 26 05 00 or refer to wiring device and communication specification sections and to architectural layouts for particular mounting heights of outlet boxes where indicated.
- .2 Support boxes independently of connecting conduits.
- .3 Ceiling outlet boxes to be provided for each surface mounted fixture or row of fixtures installed in other than T bar ceilings with removable tiles.
- .4 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of construction material. Remove upon completion of work.
- .5 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.
- .6 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washers not to be used.
- .7 All outlet boxes to be flush mounted in all areas, excluding mechanical rooms, electrical rooms, and above removable ceilings.
- .8 Adjust position of outlets in finished masonry walls to suit masonry course lines. Coordinate cutting of masonry walls to achieve neat openings for all boxes. All cutting of masonry work for installation of electrical fittings to be done using rotary cutting equipment.
- .9 No sectional or handy boxes to be installed.
- .10 Provide vapour barrier wrap or boots behind outlets mounted in exterior walls. Maintain integrity of the vapour barrier and insulation to prevent condensation through boxes.
- .11 Coordinate location and mounting heights of outlets above counters, benches, splash-backs and with respect to heating units and plumbing fixtures. Coordinate with architectural details.
- .12 Outlets installed back to back in party stud walls to be off-set by one stud space.
- .13 Back-boxes for all communications systems equipment to be provided in accordance with specific manufacturer's recommendations and as specified in the communications sections of these specifications.

- .14 Separate outlets located immediately alongside one another to be mounted at exactly the same height above finished floor. Similarly, outlets mounted on a wall in the same general location at varying heights to be on the same vertical centre-line unless otherwise noted.
- .15 Where outlet boxes penetrate through a fire separation, ensure that the boxes are externally tightly fitted with an approved non-combustible material to prevent passage of smoke or flame in the event of a fire.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED WORK**

- .1        This Section of the Specification forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

**1.2                REFERENCES**

- .1        All conduits and accessories to be manufactured and certified by the related CSA standard.

**1.3                SCOPE**

- .1        Drawings do not show all conduits. Those shown are in diagrammatic form only.
- .2        Conceal all conduits where possible in finished areas. Conduits may be surface mounted either only where indicated or in service areas accessible only to authorized personnel.
- .3        Where a finished area is concrete (existing) or concealment is not practical, paint conduit with colour coordinated with the Architect; or obtain ruling from Consultant where exposed wiremold may be substituted.
- .4        Note particular requirements for routing of conduits where detailed.
- .5        Provide polypropylene pull cord in all conduits.

**1.4                WASTE MANAGEMENT AND DISPOSAL**

- .1        In accordance with Section 26 05 00 and Division 01.

**Part 2            Products**

**2.1                CONDUITS**

- .1        Rigid metal conduit: to CSA C22.2 No.45 Galvanized Steel.
- .2        Epoxy coated conduit: to CSA C22.2 No.45 with zinc coating and corrosion resistant epoxy finish inside and outside.
- .3        Electrical Metallic Tubing (EMT): to CSA C22.2 No.83.
- .4        Rigid PVC conduit: to CSA C22.2 No.211.2.
- .5        Flexible metal conduit: to CSA C22.2 No.56 liquid-tight flexible metal conduit.

## **2.2 CONDUIT FASTENINGS**

- .1 One hole steel straps to secure surface conduits 41mm and smaller. Use two hole steel straps to conduits larger than 41mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits.
- .4 10mm threaded rods to support suspended channels.

## **2.3 CONDUIT FITTINGS**

- .1 Fittings manufactured for use with conduits specified. Coating same as conduit.
- .2 Provide factory "ells" where 90 degree bends are required for 21mm and larger conduits.
- .3 EMT couplings and connectors shall be steel, or Regal Die-cast zinc alloy. Couplings used on conduit containing fire-rated cable shall be steel. Regular die-cast alloy fittings and couplings are not acceptable. Provide plastic bushings (insulated throat) for all connectors unless there is no chance of burrs. Provide water-tight connectors in damp or wet locations and for surface equipment (e.g. Panel boards, etc) in rooms that are fire sprinkler protected.

## **2.4 EXPANSION FITTINGS FOR RIGID CONDUIT**

- .1 Weatherproof expansion fittings with internal bonding assembly suitable linear expansion.
- .2 Water-tight expansion fittings: with integral bonding jumper, suitable for linear expansion and 21mm deflection in all directions.
- .3 Weatherproof expansion fittings for linear expansion at entry to panel as required.

## **2.5 RIGID P.V.C. CONDUIT**

- .1 Conduit: rigid non-metallic conduit of unplasticized polyvinyl chloride as manufactured C.G.E. "Sceptre" Schedule 40.
- .2 Fittings: threaded male or female solvent weld connectors and solvent weld couplings, as supplied by conduit manufacturer.
- .3 Solvent: as recommended by conduit manufacturer.

**Part 3 Execution**

**3.1 INSTALLATION - GENERAL**

- .1 Generally use electrical metallic tubing (EMT) in the building interior and in above grade slabs except where subject to mechanical injury or where otherwise indicated.
- .2 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass. Set out the work and coordinate with other services prior to installation. Maintain access to junction and pull boxes.
- .3 Where practical conceal conduits.
- .4 Any conduit shown exposed in finished areas is to be free of unnecessary labels and trade marks.
- .5 All conduit ends to be reamed to ensure a smooth interior finish that will not damage the insulation of the wiring.
- .6 Ensure grounding continuity in all conduit systems.
- .7 Surface conduits are acceptable in mechanical and electrical service rooms and in unfinished areas or where indicated.
- .8 Use rigid galvanized steel (RGS) threaded conduit on roof and where the installation is subject to mechanical injury. In any event, use RGS conduit for surface installations up to 1.5m above the finished floor.
- .9 Field threads on rigid conduit shall be sufficient length to draw conduits ends together.
- .10 Unless otherwise noted and where practical, all conduits to be routed through the ceiling space rather than in, or below, slabs or floor structures to facilitate future changes.
- .11 Conduits in walls should typically drop (or loop) vertically from above to better facilitate future renovations. Generally conduits from below and horizontal conduits in walls and concrete structures should be avoided unless indicated.
- .12 All branch circuit conduit and communication/data conduits to be minimum 21 mm diameter unless otherwise indicated.
- .13 All fire alarm system conduits to be minimum 21 mm diameter.
- .14 Generally use Rigid PVC conduits in or below ground level slab unless otherwise noted. Transition to RGS conduit in exposed locations: eg where conduits emerge from ground level slab.
- .15 Conduits are not permitted in terrazo or concrete toppings.

- .16 Cap turned up conduits to prevent the entrance or dirt of moisture during construction.
- .17 Locate conduits more than 75mm parallel to steam or hot water lines with a minimum of 25mm at crossovers.
- .18 Bend conduits cold, so that conduit at any point is not flattened more than 1/10th of its original diameter. Conduits bent more than this or kinked to be replaced.
- .19 Provide polypropylene pull cord in empty conduits to facilitate pulling wiring in future.
- .20 Where conduits become blocked, the use of corrosive agents is prohibited. Remove and replace blocked section.
- .21 Damaged conduits to be repaired or replaced.
- .22 Dry conduits out thoroughly before installing wiring. Swab out conduit and thoroughly clean internally before wires and cables are pulled.
- .23 Conduits shall not pass through structural members except as indicated.
- .24 Conduit sizes indicated on drawings are minimum only. Increase sizes as required to suit alternative wiring types or to comply with Code.
- .25 Conduits and ducts crossing building expansion joints shall have approved conduit expansion fittings to suit the type of conduit used.
- .26 Seal conduits with approved sealant where conduits are run between heated and unheated areas.
- .27 Seal openings with approved sealant where conduits, cables, or cable trays pierce fire separations.
- .28 Where conduits pass through walls, they shall be grouped and installed through openings. After all conduits shown on the drawings are installed, wall openings shall be closed with material compatible with the wall construction and/or to meet any fire separation integrity.
- .29 Where drawings show conduit designations, these conduits shall be identified at each point of termination with Thomas & Betts "Ty-Rap" No. TY532M labels.
- .30 Use "Condulet" fittings for power and telephone type conduit terminations in lieu of standard boxes where box support is not provided.
- .31 Provide necessary roof jacks or flashing where conduits pass through roof or watertight membranes. Apply approved sealant to maintain membrane integrity.

- .32 Use flexible metal conduit for connection to recessed incandescent fixtures without a prewired outlet box and connection to recessed fluorescent fixtures.
- .33 Use liquid tight flexible metal conduit for connection to motors, and other vibrating equipment and transformers.
- .34 The electrical contractor is to provide all of the conduits, raceways, pull boxes & junction boxes, as required by the security system contractor. The General Contractor, the Electrical Contractor and the Security Contractor shall coordinate the specific conduit & raceway requirements on site prior to rough-in.

### **3.2 SURFACE CONDUITS**

- .1 Run parallel or perpendicular to building lines.
- .2 Locate conduits behind infrared or gas fired heaters with minimum 1.5m [5'] clearance.
- .3 Conduits to be run in flanged portion of structural steel.
- .4 Group conduits wherever possible on suspended and/or surface channels.
- .5 Surface conduits will not be accepted in finished areas unless detailed.

### **3.3 SPARE CONDUITS**

- .1 Provide spare conduits as indicated.
- .2 Provide 4x27 mm spare conduits up to ceiling space and 2x27 mm spare conduits down to ceiling space below from each flush panel tub. Terminate the conduits in 150x150x100 mm junction boxes in ceiling spaces or in case of an exposed concrete slab, terminate each conduit in a flush concrete box. Provide cover plates for all junction boxes.

### **3.4 CONDUITS IN CAST IN PLACE CONCRETE**

- .1 Locate conduits to suit reinforcing steel. Install in centre third of slab.
- .2 Do not place conduit in concrete slabs in which slab thickness is less than four times conduit diameter. Place conduits larger than this size under the floor or slab. Conduits to have minimum 25 mm concrete cover. Conduits to be completely encased in concrete
- .3 Organize conduit in slabs to minimize crossovers. Obtain approval and minimum concrete cover required from structural engineer prior to installing conduits in slabs.
- .4 Protect conduits from damage where they stub out of concrete.
- .5 Tie down conduit to prevent shifting. All joints are to be made up tight to ensure ground



continuity. To prevent concrete entry, seal EMT set screw fittings with tape, pack outlet boxes and cap conduit terminations both in boxes and stub-ups. Apply Polykin #940 tape to the conduit 150 mm at the point of leaving slab.

- .6 Carefully check and mark out set-backs of conduit(s) to be installed in floor slabs and to be stubbed up to equipment or motors. Verify conduit size and stub-up locations for mechanical and equipment from shop drawings or detail drawings. Brace all stub-ups. Stub-ups shall be RGS.
- .7 Install sleeves in advance of concrete pour where conduits pass through slab or wall.
- .8 Where conduits pass through waterproof membrane provide oversized sleeve before membrane installation. Use cold mastic between sleeve and conduit.

### **3.5 CONDUITS IN POURED SLABS ON GRADE**

- .1 Use Rigid PVC conduit in the gravel or select fill base below concrete slabs. Provide mechanical protection around exposed stub-ups through slab and extend up to 150 mm beyond concrete. Transition to RGS conduit immediately above the slab.
- .2 In the event that rigid steel conduit is installed in contact with earth it shall be protected by Polykin #940 tape. Extend taping 300 mm above finished grade.
- .3 Conduits 27mm and larger to be run below slab and encased in 75mm concrete envelope. Provide 50mm of sand over concrete envelope below floor slab.

### **3.6 EXPANSION JOINT CONDUIT FITTINGS**

- .1 Provide conduit expansion joint fittings at concrete expansion joint.

### **3.7 RIGID P.V.C. CONDUIT**

- .1 Use in accordance with the Canadian Electrical Code and Building Codes and as noted below:
- .2 Use as raceways for following applications
  - .1 In poured slab on grade concrete floors and walls and for underground runs exterior to the buildings unless otherwise noted.
  - .2 Wiring installed in areas subject to intermittent or continuous moisture but not surface mounted.
  - .3 Rigid PVC conduit shall not be surface mounted or exposed within buildings.
- .3 Do not use in return air plenums or for exit light circuits and emergency lighting.
- .4 Provide insulated ground wire in all rigid PVC conduits in accordance with the Canadian Electrical Code.

- .5 Where rigid PVC conduit is set in poured concrete, solvent joints must be completed and allowed to set as per manufacturer's instructions.
- .6 Bend rigid conduit in strict accordance with manufacturer's directions. Distorted bends will not be accepted.

### 3.8 CONDUIT SIZE REFERENCE

- .1 The following schedule has been included to clarify conduit dimensions used throughout these specifications and on the drawings.

Imperial Standard Size	Common Metric Size	2012 CEC Metric Designation
$\frac{3}{8}$ "	10 mm	12 mm
$\frac{1}{2}$ "	12 mm	16 mm
$\frac{3}{4}$ "	19 mm	21 mm
1"	25 mm	27 mm
1 $\frac{1}{4}$ "	32 mm	35 mm
1 $\frac{1}{2}$ "	38 mm	41 mm
2"	50 mm	53 mm
3"	75 mm	78 mm
4"	100 mm	103 mm

**END OF SECTION**

**Part 1            General**

**1.1                SECTION INCLUDES**

- .1    Public address system to include:
  - .1    Microphone.
  - .2    Speakers.
  - .3    Mixing Amplifier.
  - .4    IP Paging Unit.
  - .5    Connection with the existing fire alarm system (to mute the PAS when fire alarm systems activated)
  - .6    Accessories and incidentals necessary for a complete operational system as intended.

**1.2                REFERENCES**

- .1    Canadian Standards Association C22.1 (Canadian Electrical Code, Part 1).

**1.3                SYSTEM DESCRIPTION**

- .1    Stand-alone public address system for public announcement.
- .2    Systems to be mounted on racks, with locations indicated on the drawings.

**1.4                SYSTEM OVERVIEW**

- .1    The sound system shall provide intelligible voice coverage inside the building where speakers are shown.
- .2    Locate the equipment rack in rooms as shown on the drawings.
- .3    The loudspeaker system should be organized in zones where applicable, as shown on drawings.
- .4    System to have individual volume control for each zone at the equipment rack.
- .5    System to be capable of selecting each zone independently and the volume controlled separately so that one or more zones could be turned off or down while the sound system is used for an event in the other zone or zones.
- .6    There will be no expectation to use the sound system for all zones and simultaneous events.
- .7    The loudspeaker system should be sufficiently directional to minimize excitation of the reverberant field, and should be capable of good quality voice reproduction, with a low frequency response to a minimum of 80Hz, and extended high frequency response to at least 15kHz at the listening positions.
- .8    The speaker system shall make use of the optimum quantity of devices to achieve the required coverage.

- .9 Quantity and power of the amplifiers to be sufficient to guarantee intelligible speech at all locations under peak ambient noise.

## **1.5 SHOP DRAWINGS**

- .1 Submit shop drawings in accordance with Section 26 05 01 - Common Work Results - Electrical.
- .2 Include:
  - .1 Complete material list with style, model number, quantity and technical information.
  - .2 Riser diagram, circuit diagram and block diagram of complete public address system, which clearly illustrate how all components relate and interconnect.
  - .3 Public address system design and speech intelligibility criteria.
  - .4 Speaker layout, power requirements and predicted speech intelligibility results. System could be modeled using JBL CADP2 or EASE 2.3 or 3.0.
  - .5 Layout, size and arrangement of the system rack.
  - .6 Maximum value of heat generated inside the rack and maximum heat dissipation rating of the rack at 30 °C ambient temperature.
  - .7 List of test points, and proposed format for test records.
  - .8 Details and descriptions of any other aspect of the sound system, which must differ from the tender drawings due to field conditions.
  - .9 Identify worst case ambient noise level considered in designing the system in different areas.

## **1.6 CLOSEOUT SUBMITTALS**

- .1 Provide operation and maintenance data for public address system for incorporation into manual specified in Sections 01 78 00 – Closeout Submittals and 26 05 01 - Common Work Results - Electrical.
- .2 Include:
  - .1 Approved copy of shop drawings and product data.
  - .2 Test results.
  - .3 Operation and maintenance information for the system.
  - .4 Installation manuals for components of the system.

## **1.7 SYSTEM STARTUP**

- .1 Instruct operating personnel in the operation, care and maintenance of systems, system equipment and components.
- .2 Where deemed necessary, arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation. Check, adjust, balance and calibrate components and instruct operating personnel.

- .3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with all aspects of its care and operation.

## **1.8 ENCLOSURE**

- .1 Enclosure to be EEMAC 1 or EEMAC 3 as per CSA-C22.1 suitable for the location shown on drawings, and sprinkler proof.
- .2 The enclosure to facilitate necessary ventilation and natural cooling necessary for the proper operation of the equipment enclosed therein.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Conduits: to Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
- .2 Communication conductors: as recommended by manufacturer. Provide shielded conductor where conduit is not used.
- .3 Provide plenum rated conductor and connections in plenum space.

### **2.2 MICROPHONE**

- .1 Microphone: close talking, noise cancellation, moving coil, dynamic type, complete with talk switch, microphone holder and stand.
- .2 Directivity: Unidirectional.
- .3 Rated impedance: 600 OHM, balanced.
- .4 Rated sensitivity (1 kHz 0dB=1V/Pa): -54 dB.
- .5 Frequency response: 70 Hz - 15 kHz.
- .6 Cable: Shielded complete with connectors.
- .7 Talk switch: Sort-off type, slide on-off switch.
- .8 Finish:
  - .1 Body: Die-cast zinc, painted metallic grey.
  - .2 Head: Die-cast aluminum, zinc plated steel wire, metallic grey.
- .9 Minimum standard of acceptance: TOA model DM-1300US or approved equal.

### **2.3 MIXING AMPLIFIER**

- .1 Modular design, 120 VAC  $\pm$  10% 60 Hz.
- .2 Multi-channel (minimum 5 speaker zones) with transformer isolated output.
- .3 Inputs: every port to accept any input module including satellite radio (future). One bridging input/output.
- .4 Output power: 240W @1kHz, THD 1% (max).

- .5 Frequency response: 80-17,000 Hz plus or minus 1 dB at full output.
- .6 Total harmonic distortion: less than 1% at 1 kHz rated output.
- .7 Input sensitivity and impedance:
  - .1 100 mV/10 kOhm
  - .2 Bridging input/output: 100 mV / 3.3 kOhm
- .8 Outputs:
  - .1 Main: Balanced 150/600 Ohm.
  - .2 Aux: Unbalanced 10 kOhm, 0 dBm.
- .9 Tone controls:
  - .1 Bass:  $\pm 10$  dB at 100 kHz.
  - .2 Treble:  $\pm 10$  dB at 10 kHz.
- .10 Indicators:
  - .1 Power;
  - .2 Output Level;
  - .3 Speaker Zone;
  - .4 Protect; and
  - .5 Signal LEDs.
- .11 Self protection with internal AC fuses.
- .12 Temperature range: -10 °C to +40 °C.
- .13 Minimum standard of acceptance: Inter-M PA-240 or approved equal.

## **2.4 EQUIPMENT RACK**

- .1 Rack, to accommodate system components, enclosed type, steel construction with internal mounting rails, wire and cable entrances with smooth edges protected by rubber edging, four adjustable rack leveling feet.
- .2 Metal outlet raceway with colour coded outlets wired to 120V, 60Hz supply controlled by key type locking switch.
- .3 Louvers and ventilation apertures in sides, top, back of rack for convection ventilation.
- .4 Racks to have lockable wheels.

## **2.5 SPEAKERS**

- .1 Recessed ceiling speakers:
  - .1 8" dual cone 8ohm.
  - .2 Five wattage taps from 1/3W to 5W.
  - .3 Works with 25V or 70V amplifier outputs
  - .4 Power handling: 8W RMS
  - .5 Frequency Response: 65Hz – 17kHz

- .6 12-7/8" baffle diameter, 22 ga steel zincrometal with white semi gloss powdered epoxy finish.
- .7 Minimum standard of acceptance: Aiphone SP-2570N complete with tile bridge for drop ceiling installation or approved equal.
- .2 Surface-mount speaker:
  - .1 Rated Input: 20 W (for 70 V line)
  - .2 Sensitivity: 97 dB (1 W/1M)
  - .3 Frequency Response: 805 Hz - 17 kHz (426A standard)
  - .4 Speaker Component: 20 cm (8") cone-type
  - .5 Minimum standard of acceptance: Quam System2VP complete with mounting brackets for surface mount installation or approved equal.
- .3 Surface-mount horn speakers:
  - .1 Rated Input: 16 W / 32 W (for 70 V line)
  - .2 Sensitivity: 119dB / 124dB (at rated output measured on 4' axis)
  - .3 Frequency Response: 325 Hz - 15 kHz
  - .4 All metal weatherproof construction for indoor or outdoor use.
  - .5 Minimum standard of acceptance: Aiphone AH-16TN (and AH-32TN) complete with mounting brackets for surface mount installation or approved equal.

## **2.6 POWER SUPPLY**

- .1 Power supply unit, well filtered, regulated, constant voltage under load.

## **Part 3 Execution**

### **3.1 INSTALLATION**

- .1 Install equipment in accordance with manufacturer's instructions, and as indicated.
- .2 Position and aim the speakers to minimize the potential for late reflections that will harm speech intelligibility and quality music

### **3.2 FIELD QUALITY CONTROL**

- .1 Perform tests indicated herein and recommended by the manufacturer in accordance with Section 26 05 01 - Common Work Results - Electrical.
- .2 Conduct intelligibility test and include a copy of the test report in the O&M manuals.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED WORK**

- .1        This Section of the Specification forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.
- .2        Refer to Section 26 05 00 Common Work Results.
- .3        Refer to Section 27 05 00 Common Work Results for Communications.

**1.2                REFERENCES**

- .1        CSA C22.1, Canadian Electrical Code.
- .2        NBC, National Building Code of Canada.
- .3        BCBC, BC Building Code.
- .4        Underwriter's Laboratories of Canada (ULC)
  - .1        CAN/ULC S524, Installation of Fire Alarm Systems.
  - .2        CAN/ULC S525, Audible Signal Appliances for Fire Alarm.
  - .3        CAN/ULC S526, Visual Signal Appliances, Fire Alarm.
  - .4        CAN/ULC S527, Control Units.
  - .5        CAN/ULC S528, Manual Pull Stations.
  - .6        CAN/ULC S529, Smoke Detectors.
  - .7        CAN/ULC S530, Heat Actuated Fire Detectors.
  - .8        CAN/ULC-S536, Inspection and Testing of Fire Alarm Systems.
  - .9        CAN/ULC S537, Verification of Fire Alarm Systems.
  - .10      CAN/ULC-S561, Installation and Services for Fire Signal Receiving Centres and Systems.

**1.3                PRODUCT DATA**

- .1        Submit product data in accordance with Section 26 05 00.

**1.4                WASTE MANAGEMENT AND DISPOSAL**

- .1        Separate and recycle waste materials in accordance with Division 01 - Construction/Demolition Waste Management and Disposal.
- .2        Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3        Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.



## 1.5 SCOPE

- .1 Contractor to supply and install all labour, material, and equipment necessary for two new fire alarm systems in the Buoy Maintenance Building and Pollution Equipment Building.
- .2 Provide all labour, material, and equipment necessary to extend, expand, or modify existing fire alarm systems.
- .3 Include all wiring and material required to complete the installation. Items obviously necessary or reasonably implied to complete the work are to be supplied as if indicated on the drawings and called for in the specifications.
- .4 All new components shall be ULC listed and approved for use on the intended equipment and to be compatible to the existing fire alarm system. Coordinate on site as required.
- .5 Work Included:
  - .1 Demolish and dispose of existing fire alarm system.
  - .2 Provide new complete addressable fire alarm system, including but not limited to; fire alarm panel, detectors, pull stations, annunciators, auto dialers, zone maps, sprinkler devices, isolators, ancillary relays, and signaling devices as indicated on the drawings.
  - .3 Connect new systems to existing main fire alarm panel located in the security office of the Stores Building.
  - .4 Repair and patch all damage caused by the contractors work to match existing finishes.
  - .5 Perform all the required programming, verification & documentation as required.

## 1.6 SHOP DRAWINGS

- .1 Reference Section 26 05 00 – Common Work Results for additional submission details.
- .2 Include:
  - .1 Detail assembly and internal wiring diagrams for control unit.
  - .2 Overall system riser and wiring diagram identifying control equipment initiating zones signaling circuits; identifying terminations, terminal numbers, conductors and raceways.
  - .3 Details for devices.
  - .4 Details and performance specifications for control, annunciation and peripherals with item by item cross reference to specification for compliance.
  - .5 Step-by-step operating sequence, cross referenced to logic flow diagram.
  - .6 Battery capacity calculations.
  - .7 Manufacturer recommended testing material, devices, equipment and methods for smoke and heat detectors.
- .3 Shop drawings to be stamped by manufacturer to ensure equipment/design is in accordance with ULC standards.

**1.7 MAINTENANCE MANUALS**

- .1 Maintenance manuals to be furnished as specified in Section 26 05 03 – Operation & Maintenance Manuals.

**1.8 SYSTEM DESCRIPTION**

- .1 Existing is fully supervised, microprocessor-based, fire alarm system, utilizing digital techniques for data control and digital, and multiplexing techniques for data transmission.
- .2 System to carry out fire alarm and protection functions; including receiving alarm signals; initiating general alarm; supervising components and wiring; actuating annunciators and auxiliary functions; initiating trouble signals and signalling to monitoring agency.
- .3 Zoned, single stage.
- .4 Modular in design to allow for future expansion.
- .5 Operation of system shall not require personnel with special computer skills.
- .6 System to include:
  - .1 Trouble signal devices.
  - .2 Power supplies.
  - .3 Initiating/input circuits.
  - .4 Output circuits.
  - .5 Wiring.
  - .6 Manual and automatic initiating devices.
  - .7 Audible and visual signalling devices.
  - .8 End-of-line resistors.
  - .9 Loop Isolation modules.
  - .10 Local and remote annunciators.
  - .11 Ancillary devices - Spare contacts for:
    - .1 Fan shut-down
    - .2 Air handling units shut-down
    - .3 Door release devices
    - .4 Signal alarm and trouble at the building's control & automation system.
    - .5 Interlocks with access control, intrusion alarm and video surveillance systems.

**1.9 REQUIREMENTS OF REGULATORY AGENCIES**

- .1 System components: listed by ULC and comply with applicable provisions of Local/Provincial Building Code, and meet requirements of local authority having jurisdiction.

## **1.10 SHOP DRAWINGS**

- .1 Submit shop drawings in accordance with Section 26 05 00 and Div. 1 requirements.
- .2 Include:
  - .1 Detail assembly and internal wiring diagrams for control unit.
  - .2 Overall system riser and wiring diagram identifying control equipment initiating zones signaling circuits; identifying terminations, terminal numbers, conductors and raceways.
  - .3 Details for devices.
  - .4 Details and performance specifications for control, annunciation and peripherals with item by item cross reference to specification for compliance.
  - .5 Step-by-step operating sequence, cross referenced to logic flow diagram.
  - .6 Battery capacity calculations.
  - .7 Manufacturer recommended testing material, devices, equipment and methods for smoke and heat detectors.
- .3 Shop drawings to be stamped by manufacturer to ensure equipment/design is in accordance with ULC standards.

## **1.11 CLOSEOUT SUBMITTALS**

- .1 Provide operation and maintenance data for fire alarm system for incorporation into manual specified in Section 26 05 00 and Division 01 Closeout Submittals.
- .2 Include:
  - .1 Operation and maintenance instructions for complete fire alarm system to permit effective operation and maintenance.
  - .2 Technical data - illustrated parts lists with parts catalogue numbers.
  - .3 Copy of approved shop drawings with corrections completed and marks removed except review stamps.
  - .4 List of recommended spare parts for system.
- .3 NOTE: Photostat copies of manuals or drawings shall not be accepted. Manuals to contain information applicable only to the system covered in these documents.
- .4 Installer to provide drawing of building plan showing all fire alarm zones. As described in Section 26 05 00 - Common Work Results - Electrical.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Equipment and devices: ULC listed and labelled and supplied by single manufacturer.
- .2 Power supply: to CAN/ULC-S524.
- .3 Audible signal devices: to ULC-S525

- .4 Visual signal devices: to CAN/ULC-S526.
- .5 Control unit: to CAN/ULC-S527.
- .6 Manual pull stations: to CAN/ULC-S528.
- .7 Thermal detectors: to CAN/ULC-S530.
- .8 Smoke detectors: to CAN/ULC-S529.

## **2.2 ADDRESSABLE MONITOR MODULES**

- .1 Addressable monitor elements to meet or exceed the following technical requirements:
  - .1 Compatible with main fire alarm system.
  - .2 Field programmed.
  - .3 Individually identifiable.
  - .4 Supervised.
  - .5 Supervises and controls N.O. contact devices on supervised slave line. Supervision in Class B format with end-of-line resistor.
  - .6 Operating Voltage: 24 volts.
  - .7 Slave Line Resistance: 50 ohms maximum.
  - .8 Ambient Temperature: 0°C - 40°C.
  - .9 Ambient Humidity: 0 - 93%.
  - .10 Complete with lamicoïd identification on cover identifying address and device monitored.

## **2.3 ADDRESSABLE CONTROL MODULES**

- .1 Addressable control elements to meet or exceed the following technical requirements:
  - .1 Compatible with main fire alarm system.
  - .2 Field programmed.
  - .3 Individually identifiable.
  - .4 Supervised.
  - .5 May be operated by any one or group of identifiable devices.
  - .6 May be operated from control centre or automatically by system.
  - .7 Contact rating: .5 amperes 120 volts AC, 2 amperes at 24 volt DC, with one (1) set of Type C contacts.
  - .8 Ambient Temperature: 0°C - 40°C.
  - .9 Ambient Humidity: 0 - 93%.
  - .10 Complete with lamicoïd identification on cover identifying address and device controlled.

## **2.4 ADDRESSABLE DETECTOR BASES**

- .1 Addressable detector bases to meet or exceed following technical requirements:
  - .1 Compatible with main fire alarm system.

- .2 Field programmable.
- .3 Supervised, including removal of specified plug-in detector devices.
- .4 Designed to accept ionization, photo-electric, heat detectors and electronic heat detectors.
- .5 Designed for remote LED output and base mounted LED.
- .6 Operation on system data loop.
- .7 Ambient temperature 0 to 90°C.
- .8 Ambient humidity: 0 - 93%.

## **2.5 ADDRESSABLE MANUAL FIRE ALARM STATIONS**

- .1 Manual Fire Alarm Stations: to ULC-S528-1978 and as follows:
  - .1 Type: Addressable.
  - .2 Construction: Metal or Lexan.
  - .3 Mounting: Flush or Surface as shown on drawings.
  - .4 Features: Glass rod.
  - .5 Operation:
    - .1 First Stage: Manual lever.
    - .2 Second State: Key operated.
  - .6 Ambient temperature: 0°C to 40°C.
  - .7 Ambient humidity: 0 - 93%

## **2.6 THERMAL DETECTORS**

- .1 Thermal Detectors: Addressable to ULC-S530-1978 and as follows:
  - .1 Construction: metal.
  - .2 Mounting: Addressable base and plug-in head.
  - .3 Contacts: rated at 3 A from 6 to 125 V AC, 1 A from 6 to 28 V DC.
- .2 Ambient temperature 0°C to 40°C.
- .3 Ambient Humidity - 10% to 95% R.H.
- .4 Thermal detectors to operate on the dual thermistor principle.
- .5 Built-in LED for alarm indication.
- .6 Shielded electronics to limit noise interference.
- .7 Operation:
  - .1 Projecting centre disk shall indicate when alarmed.
  - .2 Fixed Temperature Type: Resettable, shall operate at 58°C.
  - .3 Fixed Temperature Type: Non-Resettable shall operate at 88°C.

## **2.7 PRODUCTS-OF-COMBUSTION DETECTORS**

- .1 Photo-electronic products-of-combustion (POC) sensors complete with addressable base shall be provided in all areas except electrical rooms where ionization type detectors are to be utilized. Units to be unaffected by changes in environmental temperature, humidity and pressure. Surface mounted, screw connection separate field wiring base, indicator lamp, provision for remote mounting, design and function based on dual chamber principle.
- .2 POC sensors shall communicate actual chamber values to system control panel. Sensors shall not have a self-contained sensitivity setting, sensitivity setting to be determined at control panel. In all areas initially, alarm set point will be set at 1% obscuration during evening hours, and 3.7% obscuration during daytime hours.
- .3 The control panel shall be programmed to automatically compensate for environmental changes at the remote sensors. Even if the smoke detector chamber is contaminated with dust, or other particles, the control panel will still alarm at the prescribed alarm set point.
- .4 The POC sensor shall be stable even withstanding air-gusts up to 10 m/sec velocity. The detector shall have a 30 mesh insect screen and have a completely sealed back to prevent entry of dust, moisture and air turbulence. The electronics of the unit shall be totally shielded to protect against false alarms due to EMI and RFI. The detector head shall be easily disassembled to facilitate cleaning. All wiring to the smoke detector shall be wired to the base only, thus when removing the head for maintenance or cleaning no wiring is disturbed. The detector head shall contain an LED which shall glow continuously to indicate alarm, or a sensor trouble condition. The detector head shall contain a locking screw to prevent unauthorized removal of the head from the base.
- .5 Ceiling units to be attractive design, easy to clean, chamber accessible without special tools, chamber to be provided with anti-static protection, overall tapered geometry with no flare-outs to collect dust. Chamber port open 360°.
- .6 Where units are mounted in the ceiling space, provide remote pilot lamp complete with lamicoid identification.
- .7 Provide terminals and output for individual annunciation as required.
- .8 Duct mounting POC detectors to be complete with addressable module, duct casting, sampling tubes for installation in air systems and pilot lamp.
- .9 Detectors to meet both ULC-S529-1978 and UL-268 standards.

## **2.8 VISUAL SIGNAL APPLIANCES**

- .1 Visual signal appliances: to ULC S527-1978 and as follows:
  - .1 Voltage: 24 VDC.
  - .2 Mounting: designed for ceiling or wall.
  - .3 Construction:
    - .1 High intensity Xenon flasher.
    - .2 Rated Candela - 110.
    - .3 Pyramid shaped.

- .4 Clear lexan lens with white print reading "FIRE".
- .4 Operation: All strobes to be synchronized at 1 flash per second.
- .5 All visual signal appliances to be connected to a dedicated supervised output circuit in the fire alarm control panel.

## **2.9 AUDIBLE / VISUAL SIGNAL APPLIANCES**

- .1 Signalling appliances shall be flush wall or ceiling mounted in finished areas as indicated on drawings. In mechanical, electrical and similar service spaces devices to be complete with matching back box in red colour.

## **2.10 END-OF-LINE RESISTOR ASSEMBLY**

- .1 End-of-line Resistor Assembly: single gang stainless steel plate, terminal strip on back, resistor, red enamel finish and lamicaid nametag on front identifying zone and / or device.

## **2.11 ISOLATORS**

- .1 Mapnet (addressable loop) isolators shall be provided in each circuit per zone area, and for each stairway such that a fault on any device in that zone shall not affect any other zone.

## **2.12 SYSTEM POWER SUPPLY**

- .1 Power Supply: to ULC S527-1978 and as follows:
  - .1 Rectifier and Battery Charger:
    - .1 Designed to automatically maintain battery bank fully charged.
    - .2 Sized to recharge batteries in 24 hours minimum.
    - .3 Designed to operate system when batteries are disconnected.
    - .4 Temperature compensated.
    - .5 Provide battery connection supervision.
  - .2 Battery Bank: Gel-cell type.
  - .3 Capacity: Designed to operate system under supervisory load condition for 24 hours and then have sufficient power to provide 30 minutes of continuous voice and visual communication without recharging.
  - .4 Mounting integral with Fire Control Panel.

## **2.13 WIRE AND CABLE**

- .1 Conductors: Copper, to CSA C22.2 and No.75-M1983 and as follows:
  - .1 Conductor Insulation: Minimum rating 300 volts. Single conductor RW90 X-link. Multi-conductor cables 105°C with outer PVC jacket, colour coded, FAS rated.
  - .2 Conductor sizes as follows:
    - .1 Minimum conductor size for alarm initiating circuits shall be #18 AWG.

- .2 Minimum conductor size for signal circuits shall be #16 AWG.
  - .3 Minimum conductor size for AC circuits shall be #12 AWG.
  - .4 Minimum conductor size for visual signal appliance circuits shall be #14 AWG.
  - .5 Size all fire alarm wiring for maximum 3% voltage drop at maximum load at last device in run.
- .2 All wiring for systems to be PVC insulated, shielded, twisted pair, multi-conductor or coaxial, as called for or as required. All wiring for systems to be installed in conduit.
  - .3 Selection of type of cable to be at discretion of system installer but the system meeting all code requirements, when complete, must perform to the complete satisfaction of the Owner. All wiring to be terminated in terminal panels, junction boxes, etc. on suitable terminal strips or blocks, and to be neatly installed, laced and tagged where required. All terminals in terminal panels and junction boxes shall be made with solderless connectors to terminal blocks with separate terminal for each conductor.

### **Part 3 Execution**

#### **3.1 INSTALLATION**

- .1 Install devices at locations indicated and in accordance with the manufacturer's layout drawings.
- .2 Each device shall be clearly identified with its zone and address number, using machine-printed clear adhesive tape with black lettering.
- .3 Mounting heights for devices:
  - .1 Manual stations (1050mm)
  - .2 Audible signal devices at 2300mm above floor
  - .3 Visual signal devices at 2300mm above floor
  - .4 End-of-line devices at 1800mm above floor.
- .4 All fire alarm system junction boxes, conduits, and wiring shall be painted and identified.
- .5 All fire alarm conduits and BX drops shall be identified with a red band at 3 meter intervals and at all wall or slab penetrations.
- .6 Sprinkler devices shall be wired for wet areas using liquid-tight flexible conduit. Junction boxes less than 1800mm away from the sprinkler device shall also be suitable for wet area installation.
- .7 Door mags and door hold-open devices shall have their respective power circuit numbers identified on them in conspicuous location. Labels shall be black text on clear adhesive tape.
- .8 Integrate the fire alarm system with the following systems as indicated and/or as required by code or standard.
  - .1 HVAC system



- .2 Sprinkler system
- .3 Door security system.
- .9 Wiring shall be installed in conduit and shall be as recommended by the system manufacturer and as required by the CEC.

### **3.2 OPERATION OF FIRE ALARM SYSTEM DURING RENOVATIONS**

- .1 Construction/demolition activities in existing building may require that certain fire alarm devices are protected from construction dust, damage etc. Coordinate with the Owners representative as required to protect components of the fire alarm system to prevent nuisance operation and alarms.
- .2 Provide, install and test temporary heat detectors in the area of construction where the construction area is not protected by an active supervised fire protection sprinkler system. The “construction” detectors to be removed and discarded at the end of the project.
- .3 Provide temporary replacement of smoke detectors with heat detectors including interim programming and testing and final re-verification where deemed necessary to minimize false alarms and to ensure other occupants of the building are protected.
- .4 Maintain existing fire alarm system in areas under construction where practical. Relocate, rewire and provide interim connections as required while installing the new system to replace the existing. Provide temporary fire alarm devices and audible signals to suit any temporary exiting provisions.
- .5 Fire watch shall be put into effect at the Contractor’s own expense and no cost to the Owner during the interim period between demolition and the ‘temporary’ heat detectors being installed and verified; or any time the area is unsupervised.
- .6 Devices and/or wiring shall be immediately re-verified in accordance to CAN/ULC-S537-13 whenever a change or modification is performed. Inform monitoring station prior to any modifications.
- .7 Contractor to check at the start and end of each working day to confirm the fire alarm status in the area of work. Arrange for the related fire alarm zone card or area to be deactivated either to suit the progress of the work and/or where dust will be present on a day to day basis. Bag and protect fire detectors in dusty areas during construction. Remove any bagging at the end of the work day. Any existing detectors subject to construction dust to be immediately vacuumed and marked to be replaced at the end of the project. Any fire alarm devices subject to moisture to be replaced immediately.
- .8 The fire alarm system is to be fully functional in the area of construction when the contractor is neither on site nor after the contractor’s normal work hours. (i.e. overnight, holidays, weekends)

### **3.3 SYSTEM VERIFICATION**

- .1 Fire alarm equipment supplier to make a thorough inspection of the complete installed fire alarm system including all components such as manual stations, thermal detections, products-of combustion detectors, and controls to ensure the following:
  - .1 System is complete and functional in accordance with engineer's specifications.

- .2 System is installed according to CAN/ULC S524 requirements.
- .3 System is installed in accordance with manufacturer's recommendations.
- .4 Regulations covering supervision of components are adhered to.
- .5 Subsequent changes necessary to conform to Items 1, 2, 3 and/or 4 to be done by Division 28 with technical assistance supplied by the manufacturer.
- .6 During the period of this inspection by the manufacturer, supply to the manufacturer one journeyman electrician.
- .7 To assist Division 28 in preparing his bid, manufacturer to specify number of hours required to perform this inspection.
- .8 Manufacturer to submit to engineer on completion of inspection a point-by-point check list indicating date and time of each item inspected and also issue a Certificate for his records confirming that inspection has been completed and system is installed and functioning in accordance with the specifications. Included with this Certificate to be satisfactory- proof of liability insurance valid for not less than one (1) year from date of final inspection.
- .9 Certificate to be free from defining and qualified statements, which would make it unacceptable by the Owner.
- .10 Verification shall be performed by manufacturer's certified representative with contractor's assistance. Verification results shall be documented by the manufacturer's representative on the manufacturer's comprehensive fire alarm verification forms.
- .11 System verification to be conducted in the presence of the engineer of record or his designated representative and also in presence of the owner's representative.
- .12 Notify Engineer of verification date and time at least ten business days in advance.
- .13 Verification may be performed only after:
  - .1 Air balancing is complete.
  - .2 Sprinkler system is 100% complete, charged and ready for use.
  - .3 Building is at a state of completion that will ensure a reasonably dust free environment and the absence of contaminating fumes from verification date to final completion.
- .14 Provide two fully charged hand held two-way voice communication radios during verification.
- .15 Provide all testing equipment and material required for testing smoke detectors and heat detectors during verification. Testing methods are to be as approved by manufacturer. As per CAN/ULC-S537 article 5.4.1.3, each smoke detector shall be tested to confirm that it is within its rated operating range using one of the following methods:
  - .1 Using a UL approved smoke density measurement instrument for verification of smoke detectors. Canned smoke alone is not acceptable.
  - .2 Installed control units or transponders designed to test the sensitivity of individual smoke detectors.

- .3 Manufacturer's recommended test instrument, equipment or method. This method is acceptable only when complete official description of the manufacturer's recommended method, including the description of material, devices and equipment is submitted for Engineer's review at least four (4) weeks prior to the verification date.
- .4 Similar for heat detectors.
- .16 Provide all testing equipment and material required for testing sound levels of the fire alarm signaling devices during verification.
- .17 Verification to be performed by the system manufacturer or its qualified representative, certified to verify fire alarm system within the Province of British Columbia.
- .18 Fire alarm verification shall be performed during the substantial completion field review by the engineer, and witnessed by him or her. Schedule the work at the outset of the construction so that work schedules are properly coordinated to guarantee this. Coordinate with other parties involved, such as but not limited to, fire suppression systems contractor, mechanical contractor, access control system contractor, intrusion alarm system contractor, and the Owner for setting up their contract with the remote monitoring company, to ensure completion and attendance at the time of tests. Failed to do so in whole or in part, pay all engineers costs whatsoever associated with witnessing the completion of fire alarm verification at other times.
- .2 Pretest the system prior to request for substantial completion field review and troubleshoot all deficiencies. Submit a copy of successful pretesting report along with the request for substantial completion review. Coordinate with other parties involved, such as but not limited to, fire suppression systems contractor, mechanical contractor, access control system contractor, intrusion alarm system contractor, and the Owner for setting up their contract with the remote monitoring company, to ensure their components and systems are installed, tested and ready for pretesting at the time of pretests and the Owner has a contract in place with the monitoring company at the time of pretesting. Failed to do so in whole or in part, pay all engineers costs whatsoever associated with performing additional site visit to witness successful and complete fire alarm verification at other times.

### **3.4 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 - Common Requirements - Electrical and CAN/ULC-S537.
- .2 Fire alarm system:
  - .1 Test such device and alarm circuit to ensure manual stations, thermal and smoke detectors sprinkler system transmit alarm to control panel and actuate general alarm ancillary devices.
  - .2 Check annunciator panels to ensure zones are shown correctly.
  - .3 Simulate grounds and breaks on alarm and signalling circuits to ensure proper operation of systems.

- .4 Simulate and test all sprinkler valve operations, including tamper and flow switches to ensure proper annunciation on supervisory zones.
- .5 Simulate and test all auxiliary functions.
- .6 Simulate and test alarm and monitoring indication functions at building's control & automation panel.
- .7 Addressable circuits system style DCLA:
  - .1 Test each conductor on all DCLA addressable links for capability of providing 3 or more subsequent alarm signals on each side of single open-circuit fault condition imposed near midmost point of each link. Operate Acknowledge/Silence switch after reception of each of the 3 signals. Correct imposed fault after completion of each series of tests.
  - .2 Test each conductor on all DCLA addressable links for capability of providing 3 or more subsequent alarm signals during ground-fault condition imposed near midmost point of each link. Operate Acknowledge/Silence switch after reception of each of the 3 signals. Correct imposed fault after completion of each series of tests.
- .8 Addressable circuits system style DCLB:
  - .1 Test each conductor on all DCLB addressable links for capability of providing 3 or more subsequent alarm signals on line side of single open-circuit fault condition imposed near electrically most remote device on each link. Operate Acknowledge/Silence switch after reception of each of the 3 signals. Correct imposed fault after completion of each series of tests.
  - .2 Test each conductor on all DCLB addressable links for capability of providing 3 or more subsequent alarm signals during ground-fault condition imposed near electrically most remote device on each link. Operate Acknowledge/Silence switch after reception of each of the 3 signals. Correct imposed fault after completion of each series of tests.
- .9 Test to be performed by the system manufacturer or qualified testing company, certified to test fire alarm system within the Province of British Columbia.
- .10 Pay for all testing costs, excluding those of the electrical consulting engineer for one time witnessing the verification. Bear all electrical consulting Engineer cost to attend more verification sessions when verification is not complete in one session. It is the contractor's responsibility to coordinate the verification and pretest the system prior to verification to minimize the efforts and cost.

### **3.5 PROGRAMMING**

- .1 This contract to include software re-program for all the equipment installed under this Contract. These software generations to include all memory storage devices and burn-in based on devices, control points and monitor points installed under this Contract.

### **3.6 TRAINING**

- .1 Arrange and pay for on-site lectures and demonstrations by fire alarm equipment manufacturer to train operational personnel in use and maintenance of fire alarm system.

**3.7 LABELING**

- .1 The company name and phone number of the fire alarm monitoring company and a clear statement that the equipment is being monitored and that notification must be given prior to working on or testing of the fire alarm system shall be prominently displayed on the DACT as well as the fire alarm panel, as required by CAN/ULC-S561 article 9.2.2.
- .2 When DACT transmit signals for other systems such as intrusion alarm system to the monitoring company, include all systems monitored on the same label and display the label on the control panels of other monitored systems as well.

**3.8 CLEANING**

- .1 Perform per section 26 05 00 Common Work results - Electrical.

**END OF SECTION**

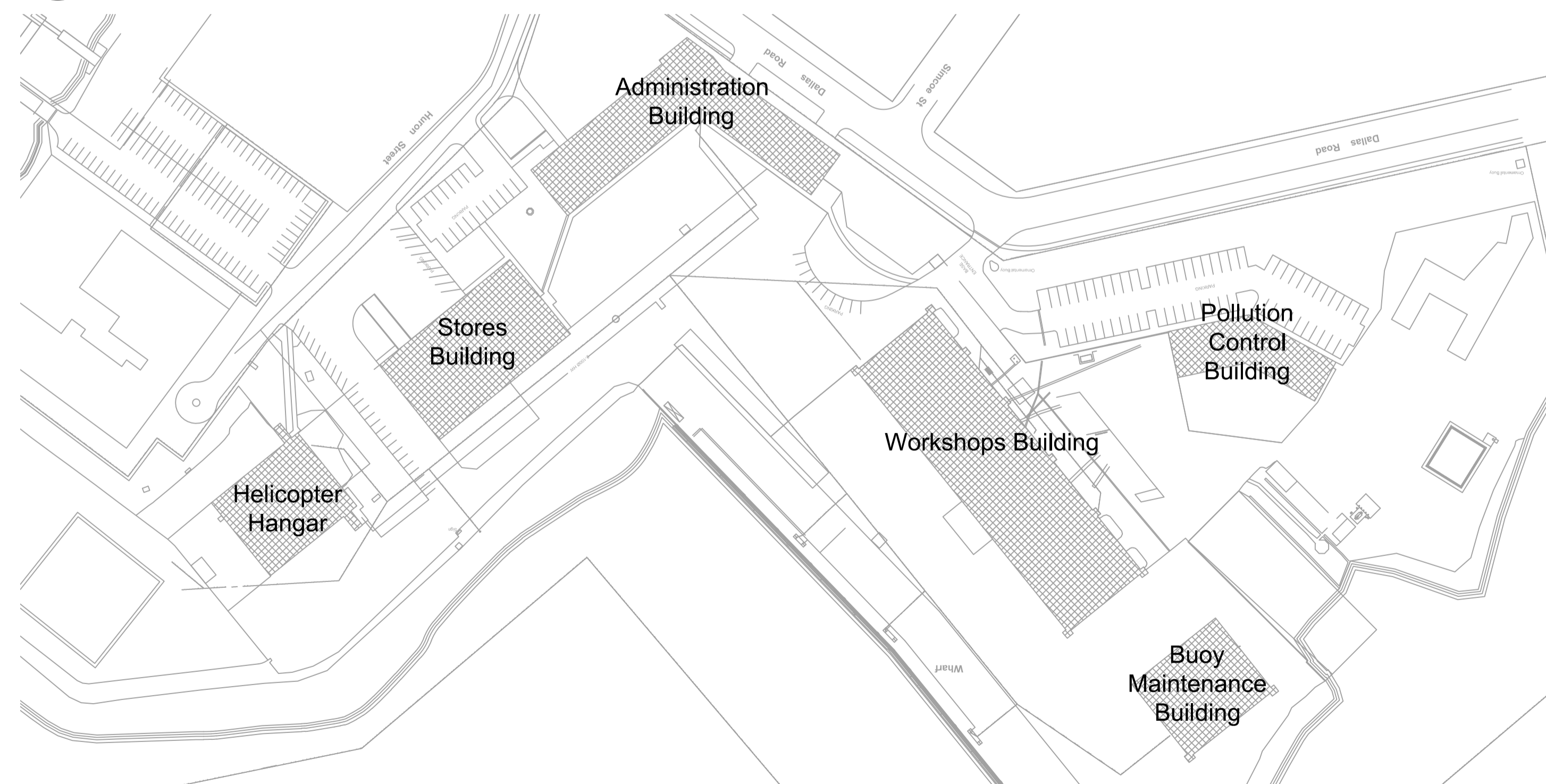
# DEPARTMENT OF FISHERIES AND OCEANS CANADA

# LIFE SAFETY REFURBISHMENTS

## VICTORIA COAST GUARD BASE, VICTORIA, BRITISH COLUMBIA



1 VICTORIA COAST GUARD SITE  
G000 NTS



2 ELECTRICAL KEY PLAN  
G000 NTS

### FIRE ALARM SYMBOL SCHEDULE

☐	FIRE ALARM MANUAL STATION
☐	FIRE ALARM BELL
☐	FIRE ALARM BELL c/w STROBE
☐	CEILING MOUNTED FIRE ALARM HORN SPEAKER
☐	WALL MOUNTED FIRE ALARM HORN SPEAKER
☐	CEILING MOUNTED FIRE ALARM HORN c/w STROBE
☐	WALL MOUNTED FIRE ALARM HORN c/w STROBE
☐	CEILING FIRE ALARM STROBE
☐	WALL MOUNTED FIRE ALARM STROBE
☐	CEILING MOUNTED FIRE ALARM SPEAKER
☐	WALL MOUNTED FIRE ALARM SPEAKER
☐	CEILING MOUNTED FIRE ALARM SPEAKER c/w STROBE
☐	WALL MOUNTED FIRE ALARM SPEAKER c/w STROBE
☐	FIRE ALARM PIEZO SOUNDER
☐	FIRE ALARM PIEZO SOUNDER c/w STROBE
☐	FIRE ALARM ELECTRONIC HORN
☐	FIRE ALARM ELECTRONIC HORN c/w STROBE
☐	CARBON MONOXIDE ALARM
☐	FIRE ALARM HEAT DETECTOR (RATE OF RISE UNLESS OTHERWISE INDICATED)
☐	FIRE ALARM SMOKE DETECTOR
☐	FIRE ALARM SMOKE DETECTOR, DUCT MOUNTED
☐	SMOKE ALARM
☐	FIRE ALARM ANNUNCIATOR PANEL
☐	FIRE ALARM CONTROL PANEL
☐	CENTRAL ALARM & CONTROL FACILITY
☐	EMERGENCY TELEPHONE
☐	FIRE ALARM MAGNETIC DOOR HOLD OPEN DEVICE
☐	FIRE ALARM CONNECTION TO PRESSURE SWITCH
☐	FIRE ALARM CONNECTION TO FLOW SWITCH
☐	FIRE ALARM CONNECTION TO TAMPER SWITCH
☐	FIRE ALARM CONNECTION TO LEVEL SWITCH
☐	END OF LINE RESISTOR
☐	FIRE ALARM CONTROL MODULE
☐	FIRE ALARM MONITOR MODULE
☐	FIRE ALARM FAULT ISOLATION MODULE
☐	FIRE ALARM RELAY
☐	CEILING MOUNTED SPEAKER
☐	WALL MOUNTED SPEAKER
☐	CEILING MOUNTED HORN SPEAKER
☐	WALL MOUNTED HORN SPEAKER
☐	WALL MOUNTED EXIT SIGN
☐	WALL MOUNTED EXIT SIGN WITH DIRECTIONAL ARROWS DOUBLE SIDED
RE	REMOVE EXISTING DEVICE
WP	WEATHERPROOF
EP	EXPLOSION PROOF

### DRAWING LIST

DWG. NO.	DESCRIPTION
G000	KEY PLAN AND DRAWING LIST
E100	EXISTING & NEW FIRE ALARM PLAN POLLUTION EQUIPMENT, STORES AND WORKSHOPS BUILDING
E101	EXISTING FIRE ALARM - BUOY MAINTENANCE
E102	NEW FIRE ALARM - BUOY MAINTENANCE BUILDING
E103	NEW P/A SYSTEM POLLUTION CONTROL, STORES AND BUOY MAINTENANCE BUILDING
E104	NEW P/A SYSTEM ADMIN BUILDING, HELICOPTER HANGAR AND WORKSHOPS BUILDING
E500	FIRE ALARM DETAILS
M001	SITE PLAN - MECHANICAL
M101	MECHANICAL AUDIT LOCATIONS
M102	MECHANICAL AUDIT PHOTOS & DETAILS

Revision/Revision	Description/Description	Date/Date
1	ISSUED FOR TENDER	2017/01/27

DEPARTMENT OF FISHERIES AND OCEANS CANADA  
9860 WEST SAANICH ROAD  
SIDNEY B.C.

Project title/Titre du projet  
VICTORIA COAST GUARD BASE  
25 HURON ST. VICTORIA, B.C.

LIFE SAFETY REFURBISHMENTS

Consultant Signature Only

Designed by/Concept par  
AD  
Drawn by/Dessiné par  
AG  
DFO Project Manager/Administrateur de Projets  
RANDY BURGIN  
Regional Manager, Architectural and Engineering Services  
Gestionnaire régionale, Services d'architectural et de génie, TPSGC

Drawing title/Titre du dessin

KEY PLAN AND DRAWING LIST

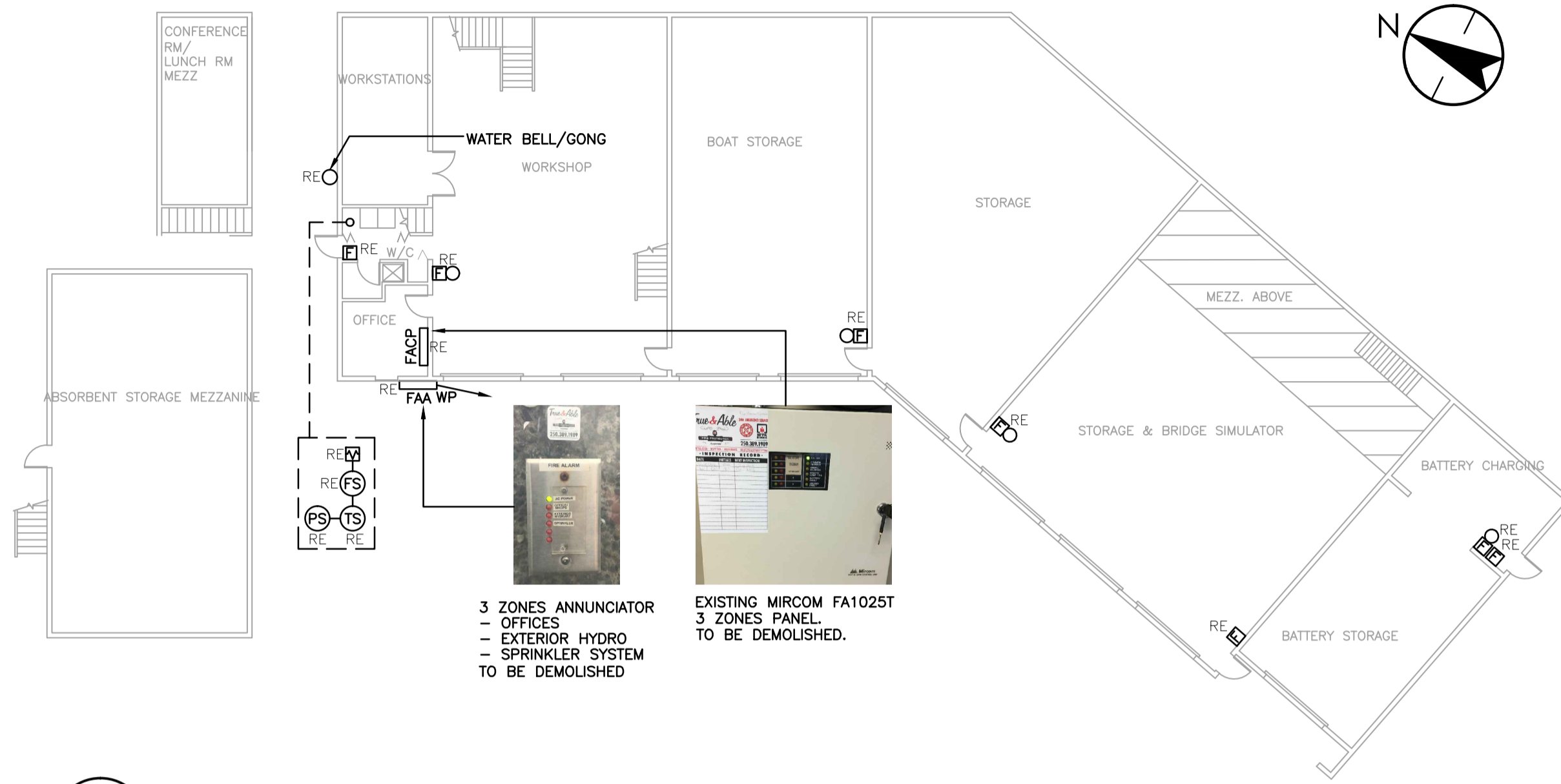




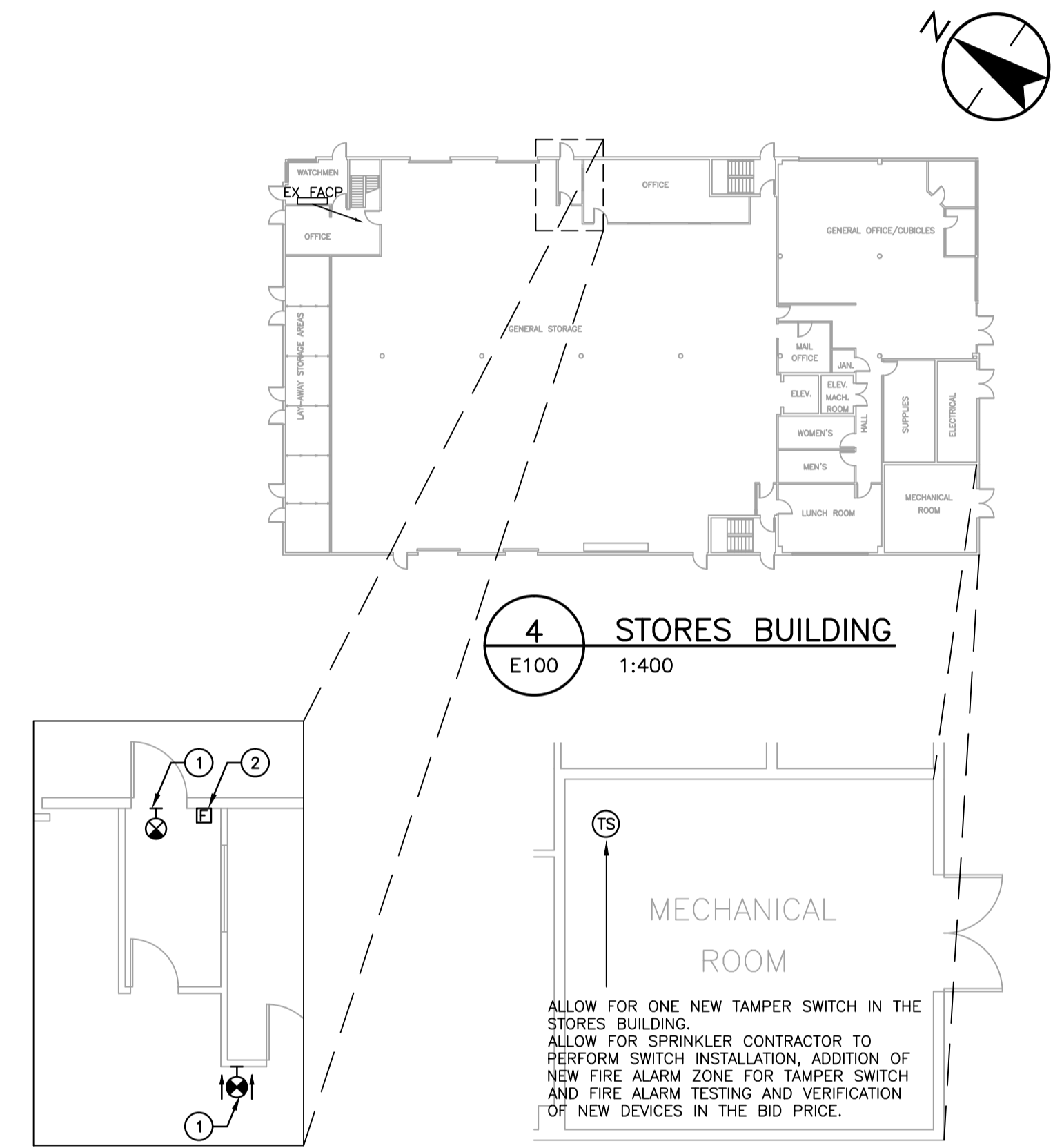
Stantec Consulting Ltd. www.stantec.com STANTEC PROJECT NO: 115615358 - PHASE 2

DRAWING NOTES	
1.	CONTRACTOR TO INSTALL THE NEW SYSTEM AS SHOWN ON THE DRAWINGS. BEFORE DE-COMMISSIONING THE EXISTING SYSTEM, WHERE THERE IS AN OVERLAP BETWEEN THE INSTALLATION AND THE DE-COMMISSIONING, PROVIDE FIRE WATCH. RETAIN SERVICE OF A COMMISSIONAIRE. THE BUILDING SHALL BE PROTECTED AT ALL TIMES.
2.	ALL WIRING MUST BE INSTALLED INSIDE EMT CONDUITS (MINIMUM 21mm). SURFACE MOUNT IS ACCEPTABLE IN THE WORKSHOPS, STORAGE ROOMS AND SERVICE ROOMS. COLOR CODE 'RED' ALL CONDUITS AND BOXES.
3.	DEMOLISH THE EXISTING F.A. SYSTEM. UPON COMPLETION AND VERIFICATION OF THE NEW SYSTEM REMOVE ALL PANELS, DEVICES, WIRES & CONDUITS AND DISPOSE. PATCH AND REPAIR TO MATCH EXISTING SURFACES & FINISHES, INCLUDING PAINT.
4.	CONTRACTOR SHALL PROVIDE 2 COPIES OF EACH F.A.P. SPECIFIC SOFTWARE ALONG WITH O&M MANUALS. THE OWNER SHALL HAVE FULL ACCESS TO THE PANEL'S SOFTWARE c/w SOFTWARE COPY PROVIDED ON A DISC.

KEY NOTES	
1.	CONTRACTOR TO SUPPLY AND INSTALL NEW "GREEN RUNNING MAN" PICTOGRAM EXIT SIGN. EXIT SIGN TO BE SELF-POWERED WITH A 90 MINUTE RUN TIME. FEED EXIT SIGN FROM LOCAL EXIT SIGN CIRCUIT. MINIMUM #12AWG Cu IN 3/4" EMT CONDUIT. EXIT SIGN SHALL MEET THE REQUIREMENTS OF CSA 22.2 No.141 STANDARD.
2.	CONTRACTOR TO INCLUDE COST OF VERIFICATION OF THE NEW FIRE ALARM DEVICE IN THE BID PRICE. EXISTING SYSTEM IS SIEMENS 250 ADDRESSABLE PANEL LOCATED IN THE COMMISSIONAIRE'S OFFICE.

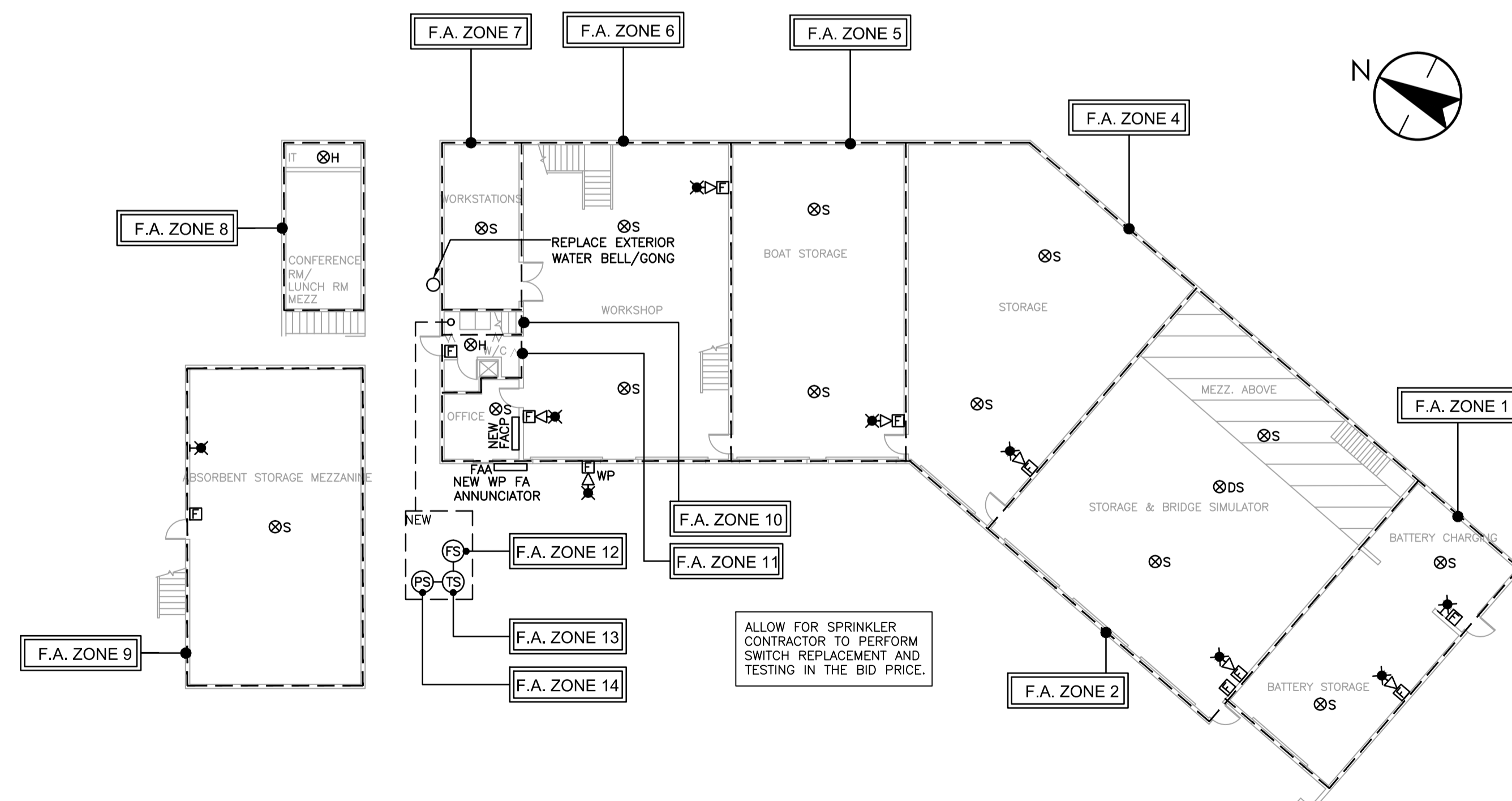


1 POLLUTION CONTROL BUILDING – EXISTING FIRE ALARM PLAN (TO BE DEMOLISHED) E100 1:200

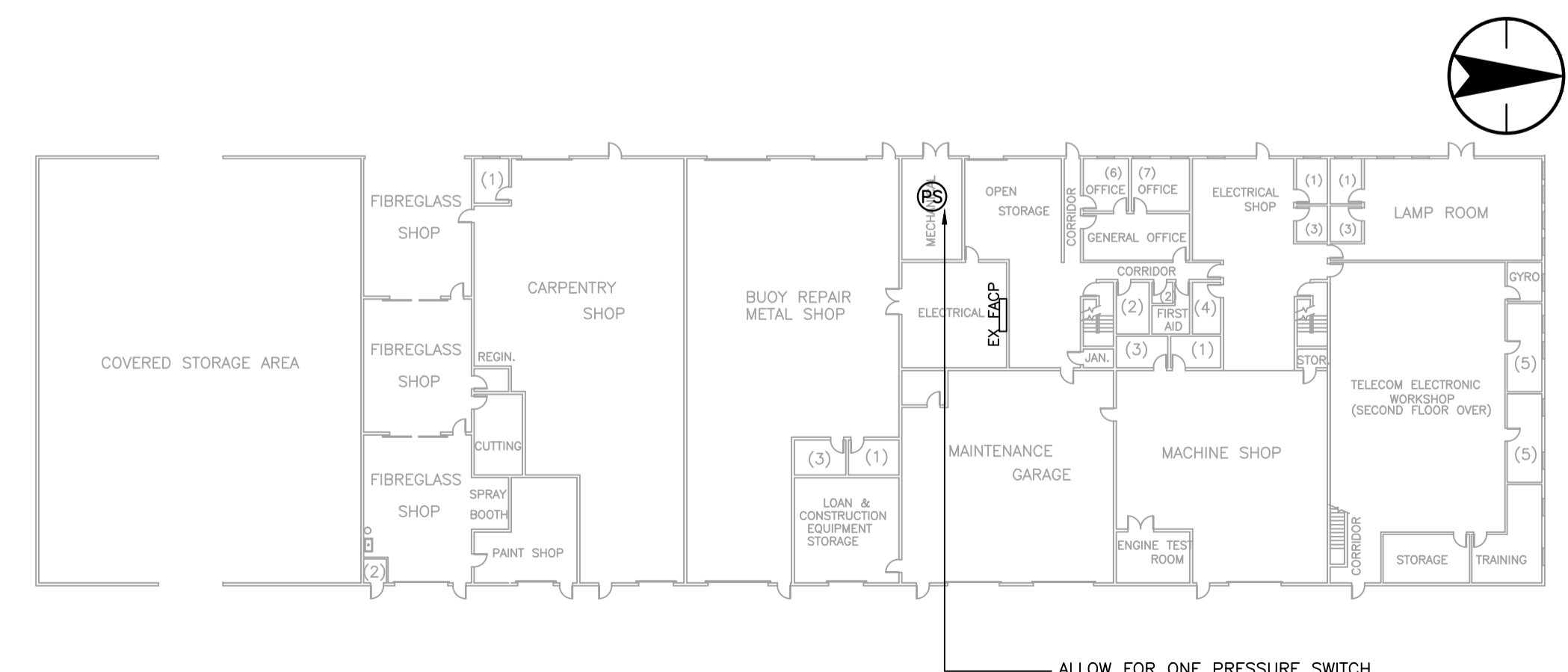


4 STORES BUILDING E100 1:400

5 STORES BUILDING AREA OF WORK E100 1:100



2 POLLUTION CONTROL BUILDING – NEW FIRE ALARM PLAN E100 1:200



3 WORKSHOPS BUILDING E100 1:400



Revision/Revision	Description/Description	Date/Date
1	ISSUED FOR TENDER	2017/01/27

DEPARTMENT OF FISHERIES AND OCEANS CANADA

9860 WEST SAANICH ROAD SIDNEY B.C.

Project title/Titre du projet VICTORIA COAST GUARD BASE 25 HURON ST. VICTORIA, B.C.

LIFE SAFETY REFRUBISHMENTS

Consultant Signature Only

Designed by/Concept par AD

Drawn by/Dessine par AG

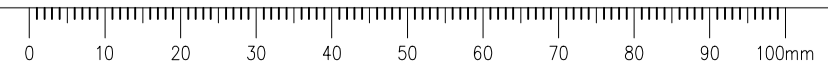
DFO Project Manager/Administrateur de Projets RANDY BURGIN

Regional Manager, Architectural and Engineering Services Gestionnaire régionale, Services d'architecture et de génie, TPSGC

Drawing title/Titre du dessin

EXISTING & NEW FIRE ALARM PLAN POLLUTION EQUIPMENT, STORES AND WORKSHOPS BUILDING

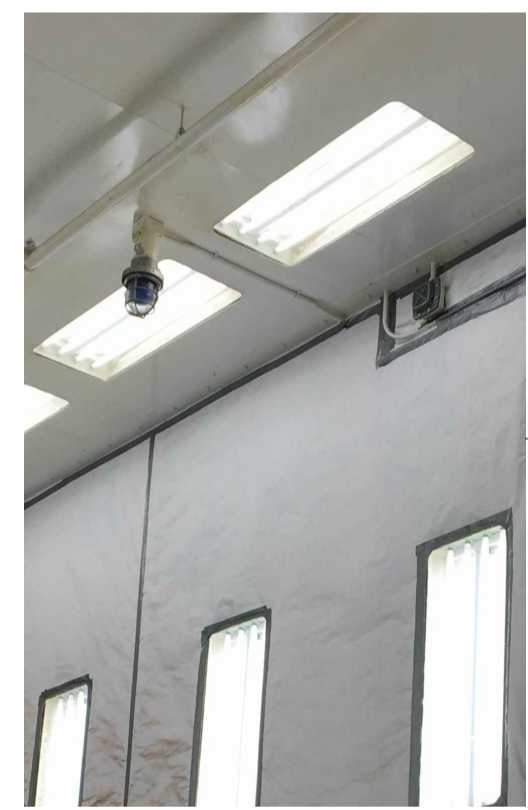
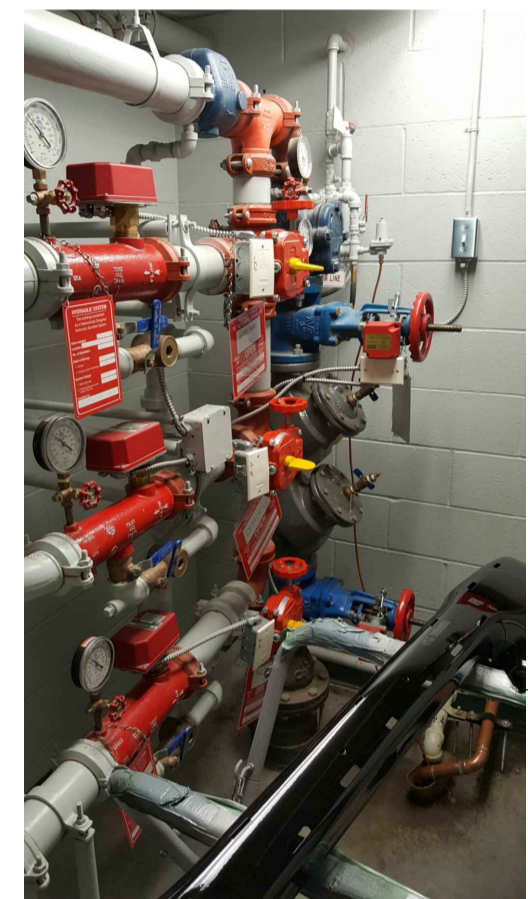
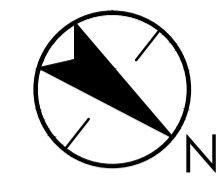
Project No./No. du projet F1700-164451	Sheet/Feuille E100	Revision no./Lo Révision no. 1
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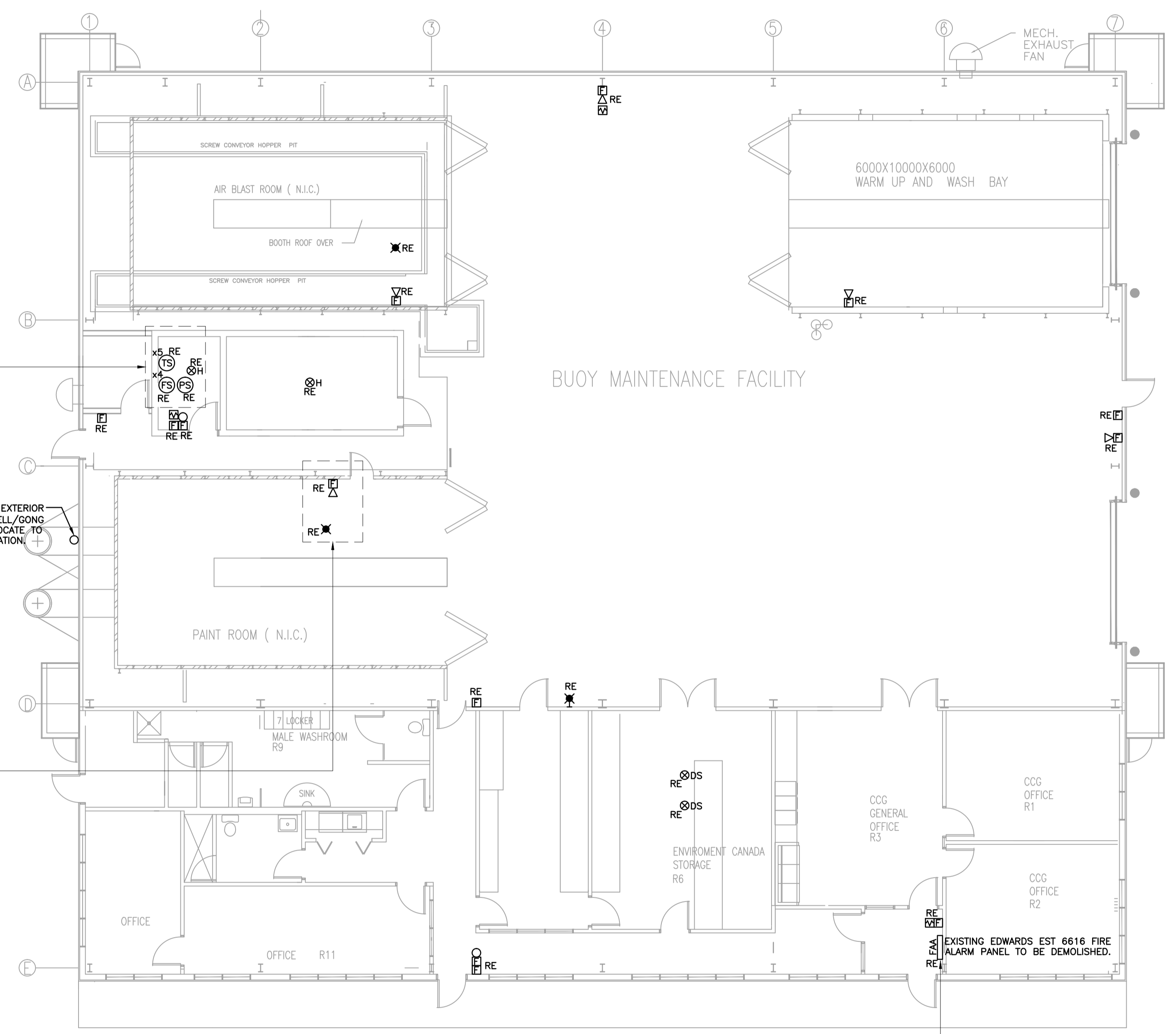


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STANTEC PROJECT NO: 115615358 - PHASE 2

DRAWING NOTES	
1.	DEMOLISH THE EXISTING F.A. SYSTEM. UPON COMPLETION AND VERIFICATION OF THE NEW SYSTEM PULL ALL WIRES & CONDUITS AND DISPOSE. PATCH AND REPAIR TO MATCH EXISTING SURFACES & FINISHES, INCLUDING PAINT.
2.	CONTRACTOR TO HAND OVER ALL REMOVED FIRE ALARM DEVICES TO THE OWNER, WHERE DIRECTED. ALLOW FOR DISPOSAL OF ANY DEVICES/PANELS WHERE OWNER DOES NOT WANT TO RETAIN. CREATE INVENTORY FOR THE OWNERS REVIEW PRIOR TO THE DISPOSAL OF THE DEVICES.



REPLACE EXTERIOR WATER BELL/GONG AND RELOCATE TO NEW LOCATION.



**1** EXISTING FIRE ALARM PLAN (TO BE DEMOLISHED)  
E101 1:200



Revision/Revision	Description/Description	Date/Date
1	ISSUED FOR TENDER	2017/01/27

Client/client: DEPARTMENT OF FISHERIES AND OCEANS CANADA

9860 WEST SAANICH ROAD  
SIDNEY B.C.

Project title/Titre du projet: VICTORIA COAST GUARD BASE  
25 HURON ST. VICTORIA, B.C.

**LIFE SAFETY REFURBISHMENTS**

Consultant Signature Only

Designed by/Concept par: AD

Drawn by/Dessine par: AG

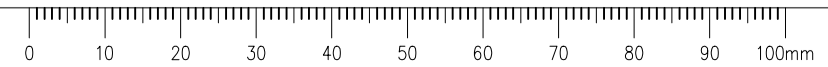
DFO Project Manager/Administrateur de Projets: RANDY BURGIN

Regional Manager, Architectural and Engineering Services / Gestionnaire régionale, Services d'architecture et de génie, TPSGC

Drawing title/Titre du dessin:

**EXISTING FIRE ALARM BUOY MAINTENANCE BUILDING**

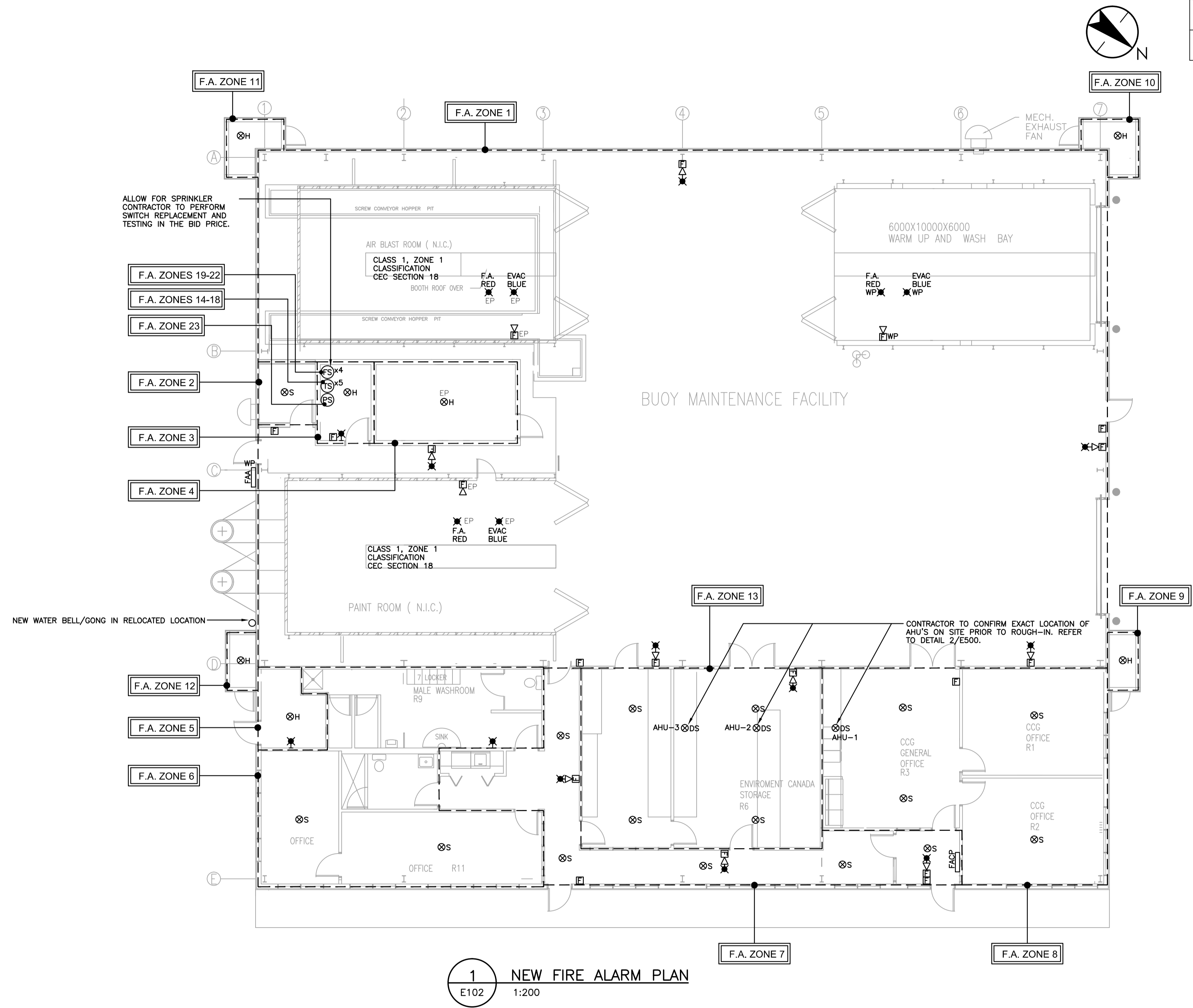
Project No./No. du projet	Sheet/Feuille	Revision no./La Révision no.
F1700-164451	E101	1







DRAWING NOTES	
1.	CONTRACTOR TO INSTALL THE NEW SYSTEM AS SHOWN ON THE DRAWINGS. BEFORE DE-COMMISSIONING THE EXISTING SYSTEM, WHERE THERE IS AN OVERLAP BETWEEN THE INSTALLATION AND THE DE-COMMISSIONING, PROVIDE FIRE WATCH. RETAIN SERVICE OF A COMMISSIONAIRE. THE BUILDING SHALL BE PROTECTED AT ALL TIMES.
2.	ALL WIRING MUST BE INSTALLED INSIDE EMT CONDUITS (MINIMUM 21mm), SURFACE MOUNT IS ACCEPTABLE IN THE WORKSHOPS, STORAGE ROOMS AND SERVICE ROOMS. COLOR CODE 'RED' ALL CONDUITS AND BOXES.
3.	CONTRACTOR SHALL PROVIDE 2 COPIES OF EACH F.A.P. SPECIFIC SOFTWARE ALONG WITH O&M MANUALS. THE OWNER SHALL HAVE FULL ACCESS TO THE PANEL'S SOFTWARE c/w SOFTWARE COPY PROVIDED ON A DISC.



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**DEPARTMENT OF FISHERIES AND OCEANS CANADA**

9860 WEST SAANICH ROAD  
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**VICTORIA COAST GUARD BASE  
25 HURON ST. VICTORIA, B.C.**

**LIFE SAFETY REFURBISHMENTS**

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**AG**

DFO Project Manager/Administrateur de Projets  
**RANDY BURGIN**

Regional Manager, Architectural and Engineering Services  
Gestionnaire régionale, Services d'architecture et de génie, TPSGC

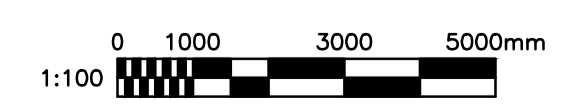
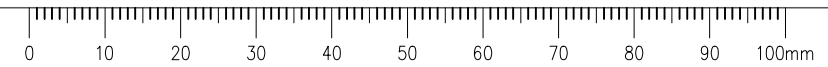
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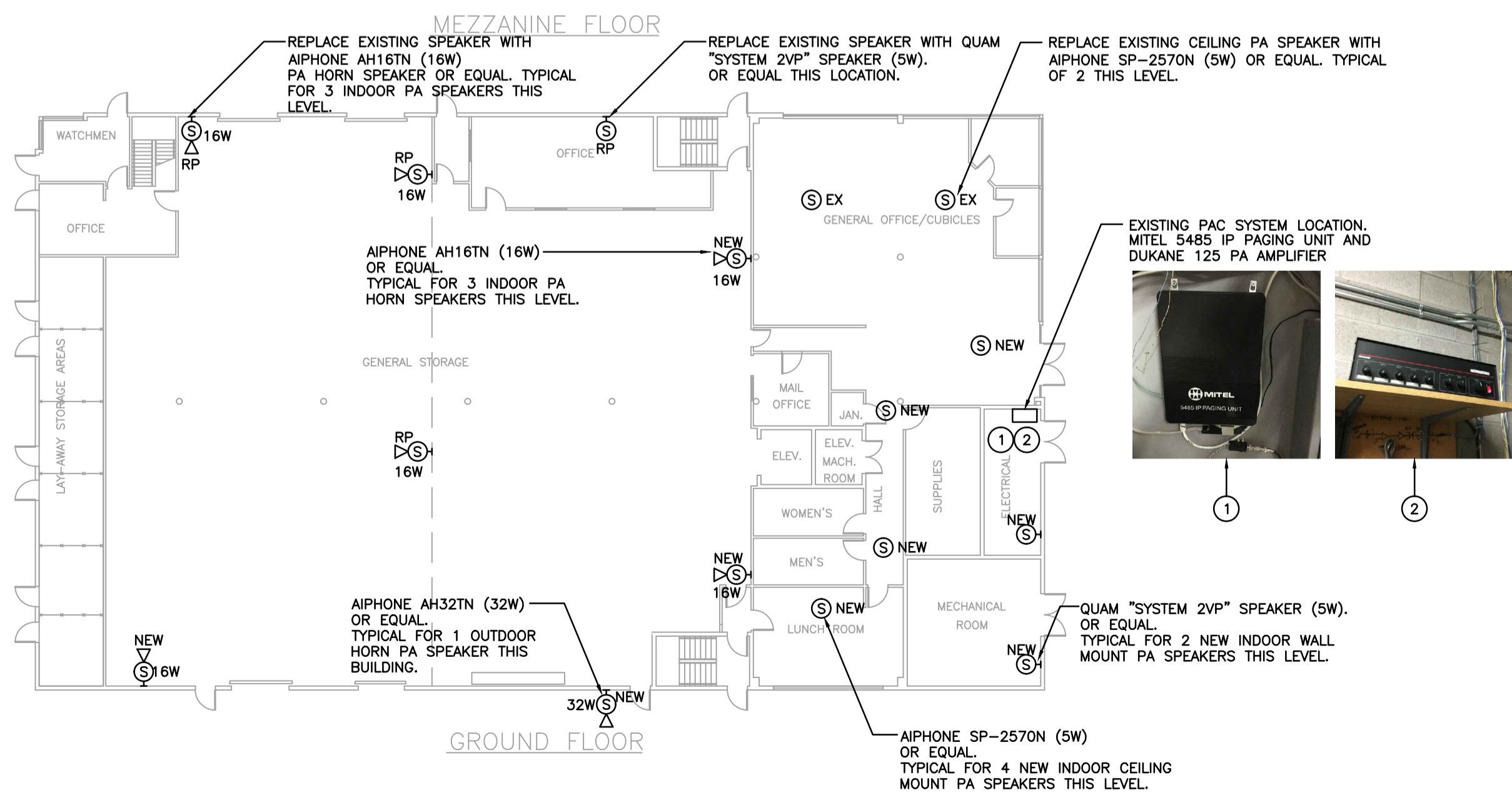
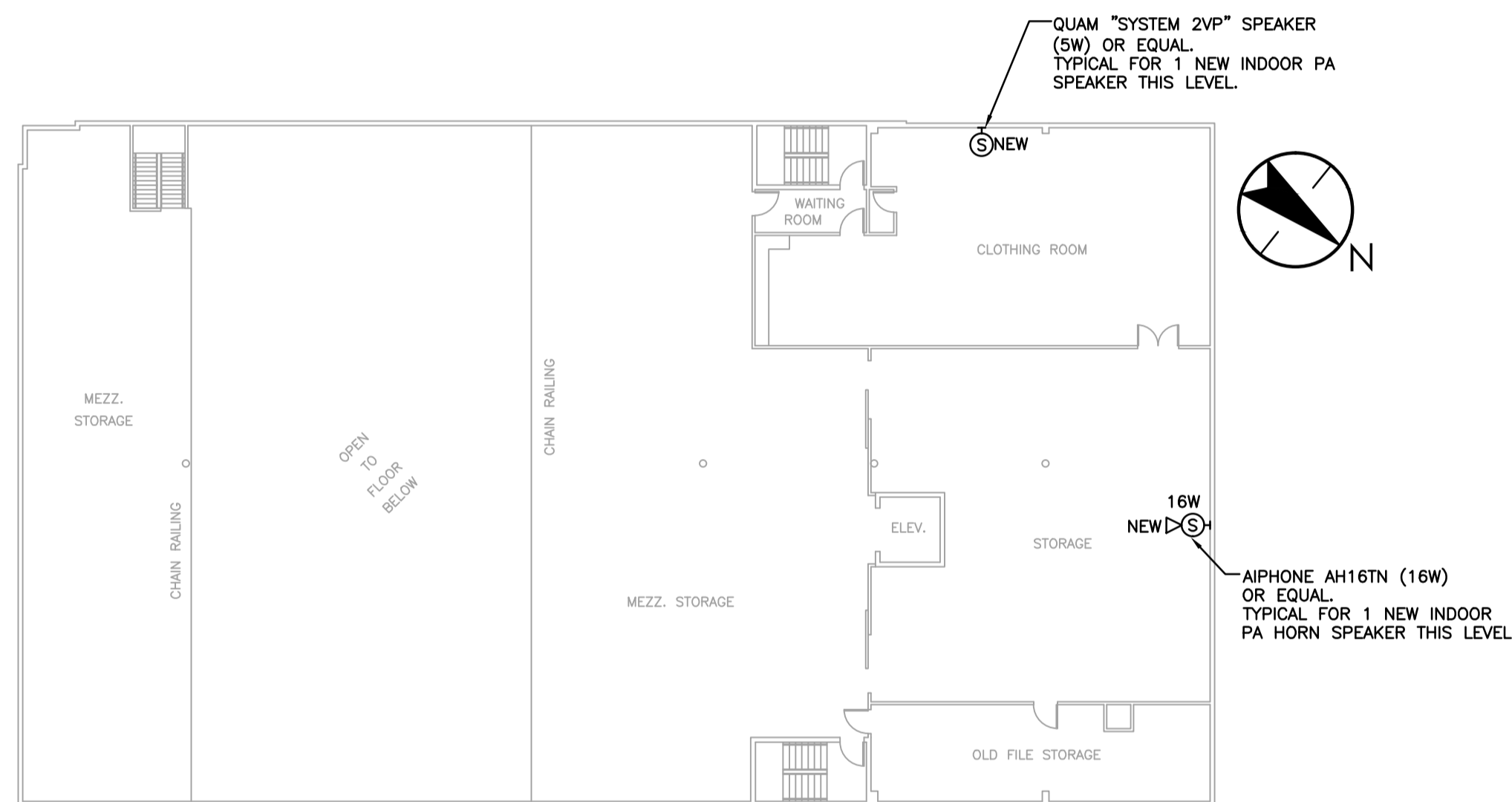
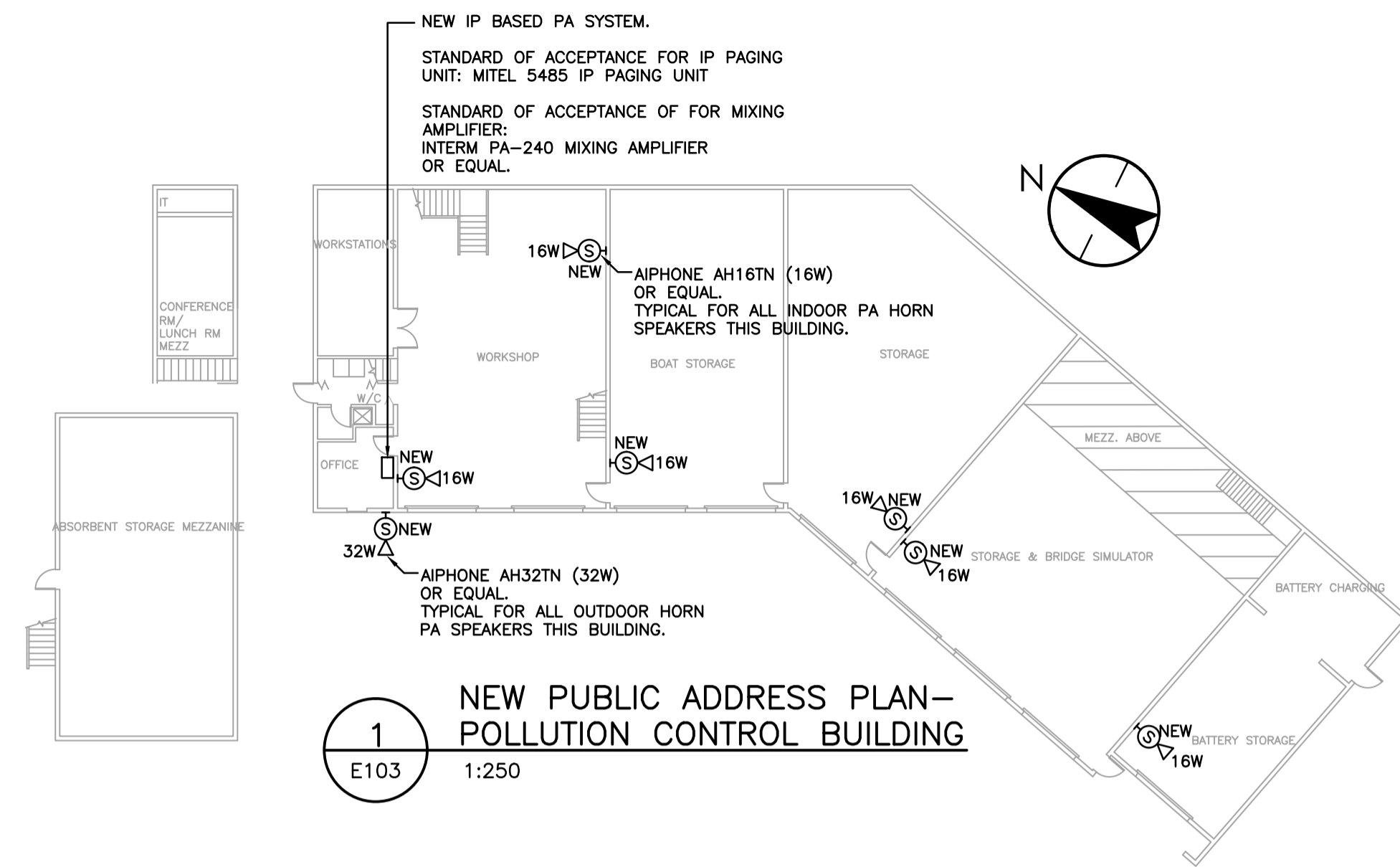
**NEW FIRE ALARM  
BUOY MAINTENANCE BUILDING**

Project No./No. du projet  
**F1700-164451**

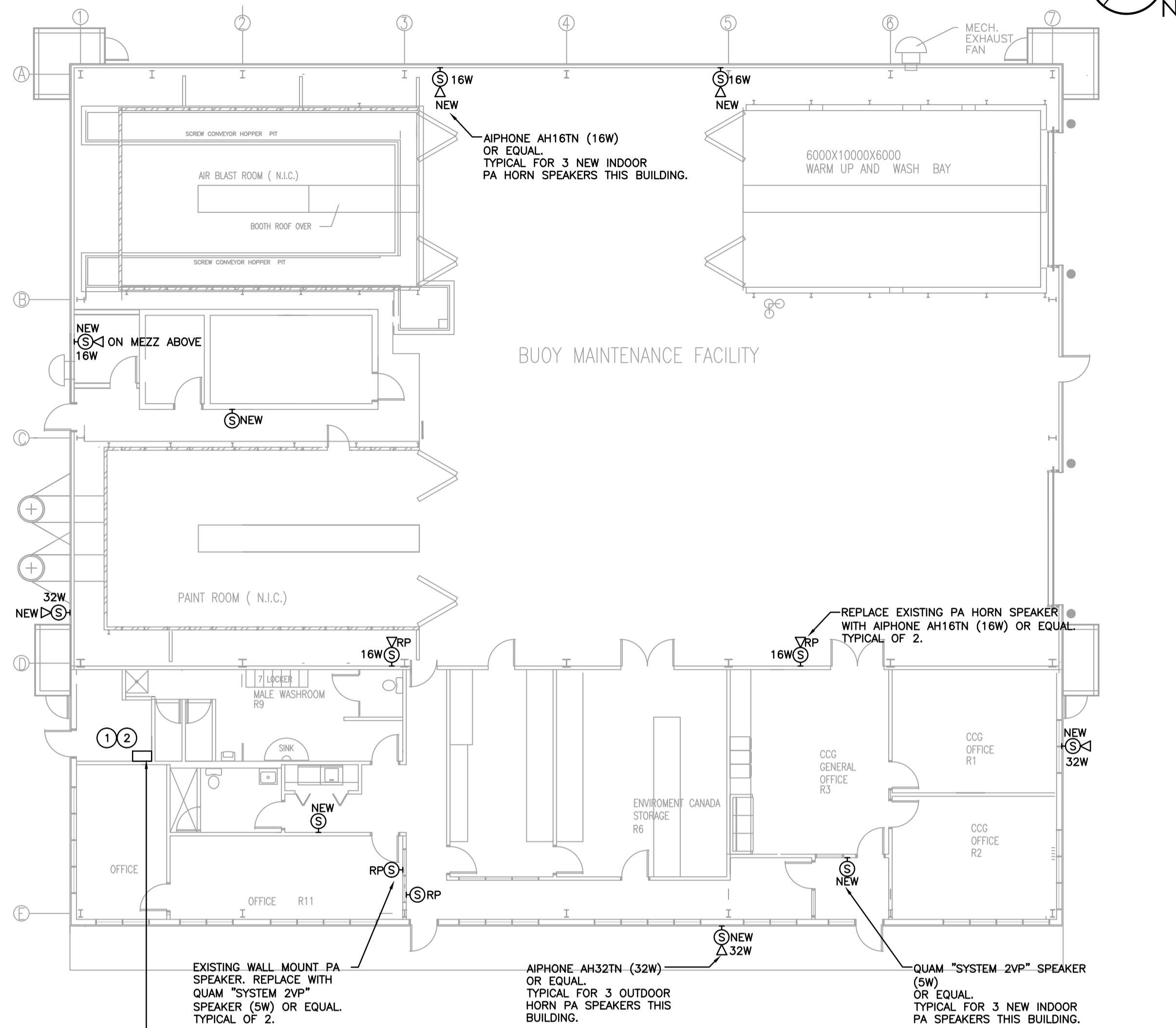
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Revision no./La Révision no.  
**1**

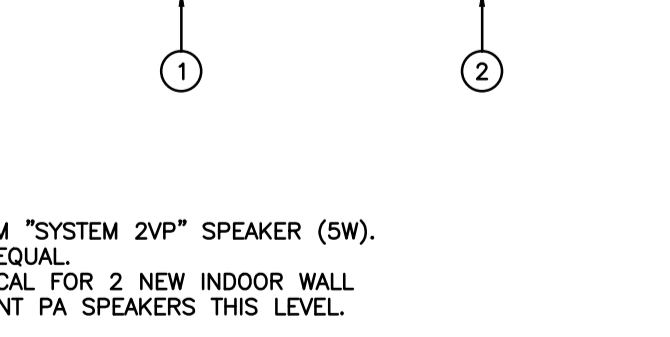
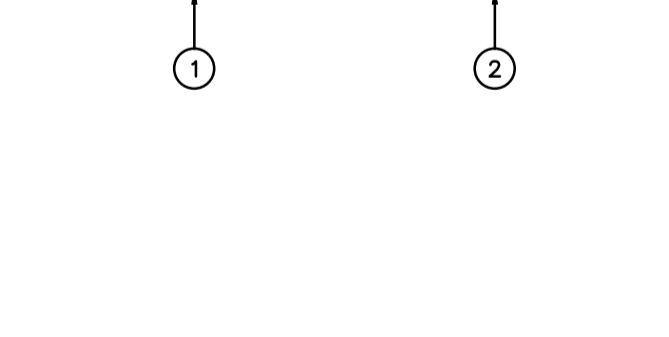




**NEW PUBLIC ADDRESS PLAN - STORES/WAREHOUSE BUILDING**  
E103 1:250



**NEW PUBLIC ADDRESS PLAN - BUOY MAINTENANCE BUILDING**  
E103 1:250



- GENERAL NOTES:**
- EACH BUILDING SHALL BE ON A SEPARATE PUBLIC ADDRESS ZONE.
  - SURFACE MOUNT CONDUIT IS ACCEPTABLE IN THE STORES, WORKSHOPS, SERVICE ROOM'S AND MEZZANINES. ALL NEW WIRING SHALL BE INSTALLED IN EMT CONDUIT. PAINT THE CONDUITS TO MATCH EXISTING WALL COLOR AND COLOR CODE AS PER SPECS.
  - WORKSHOPS BUILDING & POLLUTION CONTROL BUILDING ARE NOT EQUIPPED WITH A PA SYSTEM. CONTRACTOR TO ALLOW FOR NEW FULLY OPERATIONAL SYSTEM TO BE INSTALLED INSIDE THESE BUILDINGS. ALLOW FOR NEW DATA CONNECTION FROM THE EXISTING NETWORK SWITCH TO THE IP UNIT FOR A COMPLETE SYSTEM.
  - STANDARD OF ACCEPTANCE:  
IP UNIT: MITEL 5485  
AMPLIFIER: INTERM PA-240  
16W AND 32W HORN SPEAKER: AIPHONE AH16TN AND AIPHONE AH32TN  
CEILING MOUNTED SPEAKER: AIPHONE SP-2570N  
WALL MOUNTED SPEAKER: QUAM SYSTEM 2VP
  - THE PAGING SYSTEM LAYOUT IS DIAGRAMMATIC ONLY. CONTRACTOR TO SUBMIT DETAILED LAYOUT AND RISER AS PART OF THE SHOP DRAWING SUBMITTALS FOR APPROVAL PRIOR TO ORDERING THE MATERIALS.
  - MOUNT EXTERIOR HORN SPEAKER AT +12' A.F.F.
  - MOUNT INTERIOR HORN SPEAKERS AT HEIGHTS TO MATCH EXISTING WALL MOUNTED SPEAKERS. WHERE CEILING IS ABOVE 16' HIGH, INSTALL AT +12' AFF ON THE INTERIOR WALLS. FOR BUILDINGS WITH CEILING HEIGHT BETWEEN 8' TO 10', MOUNT 6" BELOW FINISHED CEILING.

- KEY NOTES:**
- EXISTING MITEL IP PAGING UNITS TO BE MAINTAINED, ALLOW FOR TROUBLESHOOTING & REPROGRAMMING WHERE NECESSARY FOR A COMPLETE AND OPERATIONAL SYSTEM.
  - REPLACE EXISTING PA AMPLIFIERS WITH INTERM PA-240, OR EQUAL. TYPICAL FOR ALL EXISTING PA SYSTEMS IN THE BUILDINGS. ALLOW FOR AMP EXPANSION WHERE SYSTEM INPUT EXCEEDS RATED SYSTEM OUTPUT. ADD POWER & CAT 6 DATA DROP BESIDE EACH PA AMPLIFIER LOCATION. SPECIFY APC 1000VA UPS BESIDE EACH UNIT FOR POWER BACKUP.



Revision/Revision	Description/Description	Date/Date
1	ISSUED FOR TENDER	2017/01/27

Client/client  
**DEPARTMENT OF FISHERIES AND OCEANS CANADA**  
9860 WEST SAANICH ROAD  
SIDNEY B.C.

Project title/Titre du projet  
**VICTORIA COAST GUARD BASE**  
25 HURON ST. VICTORIA, B.C.

**LIFE SAFETY REFURBISHMENTS**

Consultant Signature Only

Designed by/Concept par  
**AD**

Drawn by/Dessine par  
**AG**

DFO Project Manager/Administrateur de Projets  
**RANDY BURGIN**

Regional Manager, Architectural and Engineering Services  
Gestionnaire régionale, Services d'architecture et de génie, TPSGC

Drawing title/Titre du dessin

**NEW P/A SYSTEM POLLUTION CONTROL, STORES AND BUOY MAINTENANCE BUILDING**

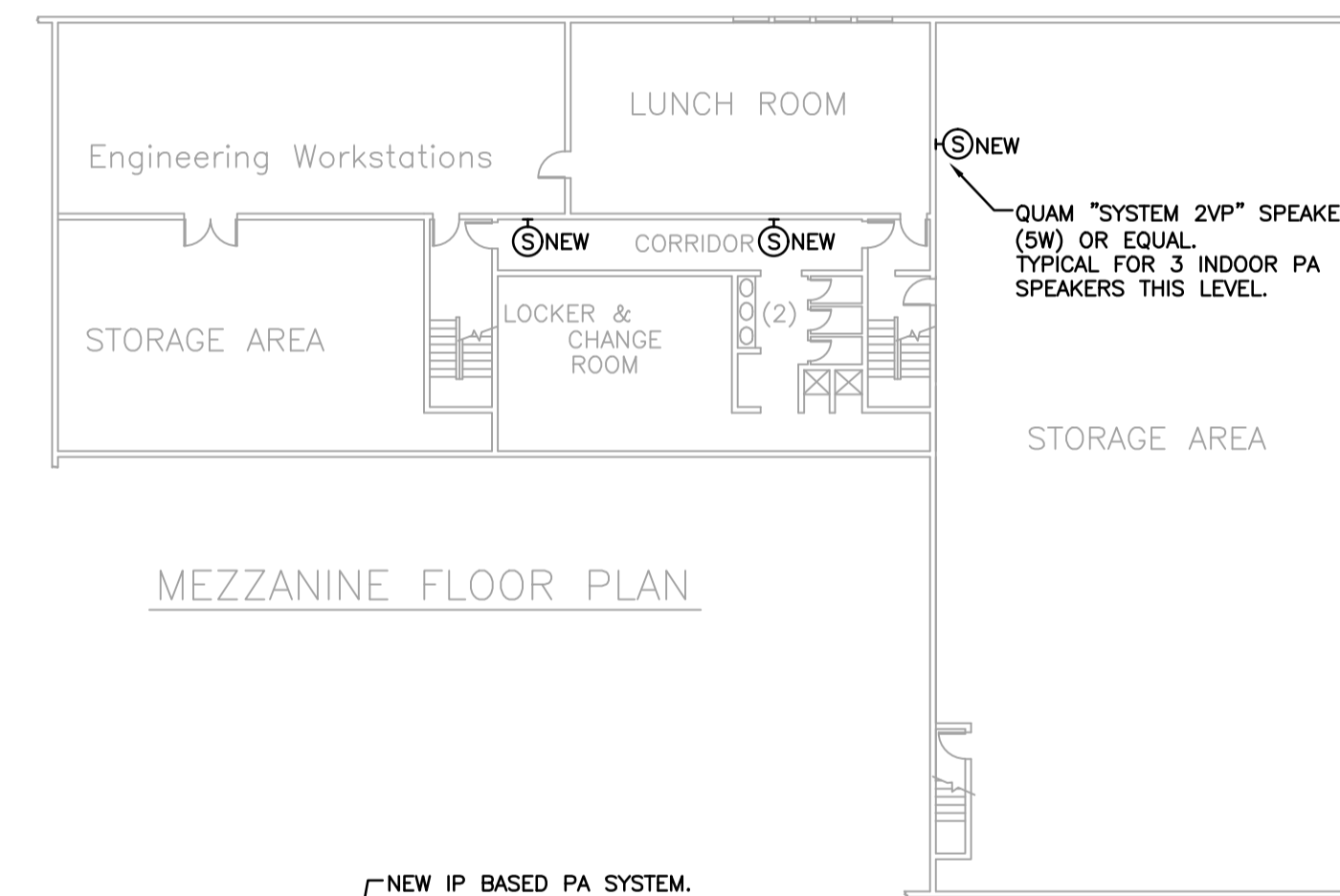
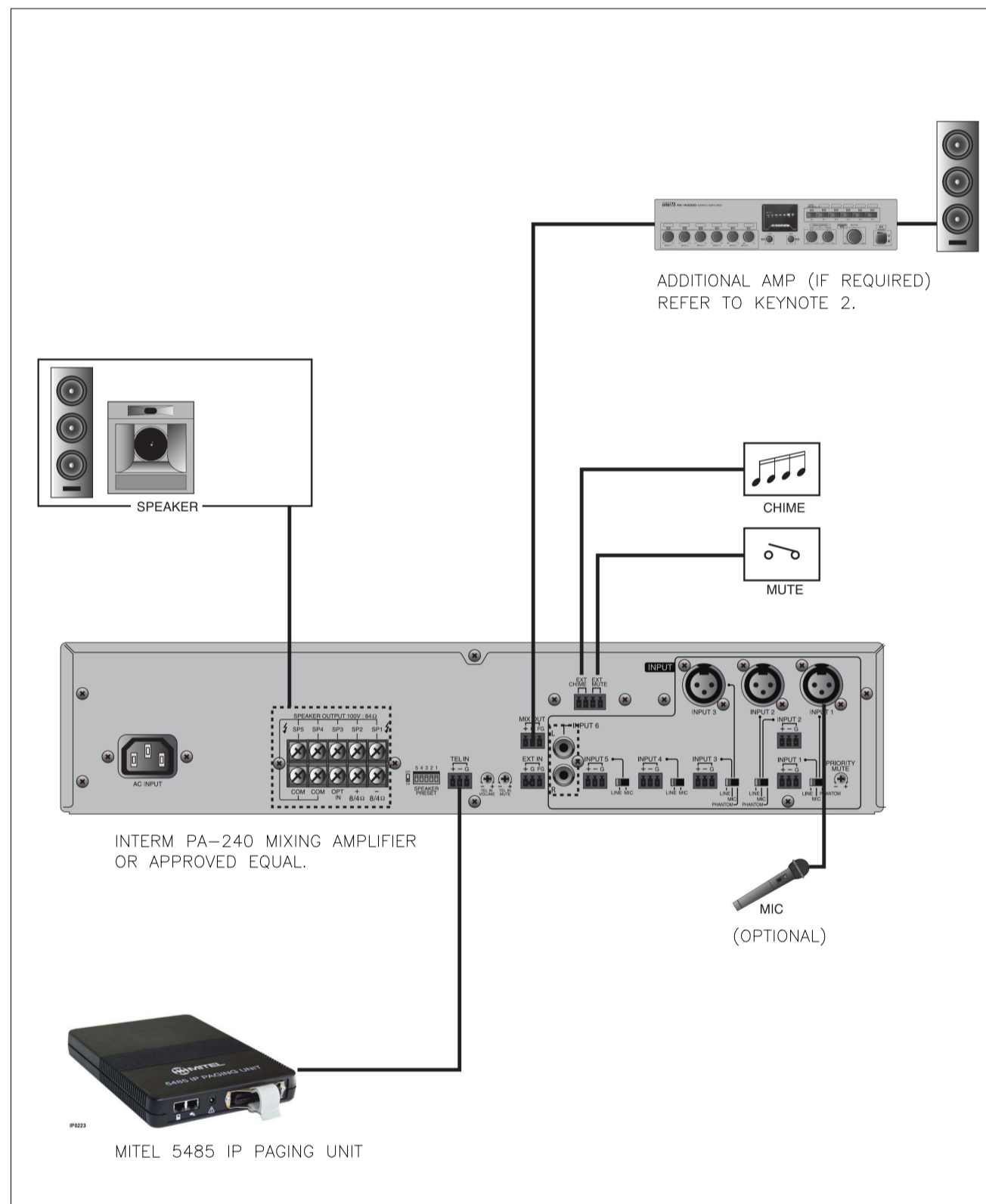
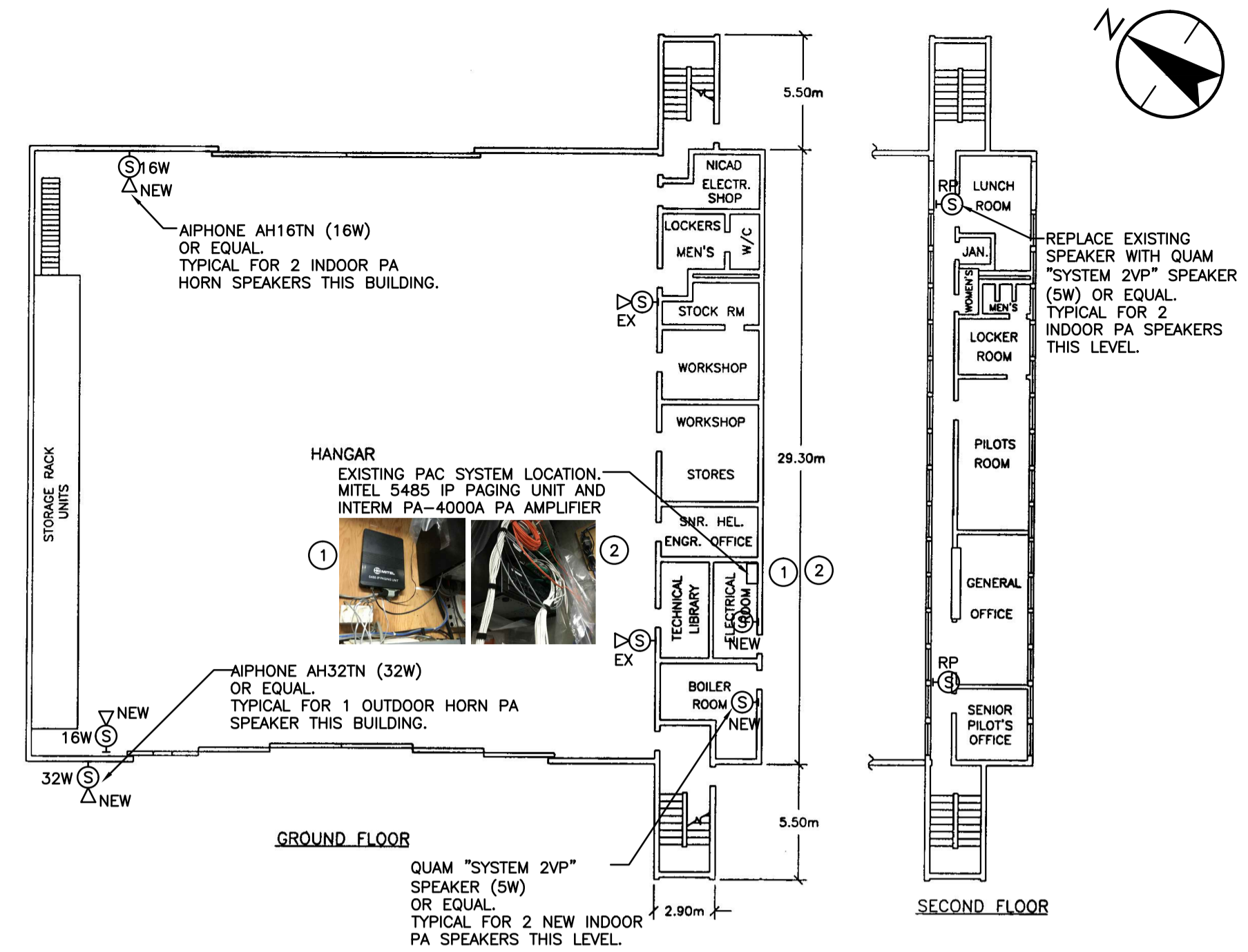
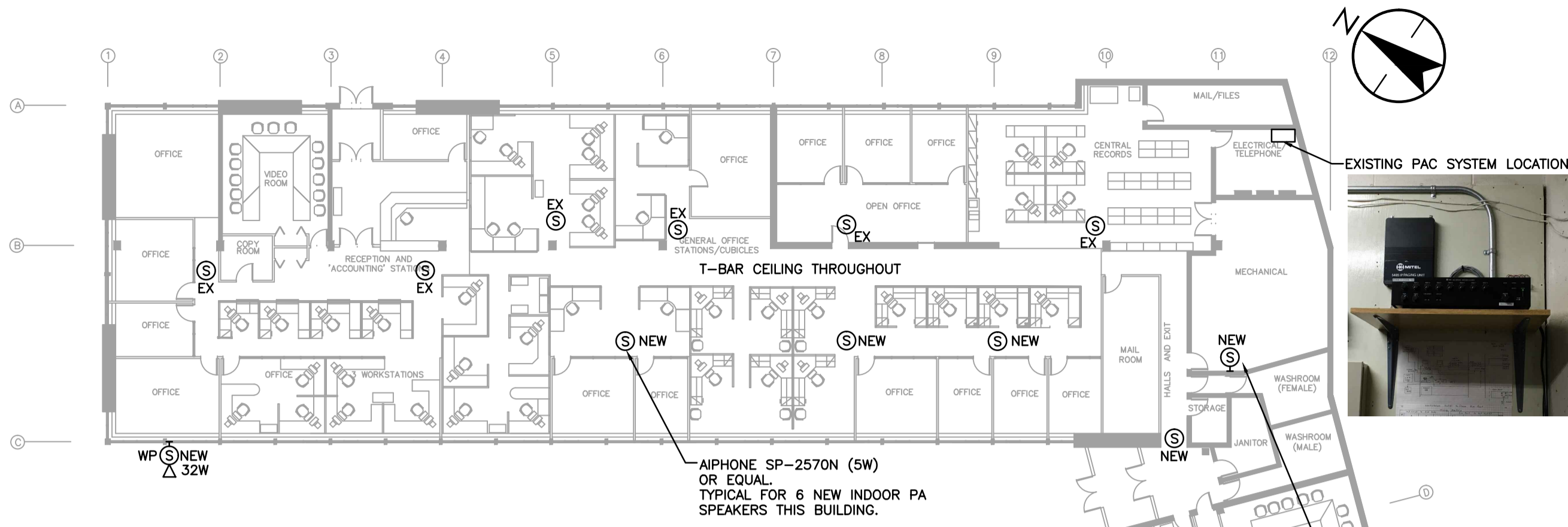
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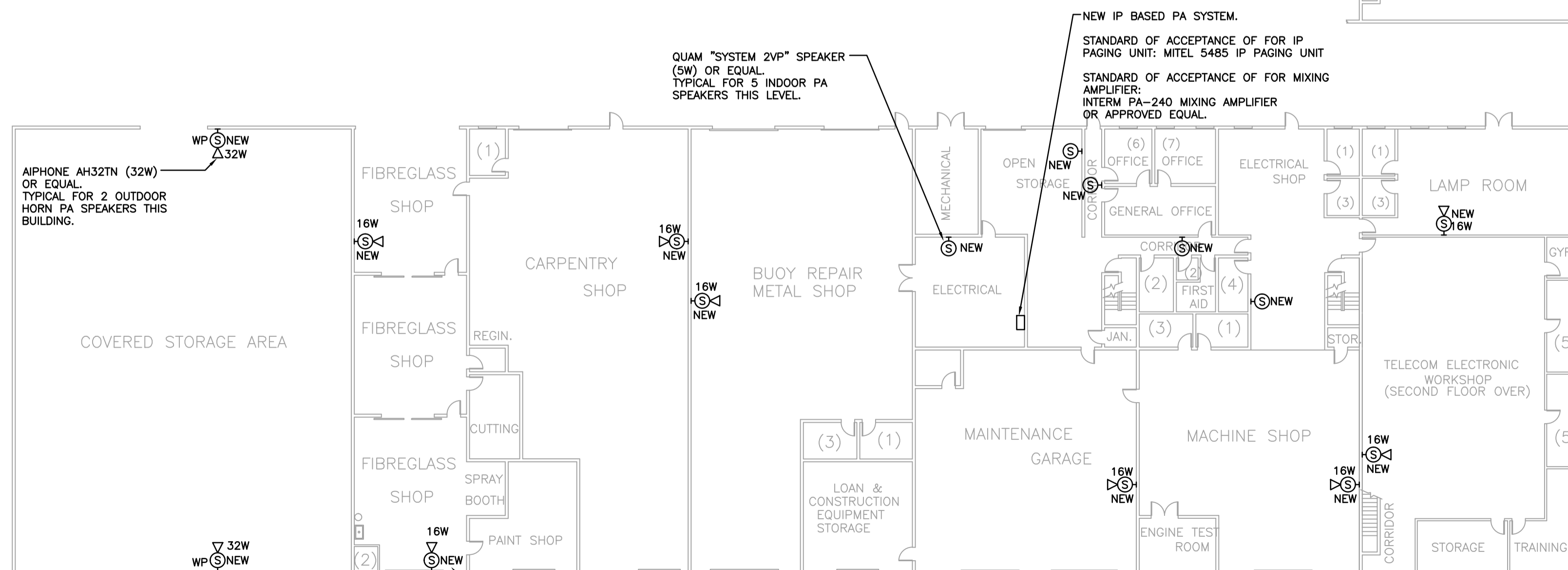


**GENERAL NOTES:**

- EACH BUILDING SHALL BE ON A SEPARATE PUBLIC ADDRESS ZONE.
- SURFACE MOUNT CONDUIT IS ACCEPTABLE IN THE STORES, WORKSHOPS, SERVICE ROOMS AND MEZZANINES. ALL NEW WIRING SHALL BE INSTALLED IN EMT CONDUIT. PAINT THE CONDUITS TO MATCH EXISTING WALL COLOR AND COLOR CODE AS PER SPECS.
- WORKSHOPS BUILDING & POLLUTION CONTROL BUILDING ARE NOT EQUIPPED WITH A PA SYSTEM. CONTRACTOR TO ALLOW FOR NEW FULLY OPERATIONAL SYSTEM TO BE INSTALLED INSIDE THESE BUILDINGS. ALLOW FOR NEW DATA CONNECTION FROM THE EXISTING NETWORK SWITCH TO THE IP UNIT FOR A COMPLETE SYSTEM.
- STANDARD OF ACCEPTANCE:  
IP UNIT: MITEL 5485  
AMPLIFIER: INTERM PA-240  
16W AND 32W HORN SPEAKER: AIPHONE AH16TN AND AIPHONE AH32TN  
CEILING MOUNTED SPEAKER: AIPHONE SP-2570N  
WALL MOUNTED SPEAKER: QUAM SYSTEM 2VP
- THE PAGING SYSTEM LAYOUT IS DIAGRAMMATIC ONLY. CONTRACTOR TO SUBMIT DETAILED LAYOUT AND RISER AS PART OF THE SHOP DRAWING SUBMITTALS FOR APPROVAL PRIOR TO ORDERING THE MATERIALS.
- MOUNT EXTERIOR HORN SPEAKER AT +12' A.F.F.
- MOUNT INTERIOR HORN SPEAKERS AT HEIGHTS TO MATCH EXISTING WALL MOUNTED SPEAKERS. WHERE CEILING IS ABOVE 16' HIGH, INSTALL AT +12' AFF ON THE INTERIOR WALLS. FOR BUILDINGS WITH CEILING HEIGHT BETWEEN 8' TO 10', MOUNT 6" BELOW FINISHED CEILING.

**KEY NOTES:**

- EXISTING MITEL IP PAGING UNITS TO BE MAINTAINED, ALLOW FOR TROUBLESHOOTING & REPROGRAMMING WHERE NECESSARY FOR A COMPLETE AND OPERATIONAL SYSTEM.
- REPLACE EXISTING PA AMPLIFIERS WITH INTERM PA-240, OR EQUAL TYPICAL FOR ALL EXISTING PA SYSTEMS IN THE BUILDINGS. ALLOW FOR AMP EXPANSION WHERE SYSTEM INPUT EXCEEDS RATED SYSTEM OUTPUT. ADD POWER & CAT 6 DATA DROP BESIDE EACH PA AMPLIFIER LOCATION. SPECIFY APC 1000VA UPS BESIDE EACH UNIT FOR POWER BACKUP.



Revision/Revision	Description/Description	Date/Date
1	ISSUED FOR TENDER	2017/01/27

DEPARTMENT OF FISHERIES AND OCEANS CANADA

9860 WEST SAANICH ROAD  
SIDNEY B.C.

Project title/Titre du projet  
VICTORIA COAST GUARD BASE  
25 HURON ST. VICTORIA, B.C.

LIFE SAFETY  
REFURBISHMENTS

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AG

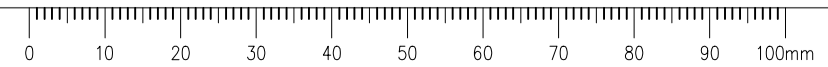
DFO Project Manager/Administrateur de Projets  
RANDY BURGIN

Regional Manager, Architectural and Engineering Services  
Gestionnaire régionale, Services d'architecture et de génie, TPSGC

Drawing title/Titre du dessin

NEW P/A SYSTEM  
ADMIN BUILDING, HELICOPTER  
HANGAR AND WORKSHOPS BUILDING

Project No./No. du projet	Sheet/Fauille	Revision no./La Révision no.
F1700-164451	E104	1



**FIRE ALARM NOTES:**

- EXISTING FIRE ALARM ARRANGEMENT TO BE CONFIRMED, FIRE ALARM RISER SHOWN AS EXAMPLE ONLY. NEW PANEL TO BE COMPATIBLE WITH EXISTING SYSTEM FOR MONITORING BY THE EXISTING SIEMENS FS-250 PANEL LOCATED IN THE GATEHOUSE (NEW PANEL TO REPORT ALARM, SUPERVISORY, TROUBLE).
- PROVIDE LABELING FOR ALL THE NEW EQUIPMENT, NEW LABELS TO READ MODULE #, ZONE #, DEVICE #. TYPICAL FOR ALL NEW DEVICES. CONTRACTOR TO COLOR CODE ALL CONDUITS AND JUNCTION BOXES AS DESCRIBED IN THE SPECIFICATIONS.
- USE WEATHERPROOF ENCLOSURES, HORN/SROBE AND PULL STATION FOR ALL DEVICES LOCATED OUTSIDE THE BUILDING.
- FIRE ALARM SYSTEM SHALL BE A FULLY ADDRESSABLE CLASS A, SINGLE STAGE SYSTEM. EVERY ZONE INDICATED ON FIRE ALARM SCHEDULE IS TO BE INSTALLED WITH ISOLATION MODULES SUCH THAT NOT MORE THAN ONE ZONE CAN BE DISABLED BY A SINGLE WIRING FAULT.
- CONTRACTOR TO SUPPLY ALL MONITORING MODULES FOR AUXILIARY TROUBLE CONTACTS AS REQUIRED.
- ALL FIRE ALARM WIRING MUST BE IN MINIMUM 21mm CONDUIT. BX, PVC AND ALUMINUM CONDUITS ARE NOT ACCEPTABLE. CONDUIT BONDING SHALL BE CONTINUOUS. AC90 FIRE ALARM CABLE IS ACCEPTABLE FOR THE DROPS TO DEVICES WHERE DISTANCE IS LESS THAN 3 METERS.
- ALL FIRE ALARM WIRING TO CONFORM TO THE CLASS A STANDARD. PROVIDE DEDICATED SURGE PROTECTION ON CIRCUIT WHERE REQUIRED AND RECOMMENDED BY THE MANUFACTURER.
- CONNECT ALARM, TROUBLE AND SUPERVISORY CONTACTS TO SPARE INITIATING ZONE IN EXISTING GATEHOUSE PANEL. USE EXISTING CONDUITS/WIRING WHERE POSSIBLE. PROVIDE NEW AUTODIALER WHERE REQUIRED.
- ALL ANNUNCIATION CIRCUITS SHALL BE MINIMUM OF #12 AWG COPPER CONDUCTORS INSIDE EMT CONDUITS.
- CONTRACTOR SHALL PROVIDE ALL CONTROL AND MONITORING MODULES FOR AHU'S SHUTDOWN AND DOOR ACCESS INTERFACE. ALLOW FOR ALL SUBTRADES TO PERFORM A FULLY FUNCTIONAL AHU'S SHUTDOWN AND DOOR RELEASE WHEN FIRE ALARM SYSTEM IS ACTIVATED.

BUOY BUILDING SIGNAL ZONES		
ZONE	DESCRIPTION	ALARM TYPE
SZ1	BUILDING NORTH	AUDIO/VISUAL
SZ2	BUILDING SOUTH	AUDIO/VISUAL

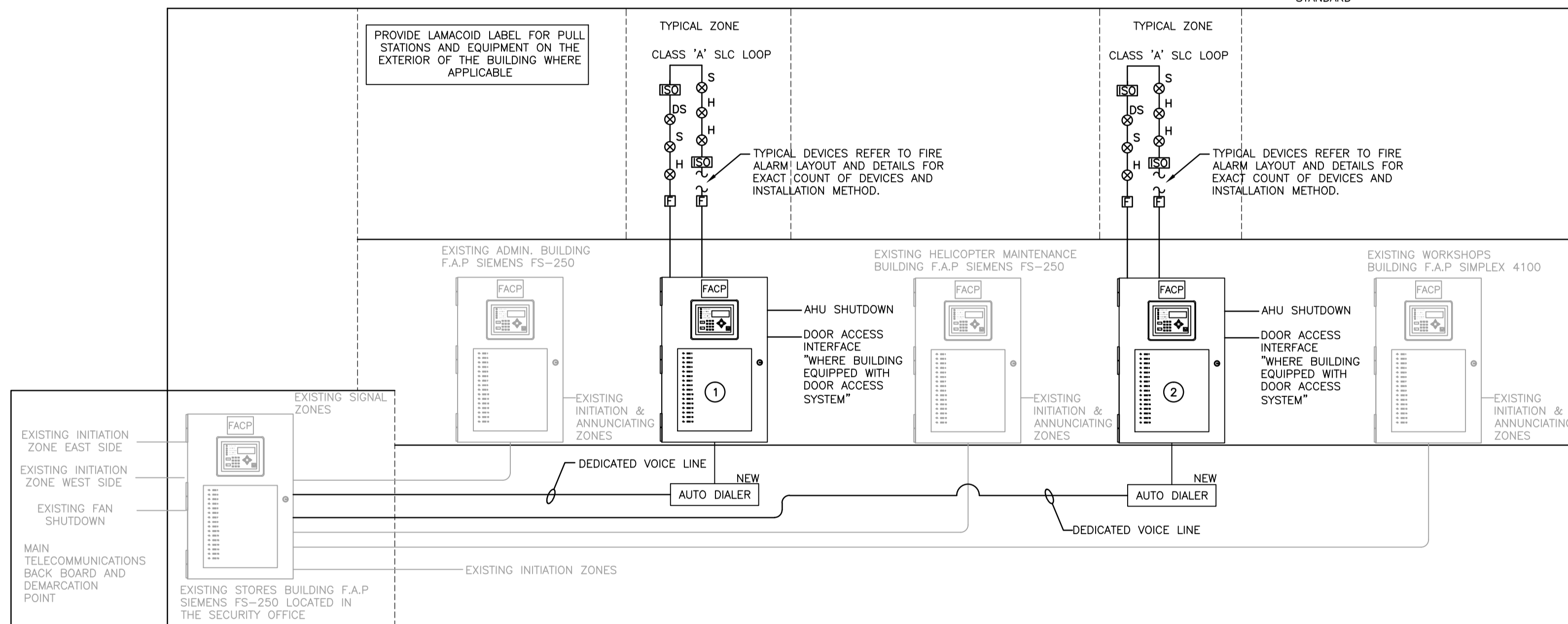
BUOY BUILDING FIRE ALARM SCHEDULE		
ZONE	DESCRIPTION	ALARM TYPE
Z1	MAINTENANCE SHOP	ALARM
Z2	ELECTRICAL ROOM	ALARM
Z3	MECHANICAL ROOM	ALARM
Z4	PAINT STORAGE	ALARM
Z5	TELECOMM ROOM	ALARM
Z6	OFFICE'S - WEST	ALARM
Z7	SOUTH CORRIDOR	ALARM
Z8	OFFICE'S EAST	ALARM
Z9	SOUTH EAST EXTERIOR ACCESS HATCH	ALARM
Z10	NORTH EAST EXTERIOR ACCESS HATCH	ALARM
Z11	NORTH WEST EXTERIOR ACCESS HATCH	ALARM
Z12	SOUTH WEST EXTERIOR ACCESS HATCH	ALARM
Z13	STORAGE	ALARM
Z14-18	TAMPER SWITCHES	SUPERVISORY
Z19-22	FLOW SWITCHES	SUPERVISORY
Z23	PRESSURE SWITCH	SUPERVISORY
Z24	AHU-1	ALARM
Z25	AHU-2	ALARM
Z26	AHU-3	ALARM
Z27-32	SPARE	ALARM

POLLUTION CONTROL BUILDING SIGNAL ZONES		
ZONE	DESCRIPTION	ALARM TYPE
SZ1	MAIN FLOOR	AUDIO/VISUAL
SZ2	MEZZANINE FLOOR	AUDIO/VISUAL

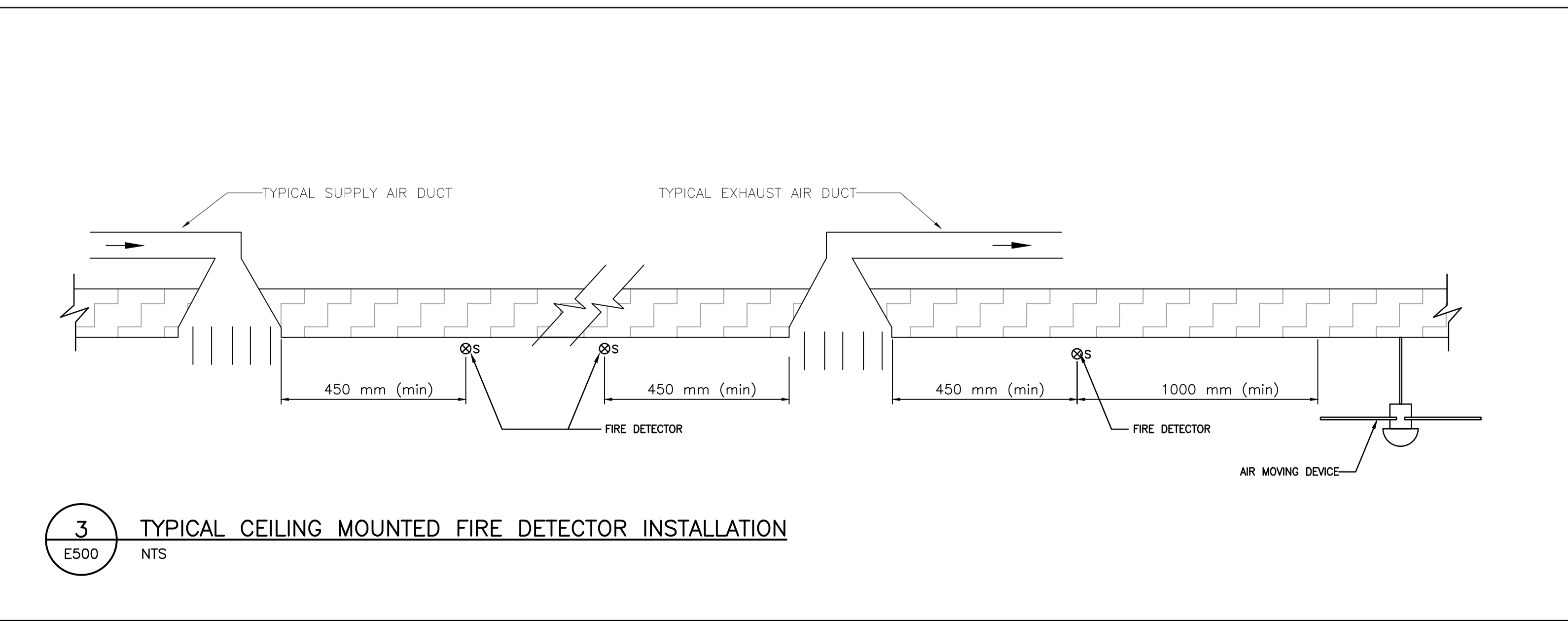
  

POLLUTION CONTROL BUILDING FIRE ALARM SCHEDULE		
ZONE	DESCRIPTION	ALARM TYPE
Z1	BATTERY CHARGING / BATTERY STORAGE	ALARM
Z2	STORAGE & BRIDGE SIMULATOR	ALARM
Z3	SPARE	-
Z4	STORAGE	ALARM
Z5	BOAT STORAGE	ALARM
Z6	WORKSHOP	ALARM
Z7	WORKSTATIONS	ALARM
Z8	MEZZANINE (LUNCH RM/CONFERENCE RM/IT RM)	ALARM
Z9	MEZZANINE STORAGE	ALARM
Z10	WATER ENTRY CLOSET	ALARM
Z11	BUILDING ENTRY	ALARM
Z12	FLOW SWITCH	SUPERVISORY
Z13	TAMPER SWITCH	SUPERVISORY
Z14	PRESSURE SWITCH	SUPERVISORY
Z15-232	SPARE	-

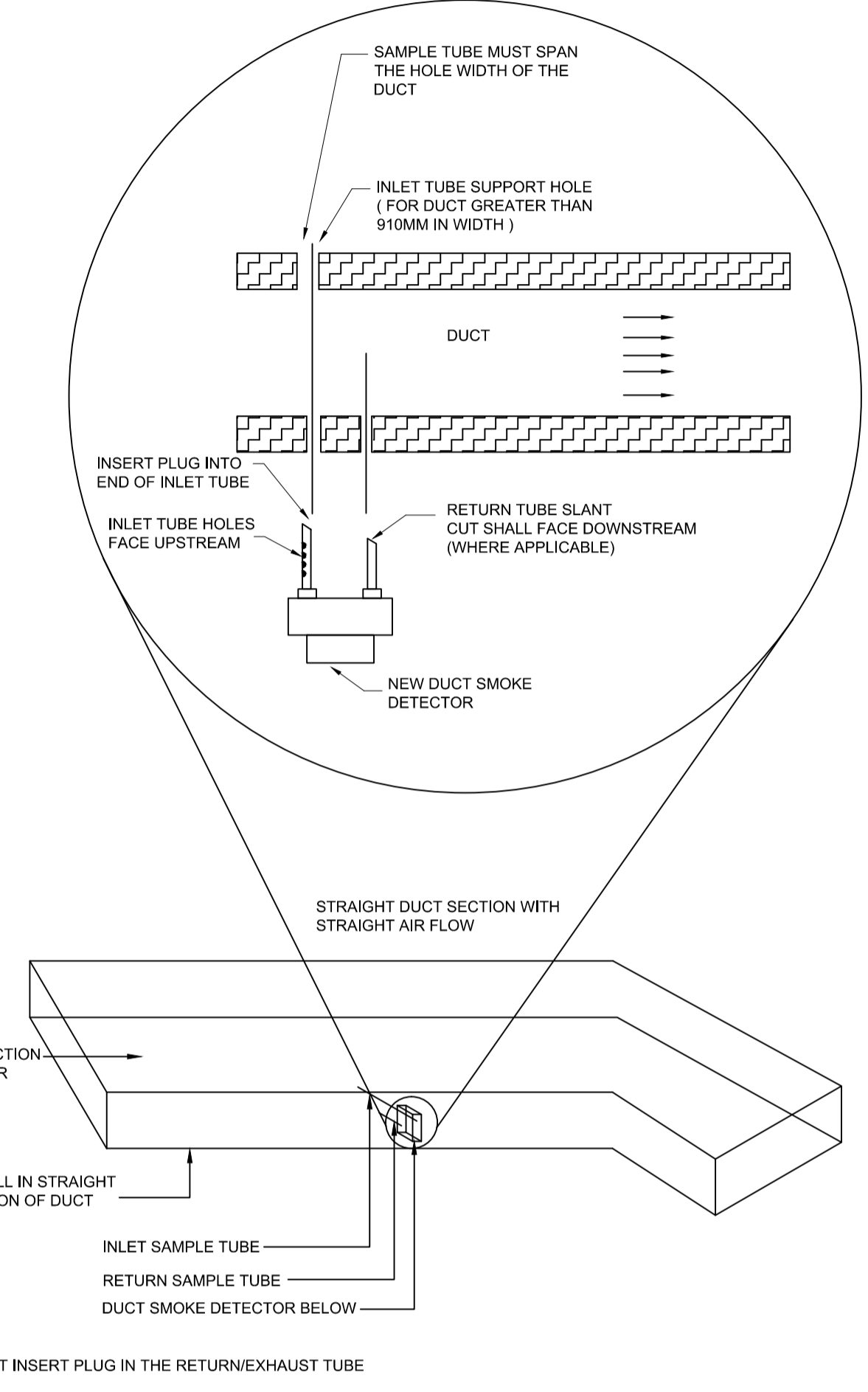
- RISER KEY NOTES:**
- NEW SIEMENS FS-250 OR SIMPLEX 4100 FIRE ALARM PANEL IN EXISTING BUOY BUILDING TO MATCH SITE STANDARD.
  - NEW SIEMENS FS-250 OR SIMPLEX 4100 FIRE ALARM PANEL IN EXISTING POLLUTION CONTROL BUILDING TO MATCH SITE STANDARD.



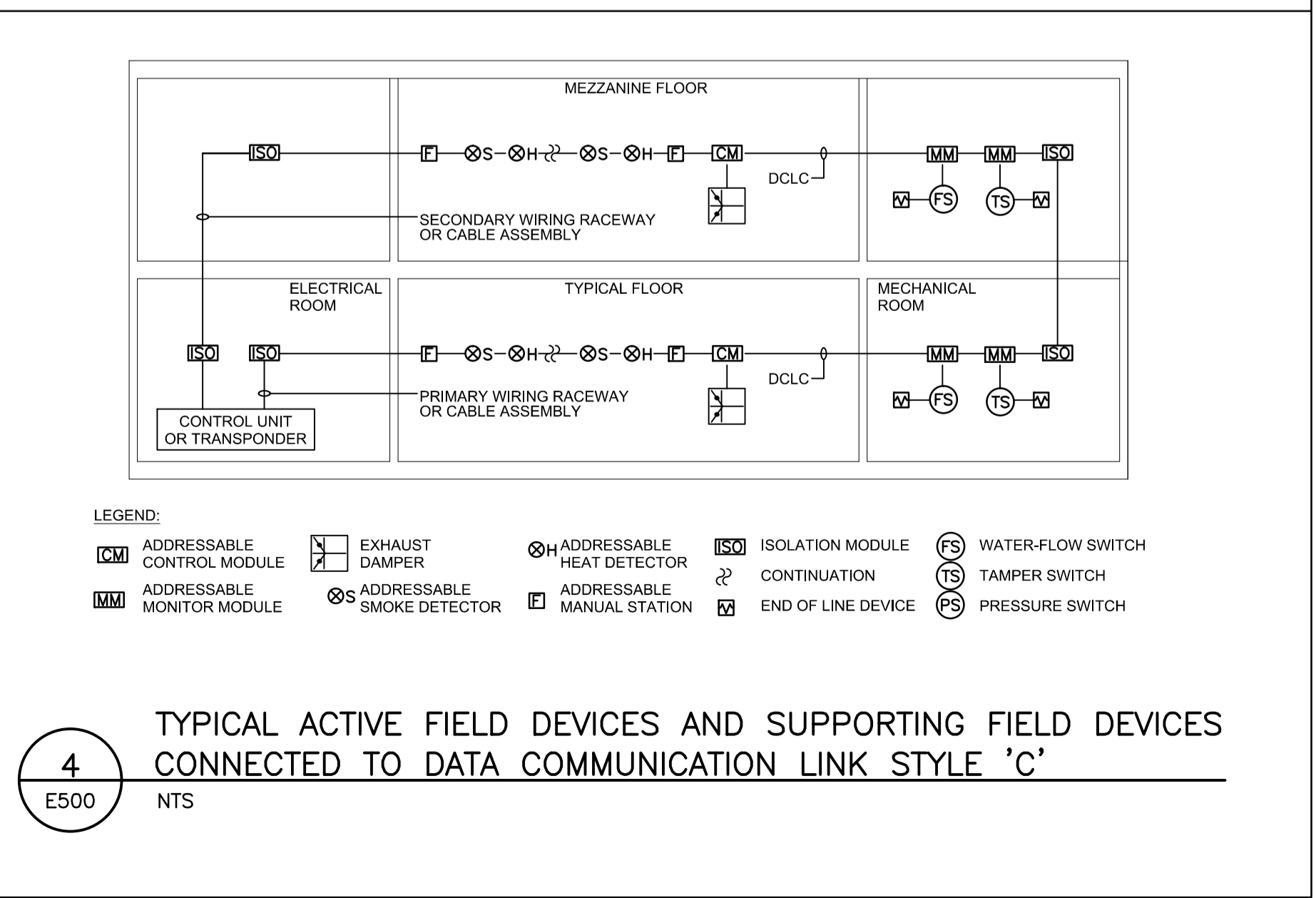
**1** INDICATIVE FIRE ALARM RISER DIAGRAM  
E500 NTS



**3** TYPICAL CEILING MOUNTED FIRE DETECTOR INSTALLATION  
E500 NTS



**2** TYPICAL SMOKE DUCT DETECTOR INSTALLATION  
E500 NTS



**4** TYPICAL ACTIVE FIELD DEVICES AND SUPPORTING FIELD DEVICES CONNECTED TO DATA COMMUNICATION LINK STYLE 'C'  
E500 NTS

1	ISSUED FOR TENDER	2017/01/27
Revision/	Description/Description	Date/Date
Client/client		

**DEPARTMENT OF FISHERIES AND OCEANS CANADA**

9860 WEST SAANICH ROAD  
SIDNEY B.C.

Project title/Titre du projet  
**VICTORIA COAST GUARD BASE  
25 HURON ST. VICTORIA, B.C.**

**LIFE SAFETY REFURBISHMENTS**

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Designed by/Concept par  
**AD**

Drawn by/Dessine par  
**AG**

DFO Project Manager/Administrateur de Projets  
**RANDY BURGIN**

Regional Manager, Architectural and Engineering Services  
Gestionnaire régionale, Services d'architecture et de génie, TPSGC

Drawing title/Titre du dessin

**FIRE ALARM DETAILS**

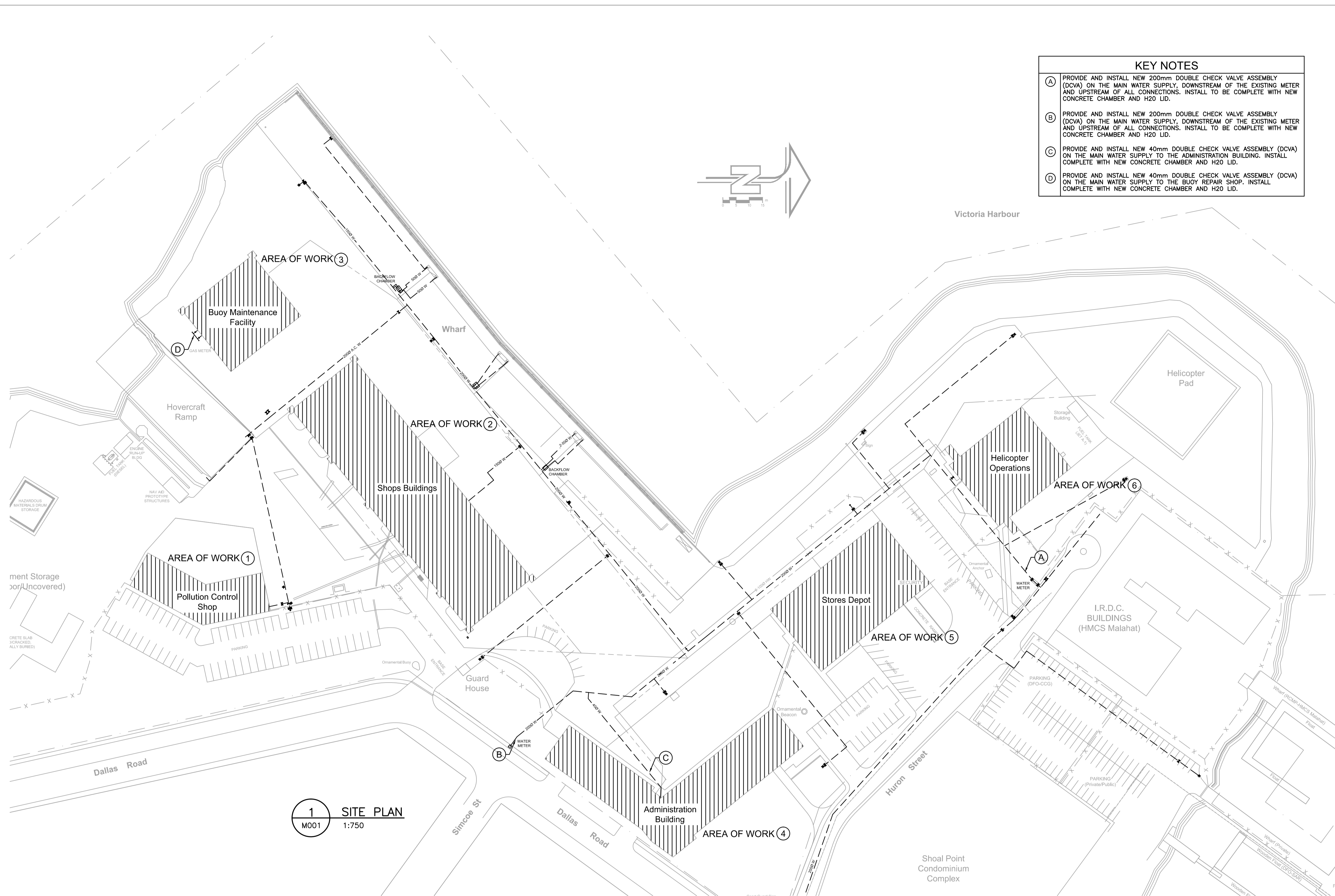
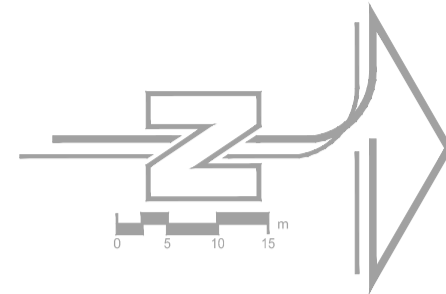
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	<b>7 OF 10</b>	





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STANTEC PROJECT NO: 115615358 - PHASE 2

KEY NOTES	
(A)	PROVIDE AND INSTALL NEW 200mm DOUBLE CHECK VALVE ASSEMBLY (DCVA) ON THE MAIN WATER SUPPLY, DOWNSTREAM OF THE EXISTING METER AND UPSTREAM OF ALL CONNECTIONS. INSTALL TO BE COMPLETE WITH NEW CONCRETE CHAMBER AND H2O LID.
(B)	PROVIDE AND INSTALL NEW 200mm DOUBLE CHECK VALVE ASSEMBLY (DCVA) ON THE MAIN WATER SUPPLY, DOWNSTREAM OF THE EXISTING METER AND UPSTREAM OF ALL CONNECTIONS. INSTALL TO BE COMPLETE WITH NEW CONCRETE CHAMBER AND H2O LID.
(C)	PROVIDE AND INSTALL NEW 40mm DOUBLE CHECK VALVE ASSEMBLY (DCVA) ON THE MAIN WATER SUPPLY TO THE ADMINISTRATION BUILDING. INSTALL COMPLETE WITH NEW CONCRETE CHAMBER AND H2O LID.
(D)	PROVIDE AND INSTALL NEW 40mm DOUBLE CHECK VALVE ASSEMBLY (DCVA) ON THE MAIN WATER SUPPLY TO THE BUOY REPAIR SHOP. INSTALL COMPLETE WITH NEW CONCRETE CHAMBER AND H2O LID.



1 SITE PLAN  
M001 1:750

Revision/	Description/Description	Date/Date
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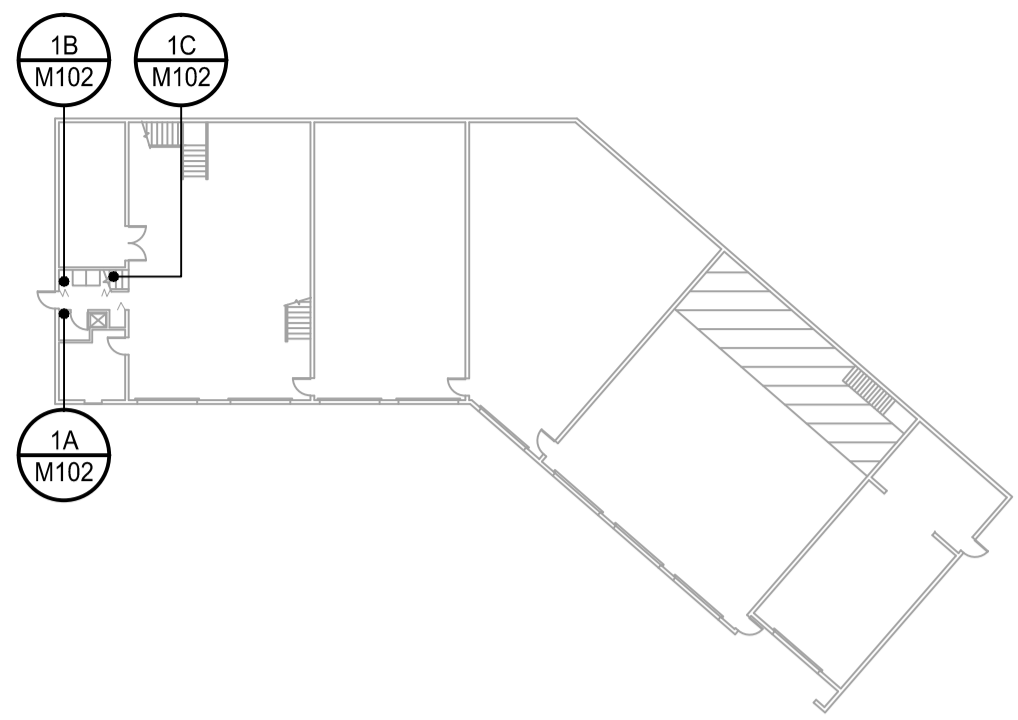
Designed by/Concept par  
**AD**  
Drawn by/Dessine par  
**AG**  
DFO Project Manager/Administrateur de Projets  
**RANDY BURGIN**  
Regional Manager, Architectural and Engineering Services  
Gestionnaire régionale, Services d'architectural et de génie, TPSGC

Drawing title/Titre du dessin

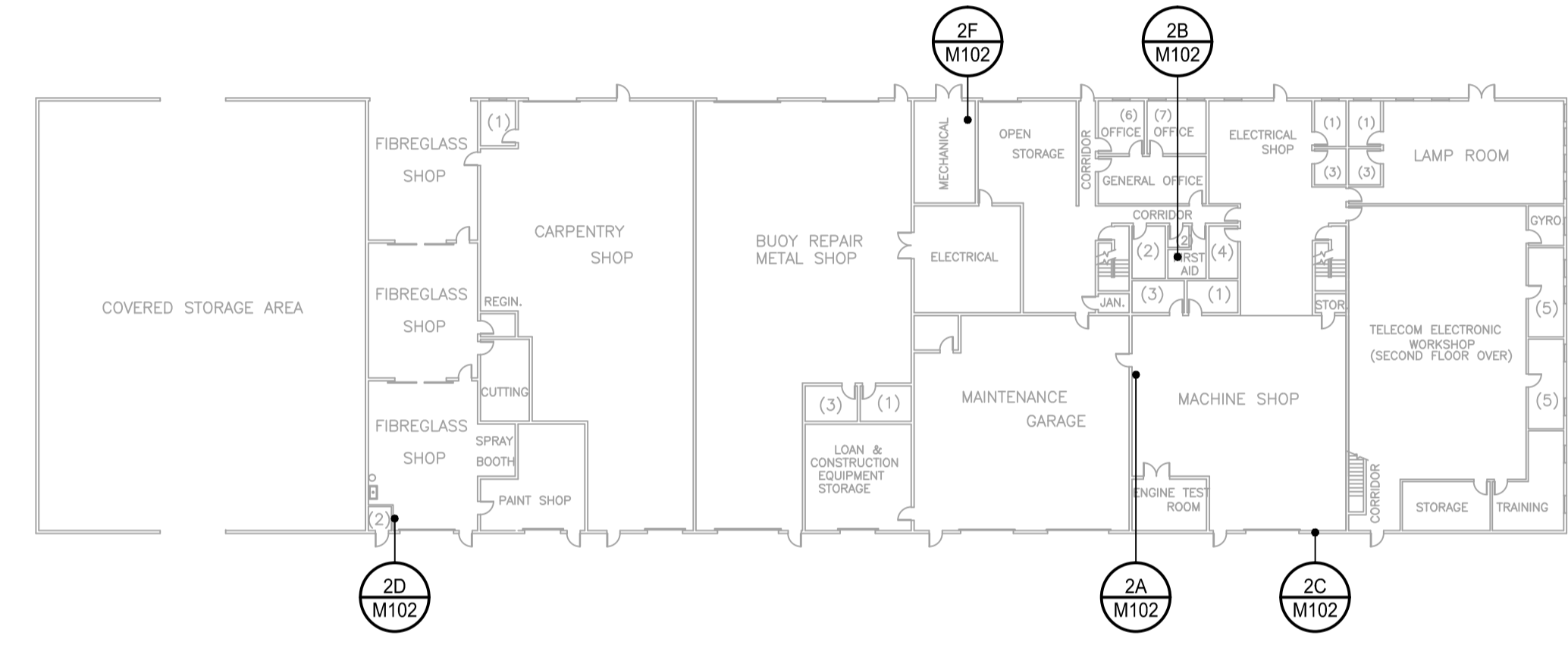
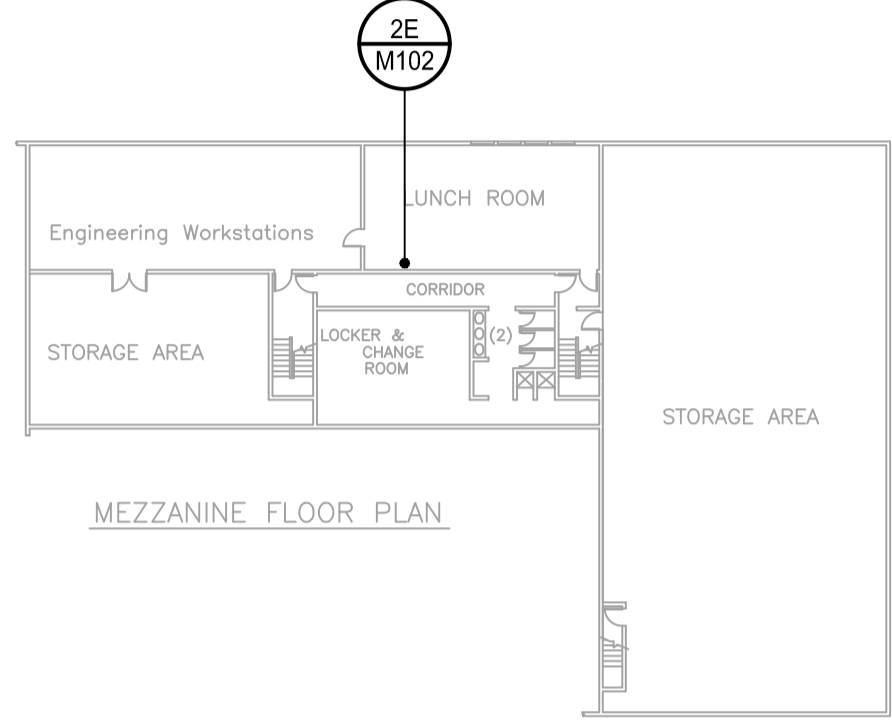
**SITE PLAN MECHANICAL**

Project No./No. du projet	Sheet/ Feuille	Revision no./ La Révision no.
F1700-164451	M001	1

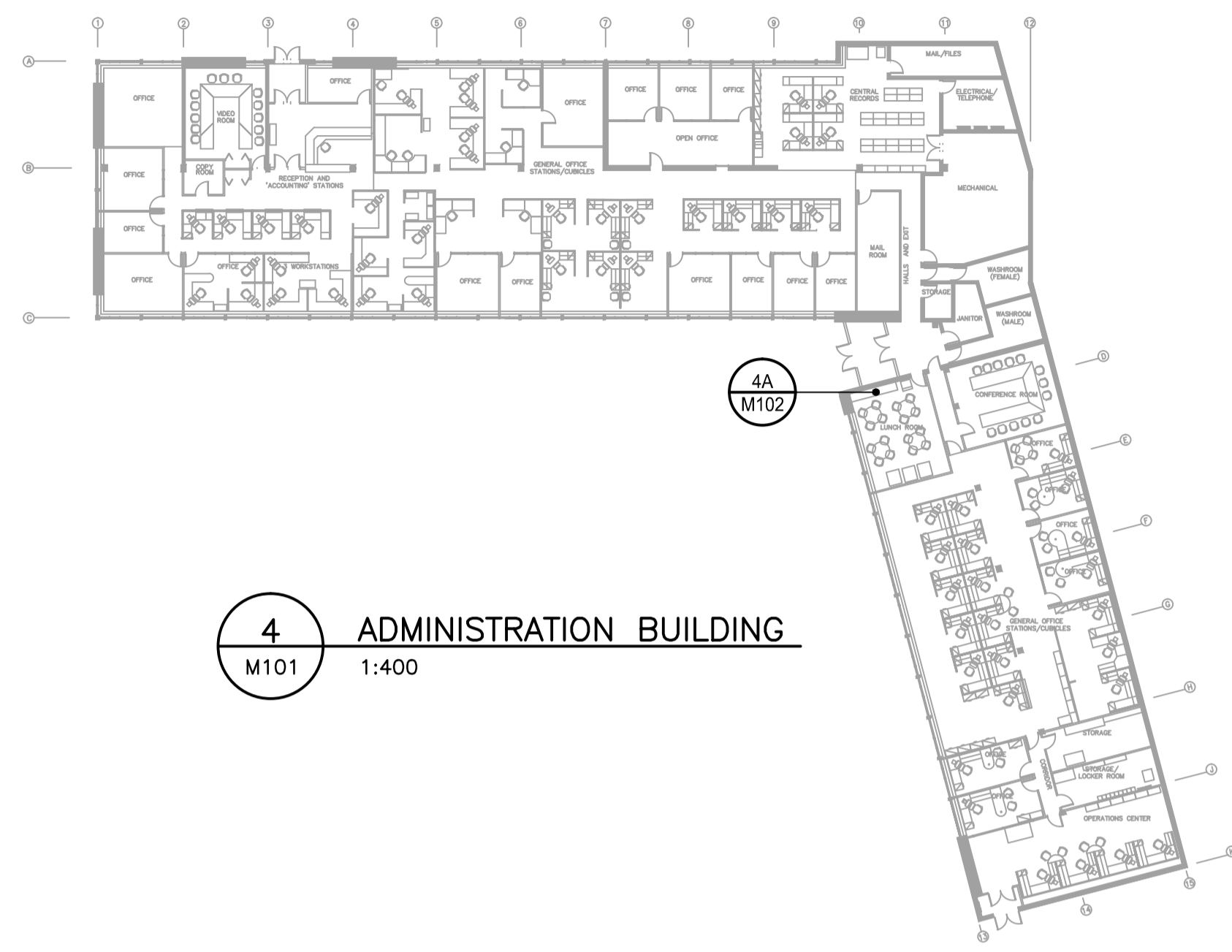




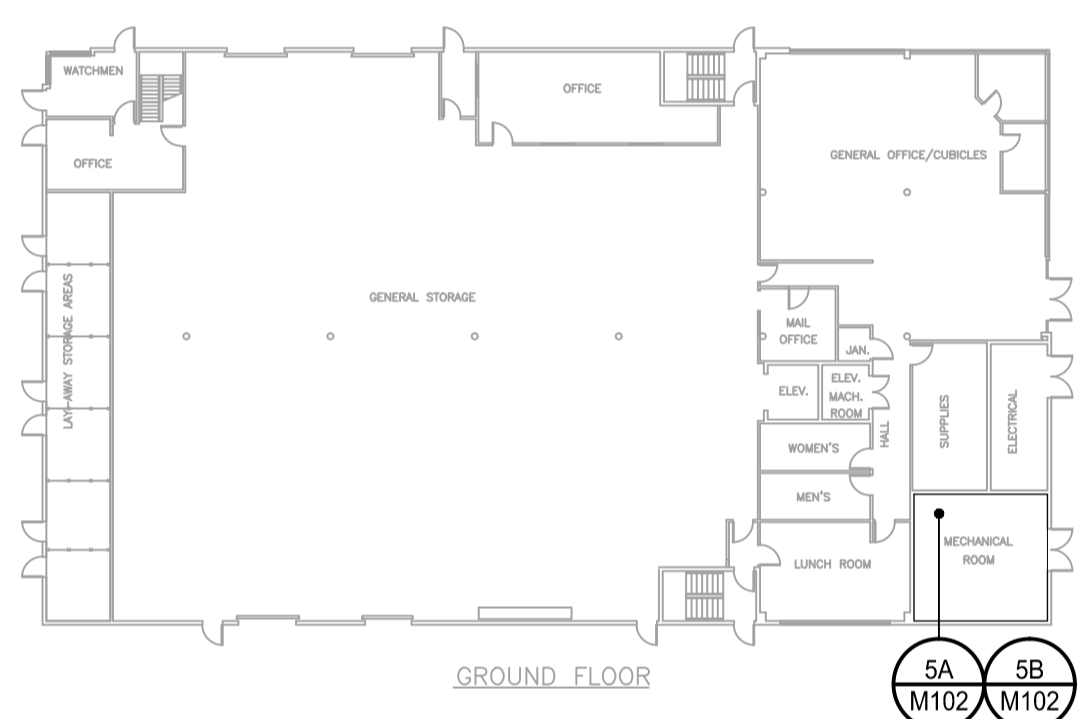
**1 POLLUTION CONTROL BUILDING**  
M101 1:400



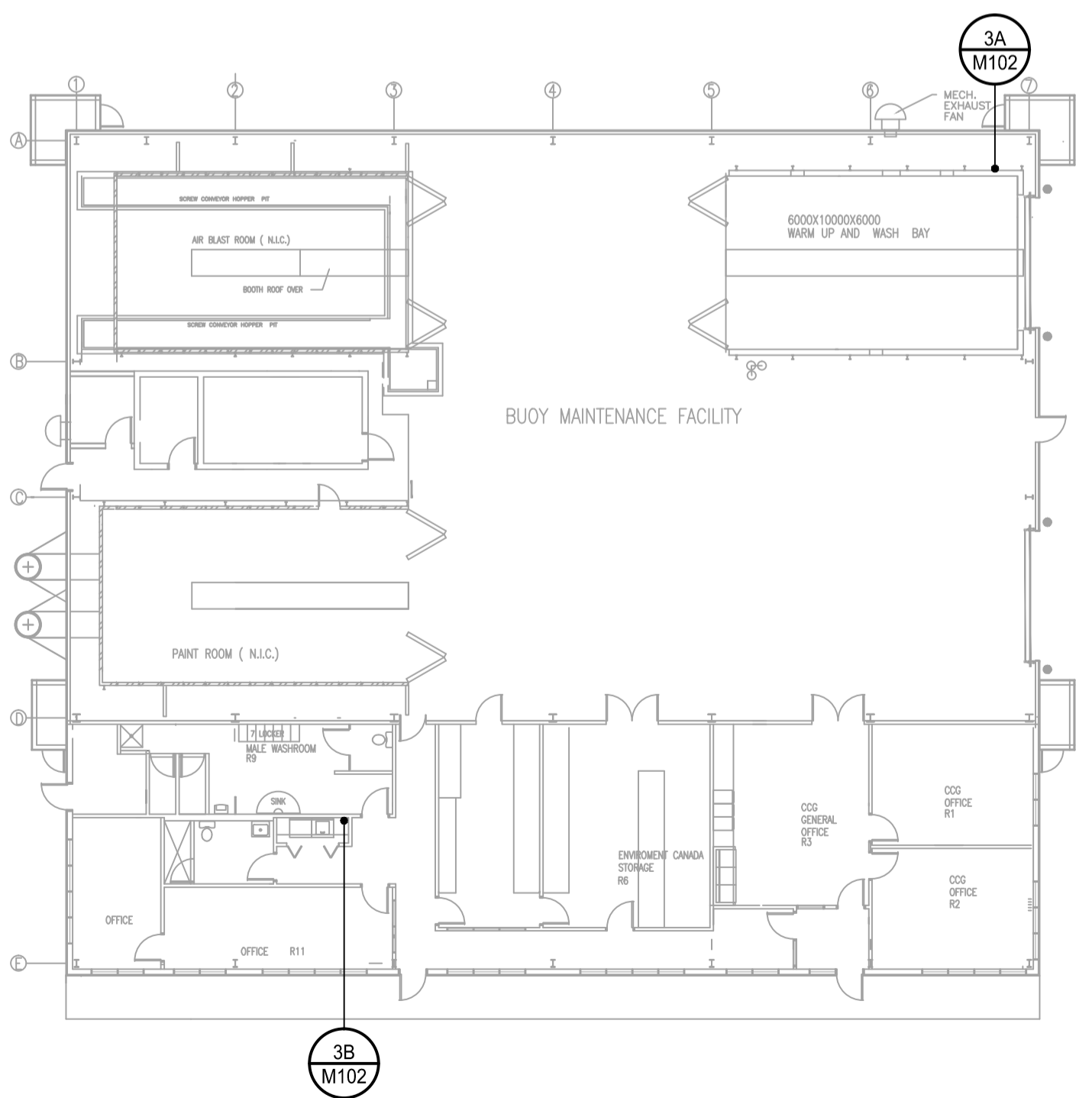
**2 SHOPS COMPLEX**  
M101 1:400



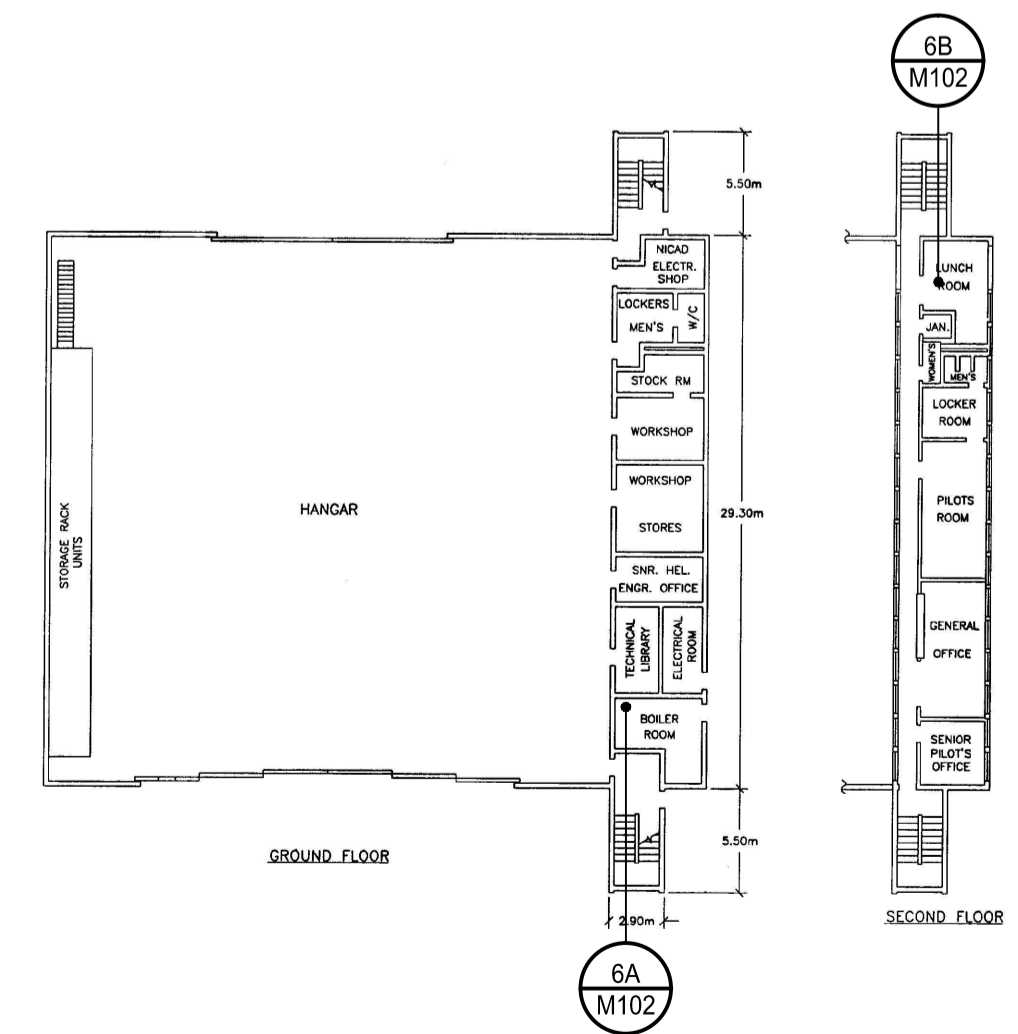
**4 ADMINISTRATION BUILDING**  
M101 1:400



**5 STORAGE BUILDING**  
M101 1:400



**3 BUOY MAINTENANCE SHOP**  
M101 1:400



**6 HELICOPTER HANGAR**  
M101 1:400

Revision/Revision	Description/Description	Date/Date
1	ISSUED FOR TENDER	2017/01/27

Client/client  
**DEPARTMENT OF FISHERIES AND OCEANS CANADA**  
9860 WEST SAANICH ROAD  
SIDNEY B.C.

Project title/Titre du projet  
**VICTORIA COAST GUARD BASE**  
25 HURON ST. VICTORIA, B.C.

**LIFE SAFETY REFURBISHMENTS**

Consultant Signature Only

Designed by/Concept par  
**AD**  
Drawn by/Dessine par  
**AG**  
DFO Project Manager/Administrateur de Projets  
**RANDY BURGIN**  
Regional Manager, Architectural and Engineering Services  
Gestionnaire régionale, Services d'architectural et de génie, TPSCG

Drawing title/Titre du dessin

**MECHANICAL AUDIT LOCATIONS**

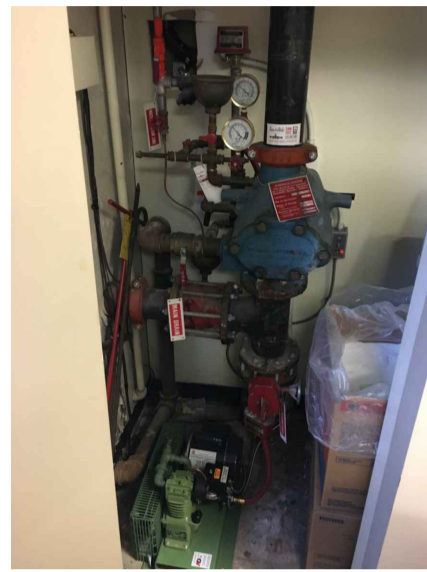
Project No./No. du projet	Sheet/Feuille	Revision no./La Révision no.
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**1A**  
M102 INCOMING WATER LINE

NOTE:  
PROVIDE AND INSTALL NEW 40mm DCVA ON INCOMING WATER LINE. INSTALL AFTER EXISTING VALVE. RELOCATE EXISTING HOSE BIB AS REQUIRED. PATCH DRYWALL AS REQUIRED. PROVIDE NEW ACCESS PANEL.



**1B**  
M102 FIRE SPRINKLER SYSTEM

NOTE:  
REBUILD EXISTING FIRE PROTECTION VALVE STATION. COMPLETE WITH NEW 100mm DCVA. INTENT OF REBUILDING STATION IS TO PROVIDE SUFFICIENT ROOM FOR NEW DCVA UPSTREAM OF EXISTING MAIN CONTROL VALVE. PROVIDE AND INSTALL NEW MONITORED TAMPER SWITCH UPSTREAM OF NEW DCVA. ALLOW FOR RECONNECTION OF SIAMESE CONNECTION AND ALL TRIM AS REQUIRED.



**1C**  
M102 WATER SUPPLY TO WATER COOLER

NOTE:  
INSTALL A 15mm DCVA ON THE WATER SUPPLY TO THE WATER COOLER UPSTREAM OF THE WATER FILTER.



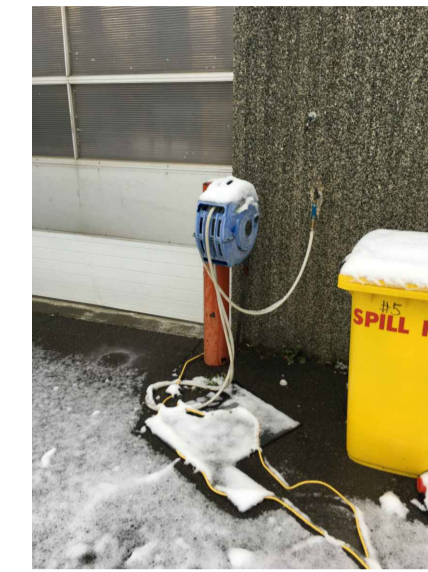
**2A**  
M102 WATER SUPPLY TO PARTS WASHER

NOTE:  
REPLACE EXISTING 15mm PEX HOT AND COLD WATER SUPPLIES TO THE PARTS WASHER. COMPLETE WITH NEW 15mm RPBP'S ON EACH LINE. PROVIDE NEW 50mm DRAIN STANDPIPE FOR RPBP VENTS TO DISCHARGE DIRECTLY INTO ADJACENT FLOOR DRAIN.



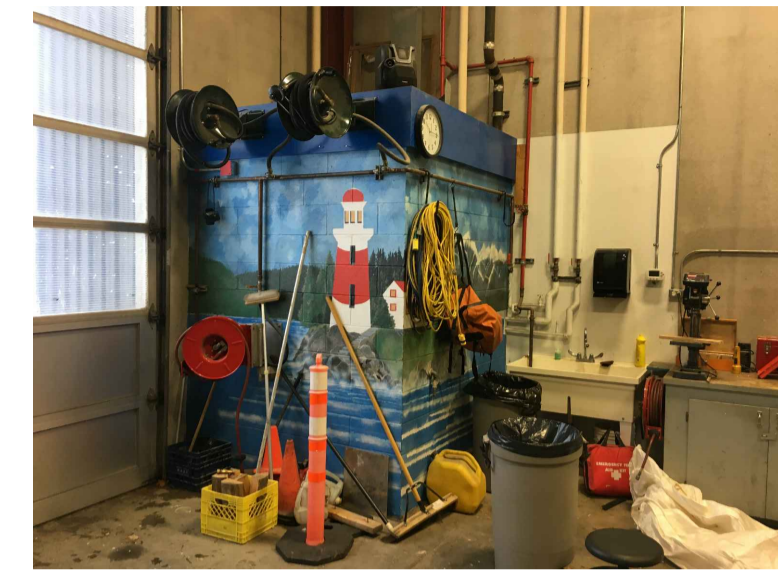
**2B**  
M102 WATER SUPPLY TO WATER COOLER

NOTE:  
INSTALL A 15mm DCVA ON THE WATER SUPPLY TO THE WATER COOLER UPSTREAM OF THE WATER FILTER.



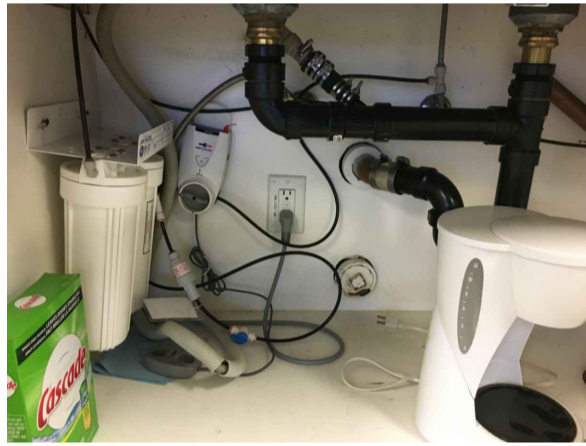
**2C**  
M102 RETRACTABLE HOSE REEL - HOSE BIB RPBP

NOTE:  
PROVIDE NEW 25mm COLD WATER TAKE OFF. COMPLETE WITH RPBP AND DRAIN AT STATION 2A' AND FIELD ROUTE TO SERVE EXISTING EXTERIOR HOSE REEL.



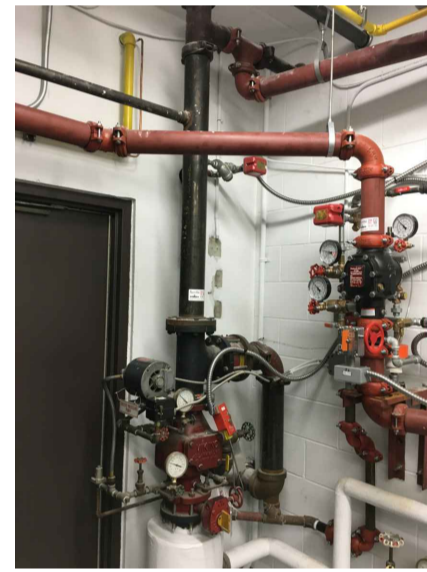
**2D**  
M102 RETRACTABLE HOSE REELS - WATER SUPPLY

NOTE:  
INSTALL NEW 25mm RPBP ON WATER SUPPLY TO RETRACTABLE HOSES. INSTALL NEW 50mm STANDPIPE DRAIN AND CONNECT TO EXISTING ADJACENT FLOOR DRAIN. ALLOW FOR SLAB CUTTING AND REPAIR AS REQUIRED TO MAKE DRAIN CONNECTION.



**2E**  
M102 WATER SUPPLY TO WATER COOLER & COFFEE MACHINE

NOTE:  
INSTALL A 15mm DCVA ON THE WATER SUPPLY TO THE WATER COOLER AND COFFEE MACHINE UPSTREAM OF THE WATER FILTER.



**2F**  
M102 FIRE SPRINKLER SYSTEM

NOTE:  
REBUILD EXISTING 100mm FIRE PROTECTION VALVE AND EXISTING 50mm WATER ENTRY STATION. COMPLETE WITH NEW 100mm DCVA TO FIRE SYSTEM AND NEW 50mm DCVA TO POTABLE WATER SYSTEM. NEW 100mm DCVA ON FIRE SYSTEM TO BE INSTALLED UPSTREAM OF MAIN SPRINKLER CONTROL VALVE. PROVIDE NEW MONITORED VALVE UPSTREAM OF NEW 100mm DCVA.



**3A**  
M102 WATER SUPPLY TO PRESSURE WASHER

NOTE:  
RELOCATE FILTER AND WATER LINE SERVING PRESSURE WASHER TO OPPOSITE SIDE (WITHIN STRUCTURAL FRAMING). PROVIDE AND INSTALL NEW 25mm RPBP ON THIS WATER LINE. UPSTREAM OF FILTER AND COMPLETE WITH 50mm STANDPIPE DRAIN FOR RPBP VENT PORT. CONNECTED TO ADJACENT RWL STACK.



**3B**  
M102 WATER SUPPLY TO WATER COOLER

NOTE:  
INSTALL A 15mm DCVA ON THE WATER SUPPLY TO THE WATER COOLER UPSTREAM OF THE WATER FILTER.



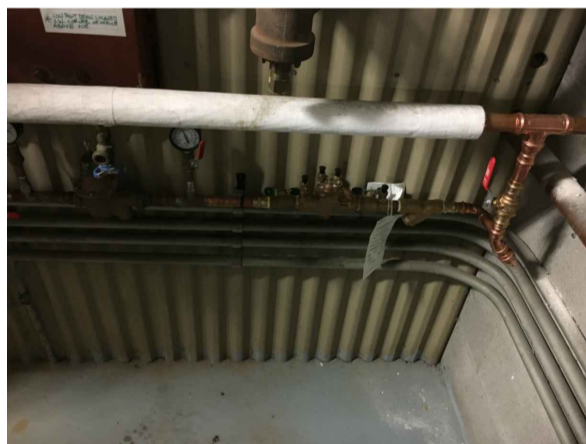
**4A**  
M102 WATER SUPPLY TO WATER COOLER

NOTE:  
INSTALL A 15mm DCVA ON THE WATER SUPPLY TO THE WATER COOLER UPSTREAM OF THE WATER FILTER LOCATED IN THE LUNCH ROOM.



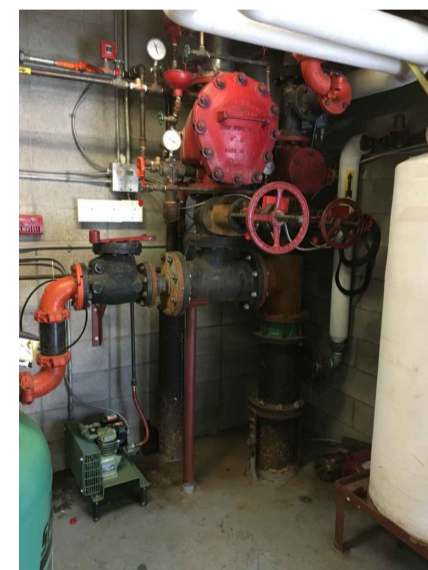
**5A**  
M102 FIRE SPRINKLER SYSTEM

NOTE:  
INSTALL NEW 100mm DCVA ON THE COMBINED WATER LINE TO THE FIRE SUPPRESSION SYSTEM. COMPLETE WITH NEW TAMPER VALVE. RELOCATE 50mm DOW TAKE OFF TO BE UPSTREAM OF NEW 100mm DCVA ON FIRE LINE AND PROVIDE NEW 50mm DCVA ON POTABLE WATER TAKE OFF.



**5B**  
M102 WATER SUPPLY TO BOILER

NOTE:  
PROVIDE NEW 50mm DRAIN STANDPIPE FOR EXISTING 19mm RPBP SERVING BOILER.



**6A**  
M102 FIRE SPRINKLER SYSTEM

NOTE:  
1. INSTALL A 200mm DCVA ON THE DOMESTIC WATER SUPPLY TO THE FIRE SPRINKLER SYSTEM. DCVA TO BE INSTALLED IN NEW CONCRETE SUMP AS SHOWN ON THE IMAGE ABOVE.  
2. RELOCATE BOILER FEED LINE TO TAKE OFF FROM COMBINATION WATERFIRE MAIN UPSTREAM OF NEW DCVA (ITEM 1. ABOVE), AND PROVIDE NEW 25mm RPBP TO SERVE BOILER SYSTEM.



**6B**  
M102 LUNCH ROOM WATER SUPPLY

NOTE:  
INSTALL A 15mm DCVA ON THE WATER SUPPLY TO THE WATER TAP UPSTREAM OF THE WATER FILTER.

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REFURBISHMENTS

Consultant Signature Only

Designed by/Concept par  
AD

Drawn by/Dessine par  
AG

DFO Project Manager/Administrateur de Projets  
RANDY BURGIN

Regional Manager, Architectural and Engineering Services  
Gestionnaire régionale, Services d'architecture et de génie, TPSGC

Drawing title/Titre du dessin

MECHANICAL AUDIT  
PHOTOS & DETAILS

Project No./No. du projet  
F1700-164451

Sheet/ Feuille  
M102  
10 OF 10

Revision no./  
La Révision no.  
1

